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# Electric Nation 2018

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PREPARED FOR:  
Transport Scotland



Urban  
Foresight

Scotland is on a journey to accelerate the widespread adoption of electric vehicles. In September 2017, Scotland's First Minister set the ambition to phase out the need for new petrol and diesel cars by 2032.

This report reviews the benefits that electric vehicles (EVs) are bringing to Scotland, the developments that are helping to achieve the 2032 targets and the potential for further change.

The review includes the findings of Scotland's first EV Drivers Survey, with the 184 respondents driving a collective total of 1.5 million electric miles a year.

Drawing on the survey results and wider analysis of transport data, the Electric Nation presents a snapshot of the changing EV landscape in Scotland.



## There are substantial benefits from EVs on Scotland's roads today

**£9m**  
a year in operational savings to Scottish motorists.<sup>1</sup>

**£4.3m+**  
per year in healthcare costs due to reduced air pollution.

**£28m**  
of turnover per year generated by Scottish businesses in the low emission vehicle industry.<sup>2</sup>

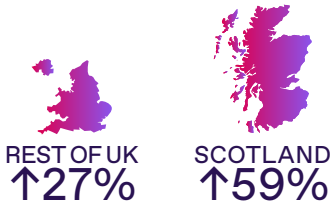
## The number of EVs on Scotland's roads is continuing to grow

**8,869 EVs**  
registered in Scotland at the end of June 2018.<sup>3</sup> This is 55% higher than the same point in 2017, and 139% higher than in 2016.<sup>4</sup>

**EV market share<sup>4</sup> more than doubled between 2015 and the end of 2017**

**76%**  
of EV owners purchased their vehicle within the last three years, and 32% with the last year.<sup>5</sup>

**Scotland's rate of EV adoption** has grown as twice the rate of the rest of the UK (59% vs 27%) between June 2017-June 2018 <sup>4</sup>



## Charging networks are expanding

  
**Scotland has over 864 public chargers, 184 of which are rapid chargers.**<sup>6</sup>

  
**35% of EV owners have access to chargers at their place of work.**

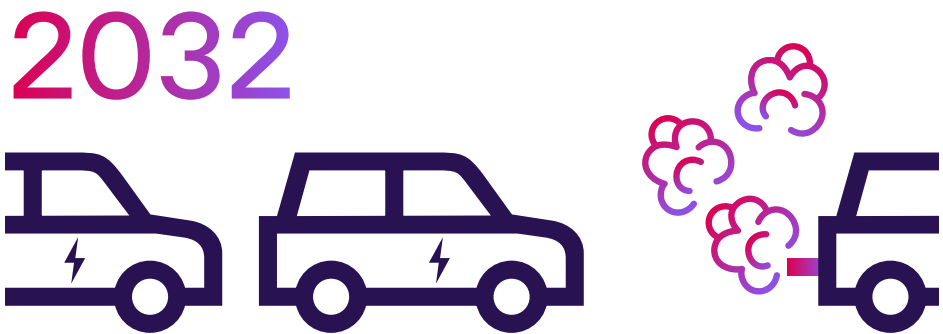
  
**Over 250,000 charging sessions on the ChargePlace Scotland network from January to September 2017.**<sup>7</sup>

## There is strong policy support

 **Aim for 50% of the Scottish bus fleet to be low emission vehicles by 2032.**<sup>8</sup>

**Scotland's ambition to phase out the need for new petrol and diesel cars by 2032.**

**37%↓**  
Scottish Government has a target that transport emissions will fall by 4.7MtCO<sub>2</sub>e (37% of current levels) by 2032 with plans to establish low emission zones (LEZs) in the four biggest Scottish cities by 2020.

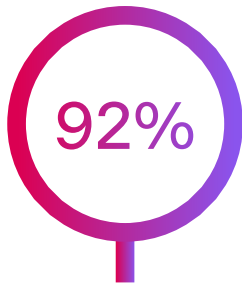


**Which aims for all new cars and vans to be effectively zero emission by 2040.**<sup>8</sup>


## There is huge potential for change

**£152 million healthcare savings**

If just **10% of cars in Scotland are electric**, the improvements in air quality would see healthcare costs fall by **£152 million per year** with nearly 1,400 fewer lives lost per year.<sup>11</sup>



**of all car journeys undertaken in Scotland are under 25 miles**, allowing EV owners to make several journeys on a single charge.<sup>9</sup>

  
**There is significant public support, with 87% of people believing EVs make a positive difference to air quality and 82% of people believing that EVs will improve road noise.**<sup>10</sup>

This report includes data captured from Scotland's first EV Drivers Survey.

The survey was released online and publicised via a range of stakeholders and networks in Scotland. Face-to-face surveys were also delivered at the E-cosse forums held at Edinburgh and Inverness.

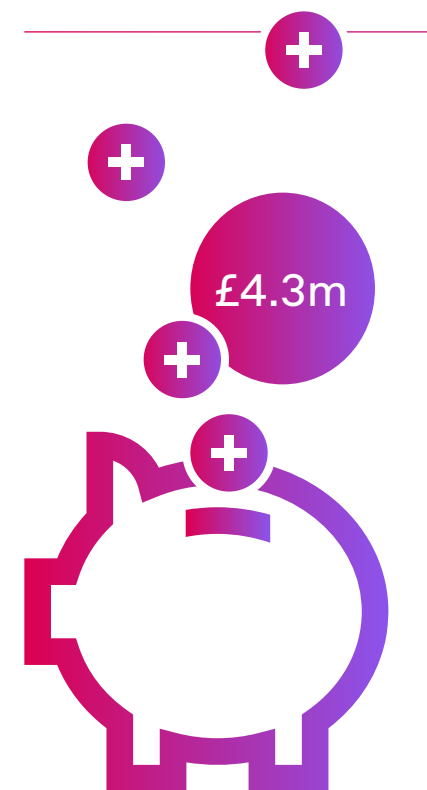
In total, there were 184 responses from EV owners in Scotland. This represents 2.3% of all plug-in grant Ultra Low Emission Vehicles (ULEVs)<sup>12</sup> registered in Scotland in May 2018.

Responses were treated as anonymous. Personal information provided was only used in aggregation for this research and stored in keeping with data protection legislation.



# The Benefits of Electric Vehicles

Accelerating widespread adoption of EVs brings an important range of benefits to transport, the environment and energy systems.



£4.3m per year saved in healthcare costs due to reduced air pollution.

**£910**

a year is saved in fuel costs on average by EV drivers in Scotland.

**£28m**

of turnover per year generated by Scottish businesses in the low emission vehicle industry.

**43,500 miles**

per year are clocked by the average Scottish taxi driver.

**2/3**

of Scottish residents used a car or van as their main mode of transport in 2016.



76% of all road traffic in Scotland is cars.

## Cleaner Road Transport

It is possible to have more EVs and fewer cars overall. Scotland is committed to reducing the need to travel by car, but where such journeys are necessary the ambition is that they should be taken in an ultra-low emission vehicle.

EVs will make the greatest contribution to reducing emissions from road transport

The overwhelming majority of trips in Scotland are taken by road transport with close to 2 out of 3 of Scottish residents using a car or van as their main mode of transport in 2016, travelling over **35 billion kilometres**.<sup>13</sup>

EVs provide a solution to decarbonise longer journeys which make up the majority of personal journeys in Scotland. Currently in Scotland, cycling is the main mode for just 1.2% of all trips with **77% of these being less than 5km**<sup>14</sup>. In contrast, cars represent 76% of all road traffic in Scotland with **Scottish car drivers completing a total of over 1.1 billion journeys per year which are longer than 5km (58% of all car trips)**.<sup>14</sup>

EVs also provide an important low carbon transport option for many people across Scotland. Geographically 20% of the population live in rural areas, where car dependency is greatest. There are also around **232,000 Blue Badges** on issue to disabled people in Scotland.<sup>15</sup>



The high mileage travelled by the **11,000 taxis** and **12,000 private hire vehicles** currently licensed in Scotland<sup>16</sup> means that they also contribute a disproportionately high amount of emissions. The average Scottish taxi driver accumulates around **43,500 miles per year**<sup>17</sup>, over three times the UK vehicle average.<sup>18</sup>

The 4,000 buses in Scotland travelled a total of just over 327 million km between 2016-17. Scotland is committed to investing in low emission electric and hybrid buses to reduce transport emissions. Through seven rounds of the Scottish Green Bus Fund, over £16 million has been awarded resulting in 362 new low emission buses.

## Cleaner Air

In Scotland, transport is responsible for **27%** of greenhouse gas emissions, with road transport contributing **73%** of these.<sup>20</sup>

Analysis by Friends of the Earth Scotland found that in 2017 air pollution levels in ten streets across four towns and cities broke Scottish and European air quality standards. The analysis measured Nitrogen Oxide (NOx) and Particulate Matter (PM) emissions, estimating that these pollutants caused more than **2,500 early deaths a year**, costing the economy more than £1.1 billion a year<sup>21</sup>.

Our analysis shows that a relatively small change, to just 10% of Scotland's cars being EVs, would see **1,400 fewer lives lost**<sup>22</sup> from air pollution and **over £158 million saved** in reduced health costs.<sup>23</sup>

27% of Scotland's greenhouse gas emissions come from transport

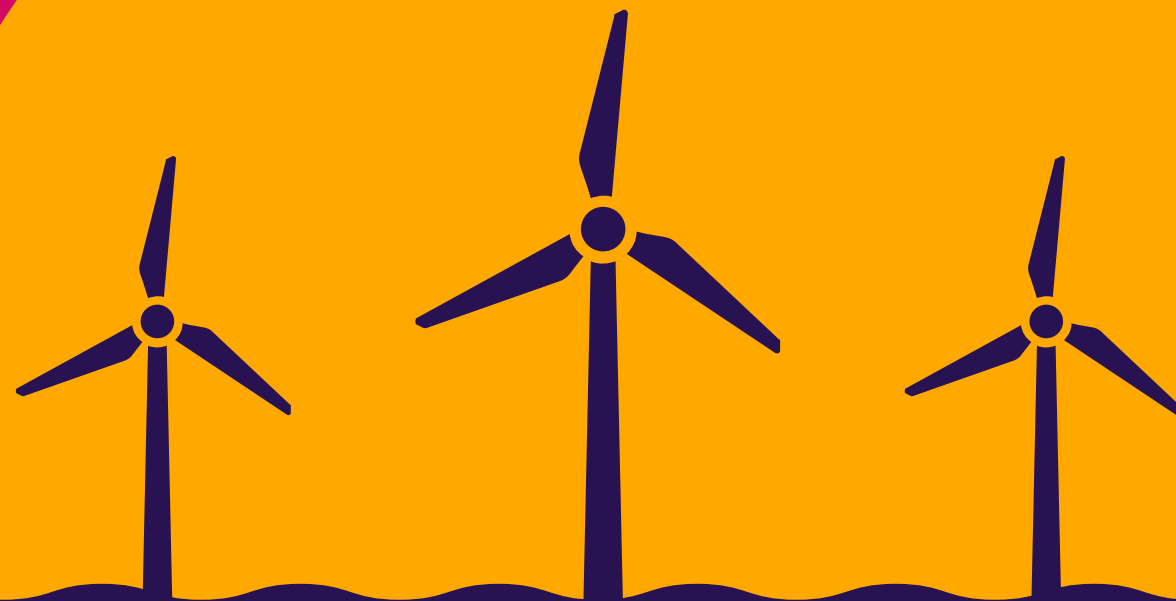


with 73% of these from road transport<sup>28</sup>

| Currently in Scotland                                                         | With just a small change, Scotland could see...                              |                                                                             |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 0.3% of cars are EVs                                                          | 10% of cars are EVs                                                          | 10% of buses are EVs                                                        |
| This means 38 fewer lives lost due to air pollution                           | Nearly 1,400 fewer lives lost from air pollution each year                   | 85 fewer lives lost from air pollution each year                            |
| Over £4.3 million saved each year in health costs from reduced air pollution. | Over £158 million in health costs saved each year from reduced air pollution | Over £5.8million in health costs saved each year from reduced air pollution |
| 34 tonnes less of NOx and PM emissions <sup>24</sup>                          | Over 2,600 tonnes fewer NOx and PM emissions                                 | Almost 80 tonnes less NOx and PM emissions                                  |
| CO2 exhaust emissions reduced by 14,370 tonnes a year <sup>25</sup>           | CO2 exhaust emissions reduced by over 535,000 tonnes a year                  | CO2 exhaust emissions reduced by nearly 22,000 tonnes a year <sup>26</sup>  |



68% of Scotland's electricity  
consumption was met by renewables  
in 2017



with a target  
to reach 100% by 2020.

## Scottish EV drivers saved £9 million last year compared to if they owned a fossil fuelled vehicle

### Safety

Early studies show that you are **25% less likely** to be injured in a collision when in a hybrid car.<sup>27</sup> Recent studies have highlighted that the lower centre of gravity in EVs is reducing the crash rate and severity.<sup>28</sup>

### Saving Money

Scottish EV drivers saved **£9 million** last year compared to if they owned a fossil fuelled vehicle.<sup>1</sup> Our EV Drivers Survey found that **75%** of EV owners stated lower driving costs is an important reason for owning an EV and **67%** believe that lower service and maintenance costs is important.

Looking at individuals we see that:

○ On average, EV owners are each saving **£910 a year** in fuel costs – even if they don't make use of free charge points and only recharge at home.<sup>29,30,31</sup>

○ An average vehicle owner saves **£304 a year** in service and maintenance costs when they switch to an EV.<sup>32</sup>

○ Zero-emissions vehicles are exempt from vehicle excise duty, saving anything from **£10 to £2,000**. Switching from a typical mid-sized petrol or diesel car to an EV would save drivers **£140**.<sup>33</sup>

With the costs of owning EVs rapidly reaching parity with fossil fuelled vehicles, these potential savings could make transport more affordable for the **1 million people** in Scotland living in transport poverty<sup>34</sup> meaning they don't currently have access to essential services or employment because of a lack of affordable transport options.

Up to 20% of neighbourhoods in Scotland have been identified as being at high risk of transport poverty and 9 out of 10 have poor access to public transport.<sup>34</sup> The people at the highest risk of transport poverty are in small urban areas, namely those designated as accessible small towns (28% of neighbourhoods in transport poverty) and accessible rural locations (30% neighbourhoods).<sup>34</sup>

As an indication of the scale of savings, in Renfrewshire, which has one of the highest rates of EV use as a percentage of all cars, **EV drivers collectively saved over £1.25 million in 2017**.



### Low Carbon Economy

The wider low carbon and renewable energy economy (LCRE) is growing in Scotland, reaching turnover of £5.5bn in 2016, and employing 24,000 people.<sup>2</sup>

Scottish businesses active in the low emission vehicle industry generated nearly **£28 million** of turnover, earning **£2 million** in exports and employing 500 people.<sup>35</sup>

Businesses in Scotland can benefit from incentives and cost savings associated with switching their fleets to EVs. This includes:

- Writing-down the purchase of new electric cars or vans against taxable profits.<sup>36</sup>
- Employees with a company car benefit from a decrease in Benefit In Kind tax, saving a basic rate taxpayer **£735** a year for a mid-range car.<sup>33</sup>
- Through the UK government’s Office for Low Emission Vehicles (OLEV) Workplace Charging Scheme, companies can claim up to £500 off the cost of installing each charge point, up to a maximum of 20 charge points. EST will provide up to £300 further funding on top of this for Scottish businesses.<sup>37</sup>





SCOTTISH EVS  
DRIVE A COMBINED  
60 MILLION MILES  
EACH YEAR,  
THAT'S 127 TRIPS  
TO THE MOON  
AND BACK



# Electric Vehicles on the Road

20%

of EV owners drive over 300 miles per week.

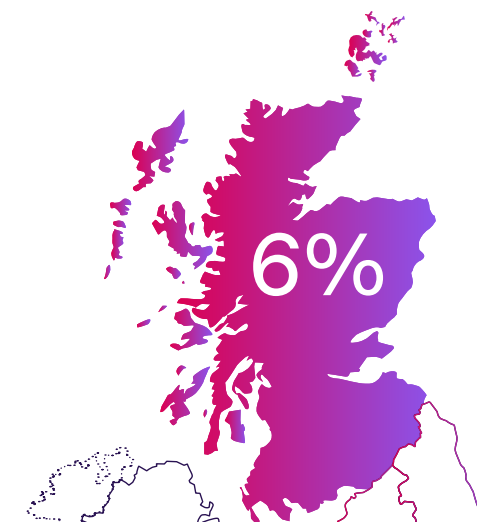


76% of EV owners use their car to travel to work.

500,000

miles were driven by EVs in Scottish car clubs in 2017/18.

6% of the UK's EVs are in Scotland



7.5

number of times a 30kWh Nissan LEAF could complete the average Scottish car journey before needing to recharge.



Orkney Islands, Stirling and Renfrewshire have the highest levels of EV ownership in Scotland.



The numbers of EVs on Scotland’s roads continues to grow and they drive 60 million miles per year.

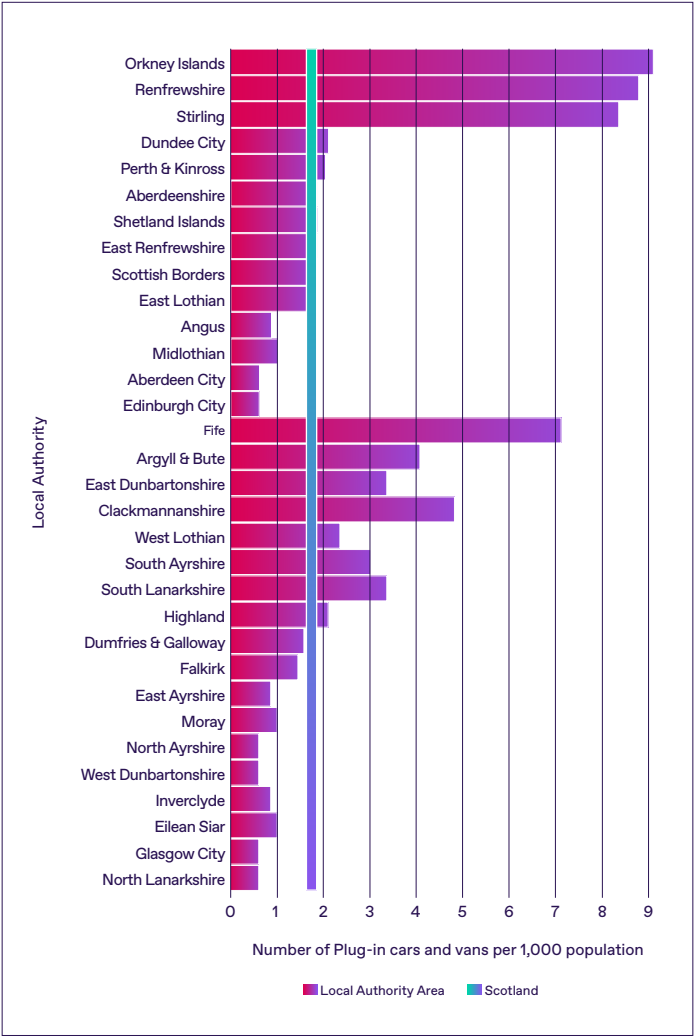
During the last seven years, over 150,000 cars and vans have been supported by the UK’s plug-in grant.<sup>38</sup> This helped increase plug-in vehicles<sup>39</sup> share of total new car sales to 2% in 2017<sup>40</sup>, making the UK the second largest market for ULEVs in the EU.

The proportional growth of EV sales in Scotland was faster than the rest of the UK in 2017. Scottish EV sales grew by 67%, compared to smaller proportional increases in England, 24%.<sup>41</sup>

There is a growing second-hand market for EVs in Scotland. 33% of respondents to Scotland’s EV Drivers Survey bought used EVs and over 80% of these purchases were in the last three years.

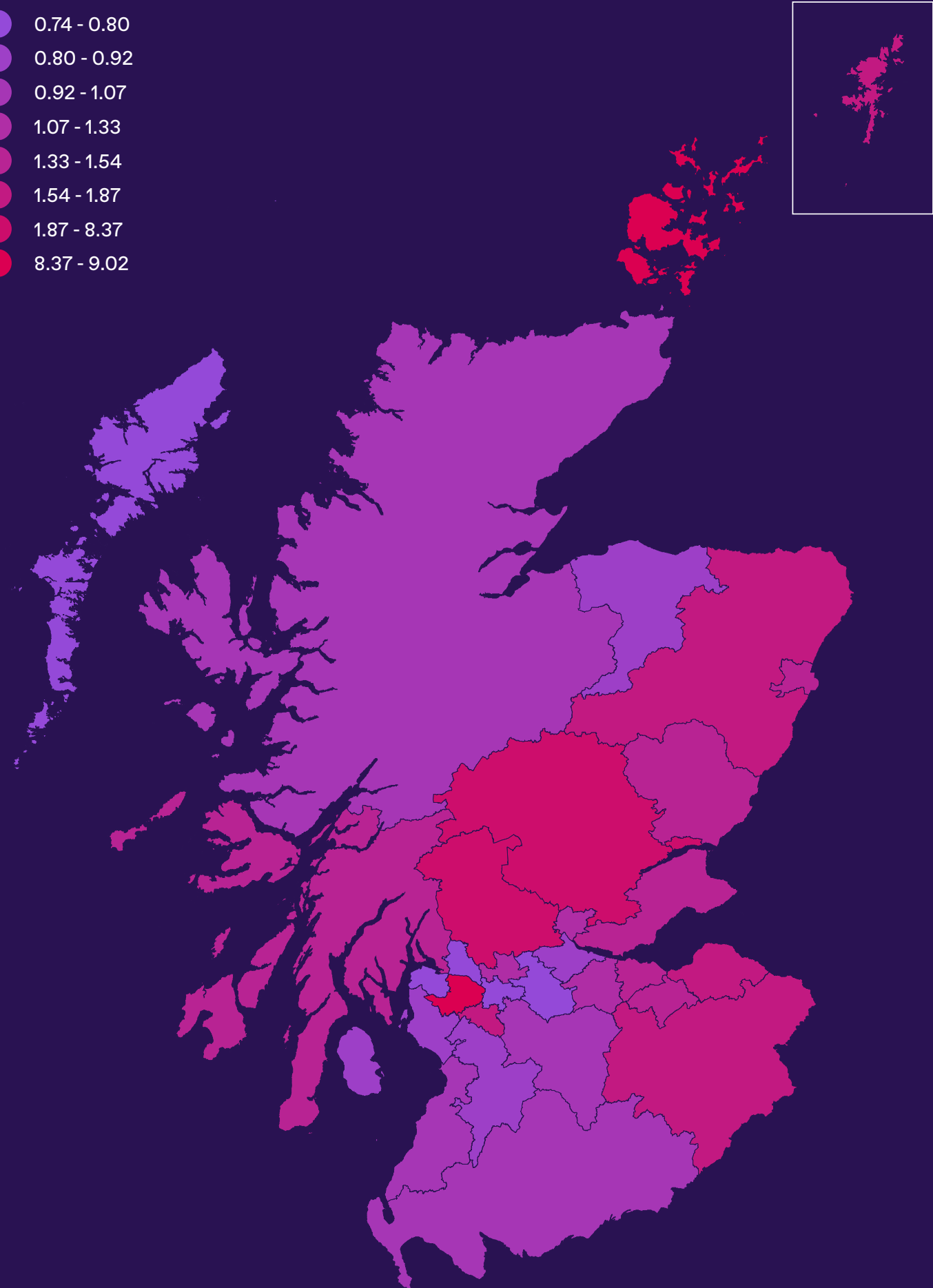
Scotland now has just under 6% of the UK’s EVs<sup>4</sup> although the number of EVs per 1,000 residents is 32% lower in Scotland than the UK average.<sup>42</sup>

The three local authority areas in Scotland with the highest proportion of EV ownership are the Orkney Islands, Renfrewshire and Stirling. The lowest proportion of EV ownership are in North Lanarkshire, Glasgow City and Eilean Siar.<sup>43</sup>



Vehicles per 1000 population

- 0.74 - 0.80
- 0.80 - 0.92
- 0.92 - 1.07
- 1.07 - 1.33
- 1.33 - 1.54
- 1.54 - 1.87
- 1.87 - 8.37
- 8.37 - 9.02



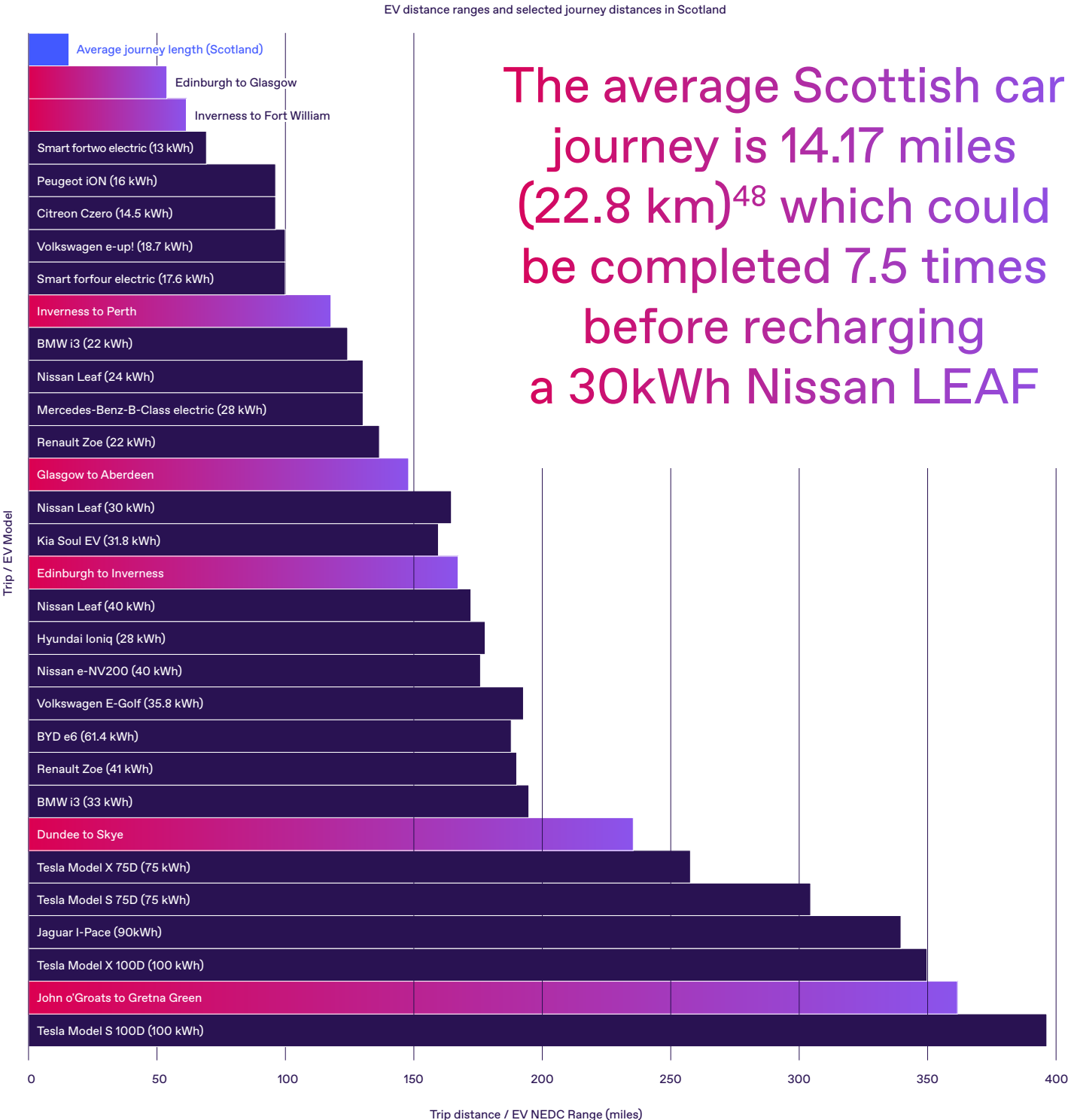
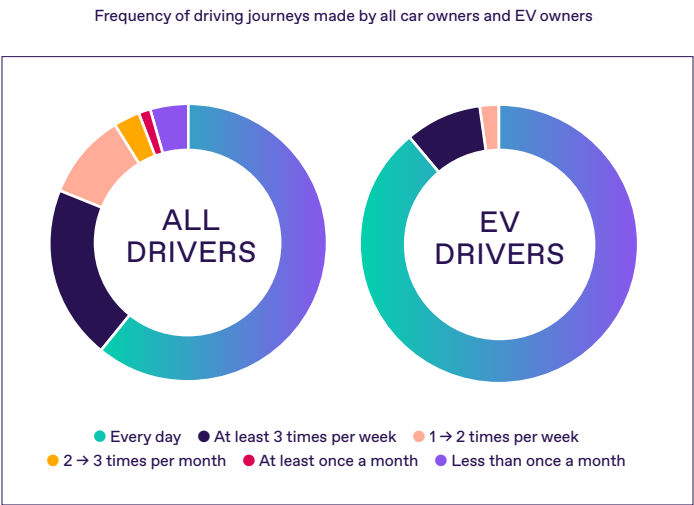
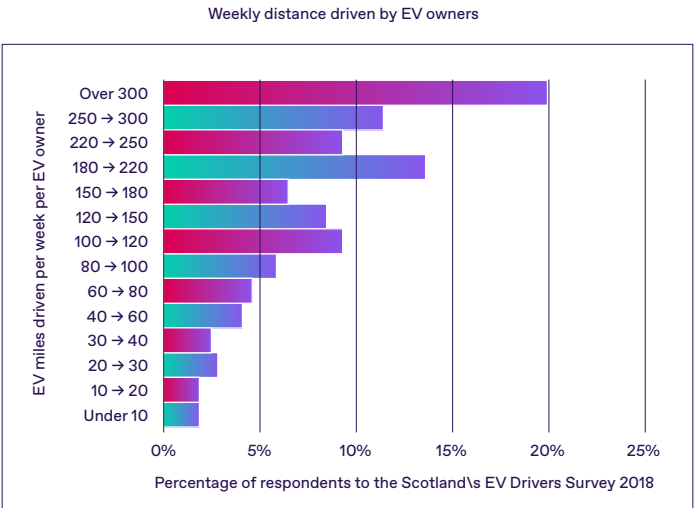
### EV Journeys in Scotland

Scottish EVs drive a combined 60 million miles each year, that’s 127 trips to the moon and back.<sup>44, 45</sup>

Scotland’s EV Drivers Survey 2018 found that electric vehicles are used in all aspects of everyday life. 76% of EV owners use their car to travel to work and 34% for the school run. 95% of owners use their EV for shopping and 98% for leisure and social activities. Regular use means EV drivers clock up significant mileage each week, with 20% of EV owners driving over 300 miles per week, compared to just 2% who drive fewer than 10 miles a week.

The battery sizes of category 1 electric vehicle models eligible for the Plug-in Grant range from 13.2 kWh to 100 kWh. The UK’s most popular EV in terms of vehicles licensed so far in 2018 is the 30kWh Nissan LEAF<sup>46</sup>, providing reported real-world driving range of 107 miles (173 km).<sup>47</sup>

The average Scottish car journey is 14.17 miles (22.8 km)<sup>48</sup> which could be completed 7.5 times before recharging a 30kWh Nissan LEAF.





## An EV journey from John o'Groats to Gretna Green

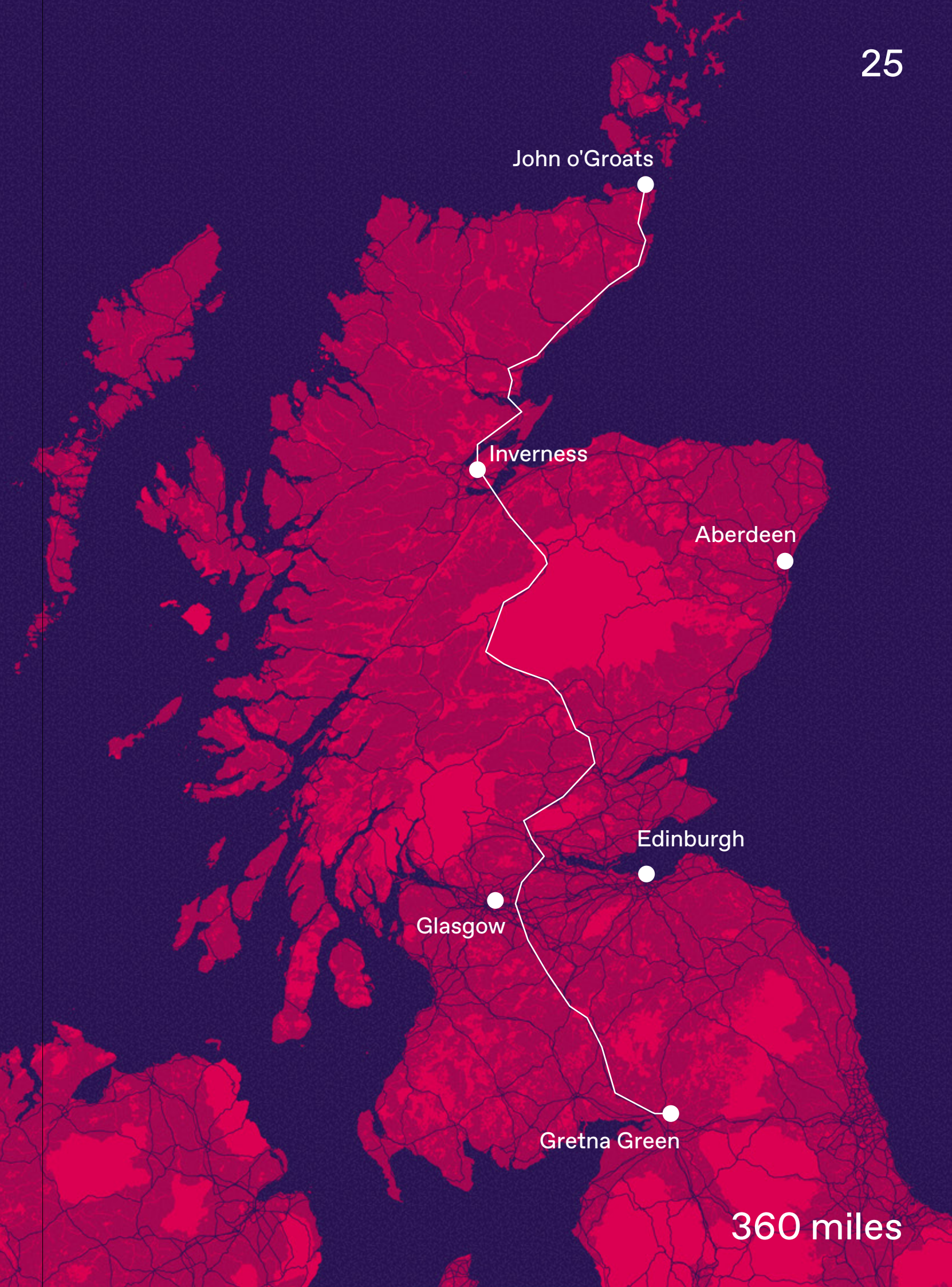
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The longest-range EV eligible for the plug-in grant (Tesla Model S 100D, 100kWh) can drive between Gretna Green and John o' Groats without needing to recharge (360 miles).

Most EVs in Scotland would need to visit 2 or 3 charge points on route, which are free to use on the current charging network. At the start of 2018, there were 56 charging locations along the route at a maximum of 45 miles apart.<sup>49</sup>

A 30 kWh Nissan LEAF would cost £4.20 to charge at home before making the trip and using free public charge points. If charging fees of 15 pence per kWh are introduced the journey would cost a total of £14.84. A comparable journey in the UK's best selling car, the Ford Fiesta would cost over £39 and produce 57kg of CO<sub>2</sub>.

25





### Electric Car Clubs in Scotland

Electric vehicles and other ultra low emission vehicles currently represent 98% of Scotland’s car club fleet.<sup>50</sup>

The 71 EVs in Scottish car clubs drove a total of around 500,000 miles in 2017/18. This represents a saving of 74 tonnes of CO2 that would have been produced in petrol cars<sup>51</sup> and 46 tonnes in diesel cars.<sup>52</sup>

Of the 42% of car club members in Scotland who have hired an EV, 80% reported a positive user experience.<sup>50,53</sup>

### Electric Buses

The Scottish Government aims to increase the proportion of low emission vehicles in the Scottish bus fleet to 50% by 2032.<sup>54</sup>

In 2015, Stagecoach launched all-electric buses in Scotland, on their 7 and 9 services in Inverness. Service 9 connects South Kessock to the city centre and service 7 connects Culduthel to the city centre and Raigmore. Together, these services carry over 24,000 passengers every month.

Orkney has also implemented an electric bus connecting passengers between Kirkwall town centre and Kirkwall Airport.

Lothian buses invested over £2.7 million in 6 fully electric buses, operating each with a 300kWh battery. The vehicles can operate for up to 130 miles and take three to four hours to charge with a 75kW charger. Lothian buses aim to add a further five electric buses to the service in 2018.

### Case Study Electric Car Sharing in the Outer Hebrides



**E-Car Club is one of a number of operators in Scotland that provides electric car hire by the hour.**

E-car has expanded its operations onto the Isle of Lewis and Harris. Initial deployment of vehicles has focused on the island’s airport and ferry terminals, seeking to capture users travelling to the islands – with visitors using CalMac ferries able to benefit from discounted rates and free membership.

To increase levels of use, E-Car has been working with the island’s community to raise awareness of potential benefits and stimulate interest in EVs, as well as working to deploy vehicles in and around the island’s community centres.



**The Orkney Islands has the highest levels of EV adoption per capita in Scotland and one of the highest in the UK.**

Passionate local advocates for EV technology raised awareness of EVs and their benefits. Through a range of different community events, and by providing ongoing advice and support, they helped break down false perceptions and generate interest in the technology.

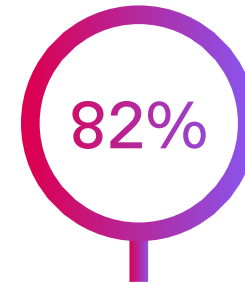
A local used car dealer helped provide EVs at a lower price for the local community, sourcing vehicles from mainland Britain. A local garage owner also sought out training and accreditation in the maintenance of EVs, providing confidence to locals that vehicles could be maintained in a convenient and cost effective manner. Orkney Islands Council invested in public charging infrastructure, with support from Transport Scotland, providing a network of over 39 ChargePlace Scotland charging points. These consist of a mixture of fast (7kW), semi-rapid (22kW) and rapid (43-50kW) charge points at convenient locations around the islands.

A high proportion of households in Orkney generate renewable energy, reducing the cost of charging EVs. Widespread EV adoption enables Orkney to make better use of excess renewable energy which is difficult to export to the mainland. This cheaper alternative to fossil fuels is particularly beneficial given that petrol prices on the islands can be higher than in mainland Scotland.



# Charging Infrastructure

Continued development of Scotland's charging infrastructure is essential to encourage faster EV uptake.



of Scotland's EV owners are confident that they can get to where they need to using public chargers.

**Over 250,000**

charging sessions on the Charge-Place Scotland network from January to September 2017.

**3.07GWh**

of electricity was used to charge EVs in 2017, the equivalent to 0.012% of Scotland's renewable energy.

**Nearly 90% of Scotland's EV owners have home charging points**



**1/5**

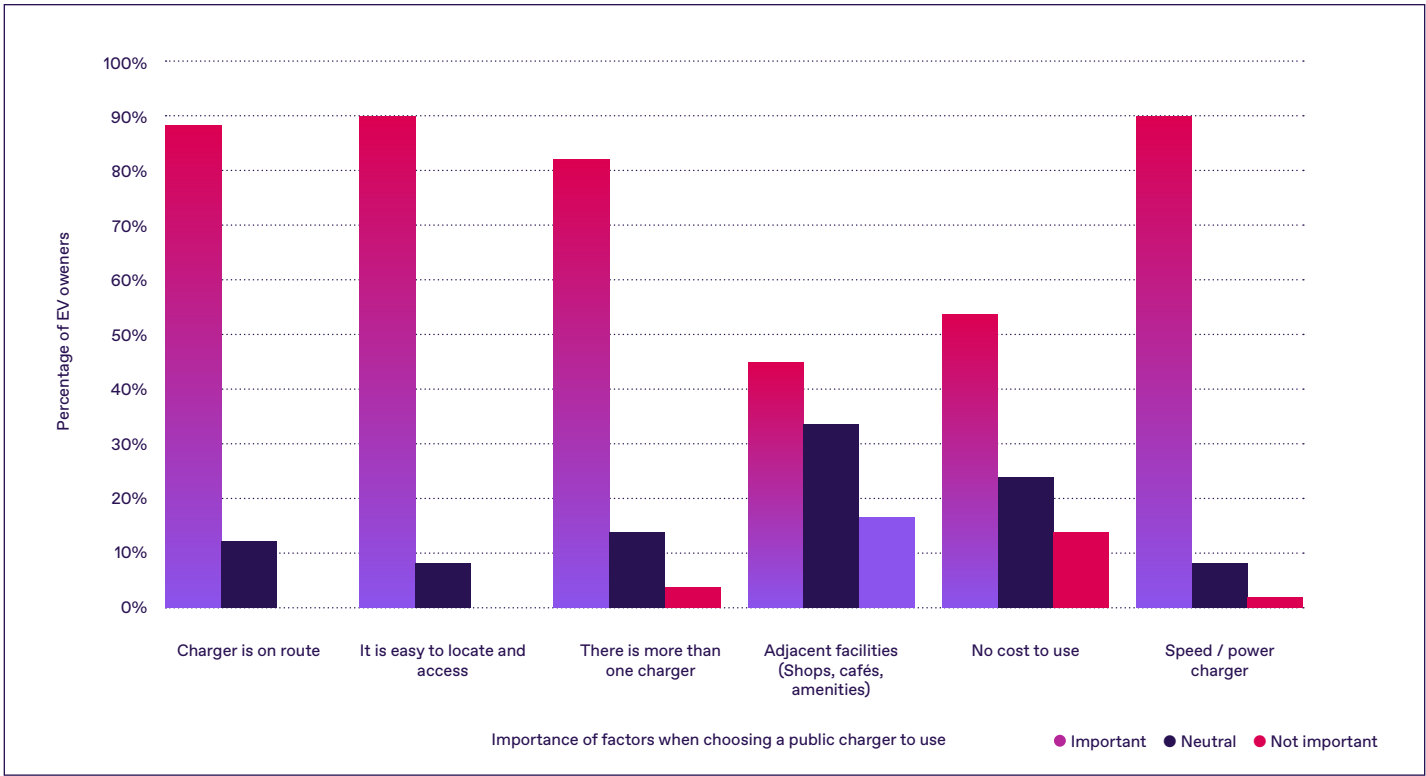
of EV owners use the public charge network on a daily basis.



**864 public chargers** across Scotland in 2017, 184 of which were rapid chargers.



Scotland's EV Drivers Survey found that fast, easy to find, and well-located public chargers are the most important features for EV owners using the charging network. The most important factors for 90% of EV owners are ease of location and access, and the speed of the charger. In contrast, only 54% consider free charging to be important.



### Charging Networks are Growing

The UK is one of the world leaders in the deployment of rapid chargers (defined as 43kW and above), with 9% of its 14,000 chargers being rapid.<sup>55</sup> In Japan, 26%<sup>56</sup> of the country’s 40,000<sup>57</sup> chargers are rapid.

China is leading on the capacity of their charging network, at 4,762MW – around four times the US, UK, European and Japanese network capacities.<sup>58</sup> The capacity on the ChargePlace Scotland network is 28MW.<sup>59</sup>

The UK ranks fourth in the world for the quantity of charging points per petrol station, beaten only by the Netherlands, Norway and China.<sup>56</sup>

The Netherlands and Norway are leading the way in charging points per head of population, with around **1 charging point for every 667 people**<sup>60</sup>. Scotland currently has around **1 charging point for every 2,857 people**.<sup>59</sup>

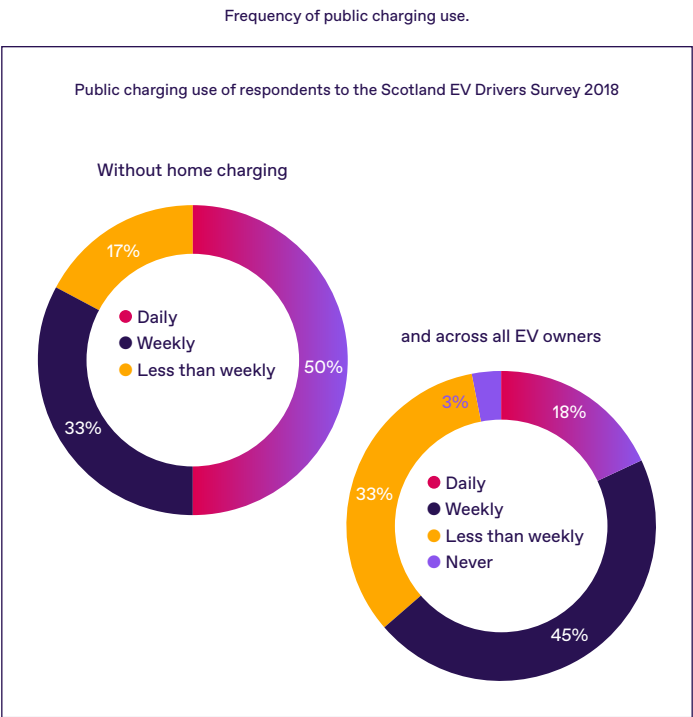
### Scotland’s Charging Network

The majority of respondents to Scotland’s EV Drivers Survey have access to charging at home, however 13% did not.

Those without home charging rely on the public charging network, with 83% of these EV owners using the network daily or weekly. More generally, nearly 1 in 5 EV owners use the public charge network on a daily basis, with 45% doing so at least once a week.

33% of EV owners use the charging network less than once a week, with 80% of these using workplace chargepoints at least once a week instead.

82% of respondents to Scotland’s EV Drivers Survey are confident that they can get to where they need to using public chargers. Transport Scotland successfully



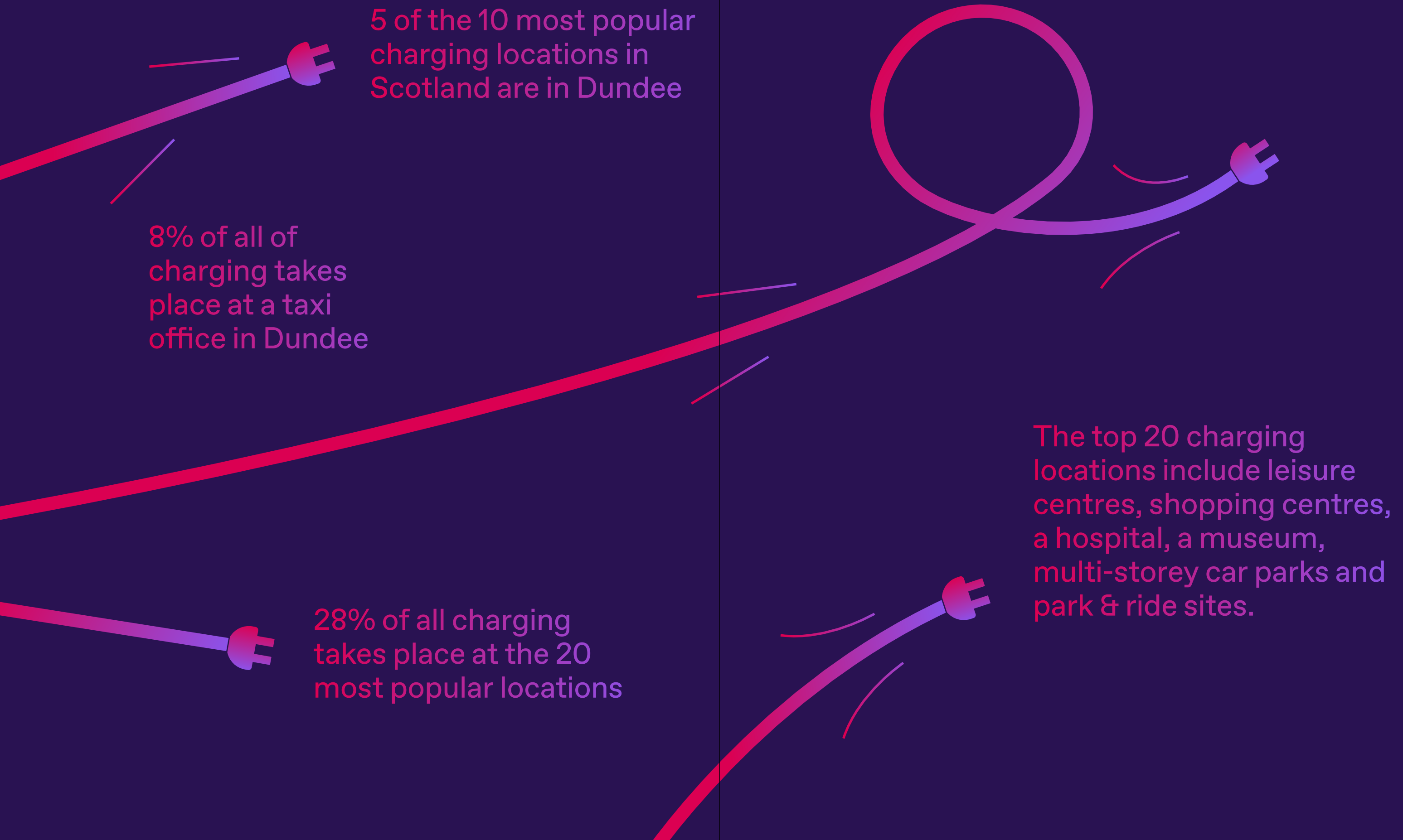
achieved its aim of having at least one EV charger every 50 miles along the trunk road network and is now making progress towards having a charger every 35 miles.

Across Scotland:

- In 2017, there were 864 public chargers, 184 of which were rapid chargers.<sup>59</sup>
- 58% of all these chargers were owned by local councils. 128 of council charge points were rapid chargers.<sup>59</sup>
- There were over 250,000 electric vehicle charging sessions from January to September 2017.<sup>59</sup>
- 150% growth in average monthly energy usage across ChargePlace Scotland chargers between April 2016 – September 2017.<sup>61,62</sup>
- In 2017, 3.07GWh of electricity was used to charge EVs.<sup>57</sup> This is equivalent to the annual energy consumption of 991 Scottish homes and only 0.012% of Scotland’s renewable energy.<sup>64,65</sup>

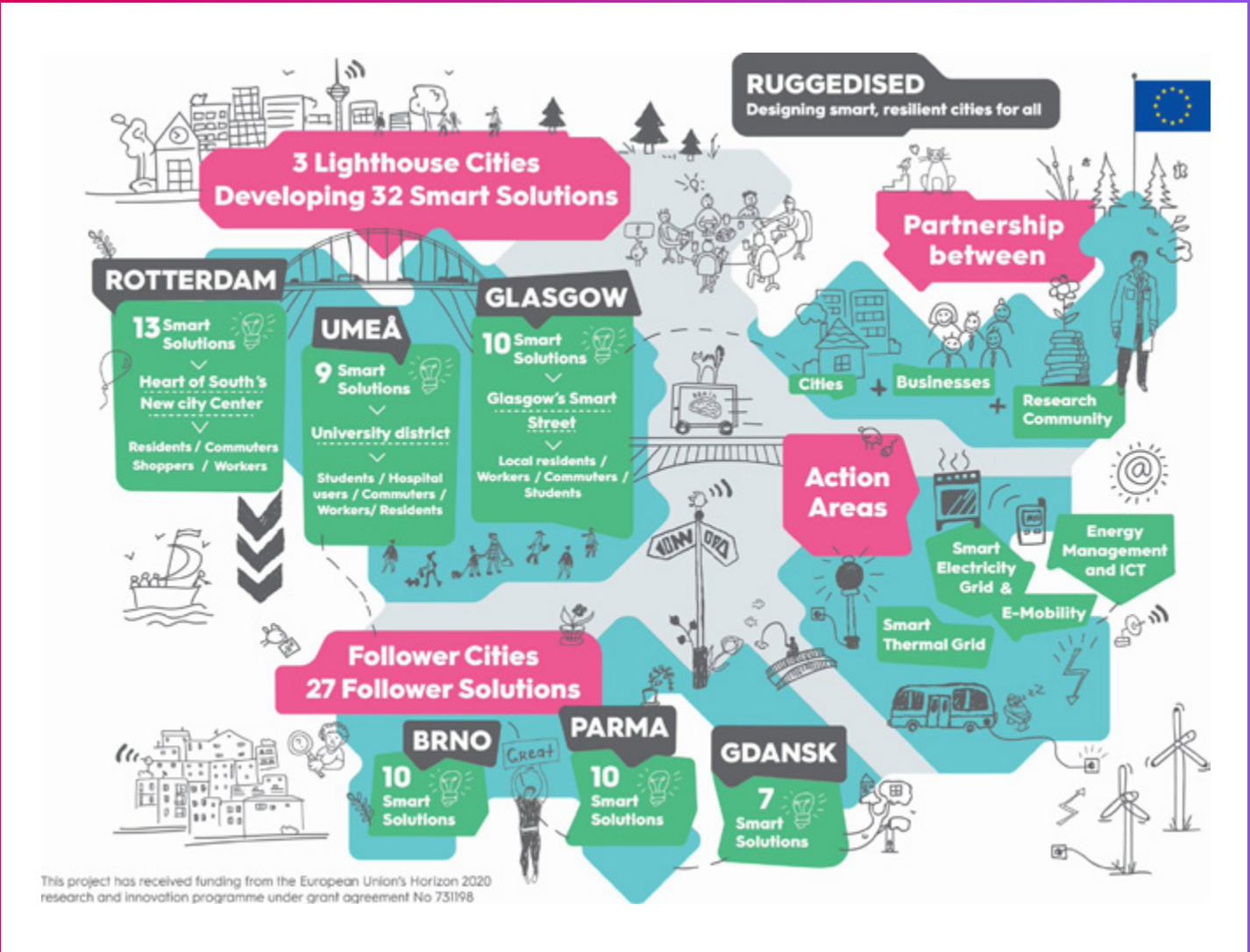


# ChargePlace Scotland Statistics



The top 20 locations on the ChargePlace Scotland network between January and September 2017.<sup>7</sup>

| Rank | Location                                             | Local authority area | Total no. of sessions | Electricity Supplied (kWh) |
|------|------------------------------------------------------|----------------------|-----------------------|----------------------------|
| #1   | 203020 Taxis                                         | Dundee               | 23,177                | 142,896                    |
| #2   | Bankhead Central, Glenrothes                         | Fife                 | 5,355                 | 36,205                     |
| #3   | Queen Street Car Park, Broughty Ferry                | Dundee               | 5,145                 | 31,933                     |
| #4   | Public Works Dept, Clepington Rd. Dundee             | Dundee               | 4,868                 | 34,660                     |
| #5   | Broxden Park & Ride                                  | Perth & Kinross      | 3,866                 | 38,311                     |
| #6   | Falkirk Stadium                                      | Falkirk              | 3,375                 | 37,897                     |
| #7   | Ninewells Hospital, Dundee                           | Dundee               | 3,281                 | 25,738                     |
| #8   | Dundee Ice Arena, Dundee                             | Dundee               | 3,249                 | 31,740                     |
| #9   | Braehead Shopping Centre, Glasgow                    | Glasgow              | 3,247                 | 23,613                     |
| #10  | Great Western Road Car Park Kirkwall                 | Orkney Islands       | 3,142                 | 22,590                     |
| #11  | Halbeath Park and Ride, Dunfermline                  | Fife                 | 2,729                 | 25,569                     |
| #12  | Ingliston Park and Ride, Ingliston                   | Edinburgh            | 2,585                 | 21,847                     |
| #13  | Greenmarket Multi Car Park, Dundee                   | Dundee               | 2,225                 | 24,572                     |
| #14  | James Hamilton Heritage Loch Car Park, East Kilbride | South Lanarkshire    | 2,141                 | 22,635                     |
| #15  | Ayrshire Athletics Arena, Kilmarnock                 | Ayrshire             | 1,655                 | 15,592                     |
| #16  | Rouken Glen Road, Thornliebank                       | East Renfrewshire    | 1,612                 | 20,016                     |
| #17  | Robson Car Park, Laurencekirk                        | Aberdeenshire        | 1,495                 | 14,294                     |
| #18  | Riverside Museum, Glasgow                            | Glasgow              | 1,484                 | 16,641                     |
| #19  | Burn Lane Car Park, Inverurie                        | Aberdeenshire        | 1,415                 | 9,542                      |
| #20  | X Leisure Edinburgh                                  | Edinburgh            | 1,375                 | 17,003                     |



Glasgow is deploying EVs in an exemplar sustainable energy district

Launched in November 2016, the €17.5 million, 5-year project RUGGEDISED, will create urban spaces powered by secure, affordable and clean energy, smart electro-mobility, and smart tools and services.

In Glasgow, the focus is on a Smart Street, with the aim of developing a cluster of innovative solutions and business models, integrating low carbon technologies with electric vehicles. A summary of these activities include:

- Surplus power storage in an EV charging hub, including: installation of a 200kW solar PV canopy, 500kW battery storage and a hub of rapid chargers at Glasgow’s Duke Street multi-storey car park.

- Innovative connection to renewables and storage including: a physical, direct connection, an innovative, virtual connection between the renewables produced at Glasgow’s Duke Street Multi-storey EV hub, will explore the use of netting-off generation against consumption in assets owned by Glasgow City Council.
- Intelligent LED street lighting with integrated EV charging functionality, including: street lighting with integrated EV charging points to reduce the street furniture, increase public space and provide an opportunity to evaluate EV batteries as demand-side management assets.

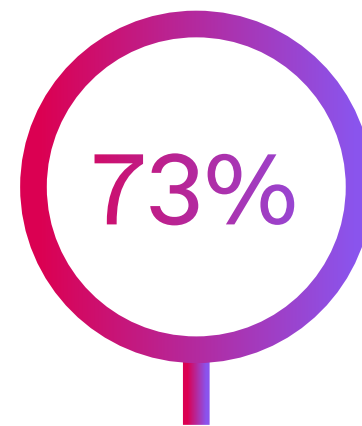


# Consumer Attitudes to Electric Vehicles

Research by Transport Scotland found that 37% of drivers would consider buying an EV and 15% of people intend to purchase an EV in the next 4 years.

80%

of respondents stated the environment was an important factor in their decision to buy an EV.



of respondents felt that the experience of driving or travelling in an EV was an important factor in their decision to buy an EV.

78%

of respondents are very satisfied that their EV is able to meet their needs.





Doubts about driving range and charging options are the biggest barriers to people purchasing EVs. Promotion and awareness raising is needed to overcome this.

Engagement with EV users suggests the desire to purchase EVs stems from positive perceptions of the impact EVs will make to people's local environments:

- 87% of people believe that EVs make a positive difference to air quality.<sup>10</sup>
  - 82% believe that EVs make a positive difference to road noise.<sup>10</sup>
  - 80% of respondents to Scotland's EV Drivers Survey stated that the environment was an important reason for them buying an EV.
- Data from Transport Scotland<sup>9</sup> shows that the top four reasons people do not buy EVs are:
- 46% have doubts about vehicle range
  - 46% are unsure on the availability of charge points.
  - 27% lack of knowledge.
  - 26% state the cost of vehicle as a barrier.

73% of responses to the Scottish EV Driver's survey feel that the experience of driving or travelling in an EV was an important reason for buying one

Increasing people's understanding and experience of EVs is important:

- 41% of people need to do more research before considering buying an EV.<sup>10</sup>
  - 15% of people would considering buying one.<sup>10</sup>
  - 73% of responses to our survey feel that the experience of driving or travelling in an EV was an important reason for buying one.
- Our survey also found that government grants and incentives were an important factor for just over half of EV owners when buying their vehicle. Currently, drivers can receive a **grant of up to £3,500** to purchase an EV and if they want to install a chargepoint at their home, they could receive a further **grant of 75%** of the chargepoint's cost.<sup>72</sup>



Dundee is a city being transformed by ultra-low emission vehicles with an ambition to become a global test bed for new smart mobility technologies and services.

In October 2018 Dundee was named Europe's most visionary EV city by the World Electric Vehicle Association.<sup>73</sup>

The city is home to the largest local authority EV fleet in the UK at 96 vehicles. Between 2012-2017, the city's electric fleet racked up 1.5 million miles, saving 255 tonnes of CO<sub>2</sub> emissions and realizing substantial savings on fuel costs. The council is aiming for all of its cars and vans to be EVs or other ultra low emission vehicles by 2025.<sup>74</sup>

There are also now 112 fully electric taxis and private hire vehicles in Dundee, making up 15% of the city's taxis.<sup>72</sup> Leading the way is private taxi firm, 203020, the first in the UK to install a private charging hub to support a fleet of over 50 EVs. The company has reported that drivers are each saving an average of £120 to £130 a week on fuel costs and have experienced

overwhelmingly positive customer feedback.

In 2016, Dundee City Council was awarded £1.9m from the UK's Office for Low Emission Vehicles' (OLEV) 'Go Ultra-Low City' scheme to develop three charging hubs, with the first at Aimer Square launched in April 2018. This incorporates four rapid chargers and three fast 22 kW chargers<sup>75</sup>. The second, on Princes Street was launched in July 2018 incorporating six rapid and three 22 kW chargers, integrated with solar photovoltaics and battery storage systems. The city has since attracted a Tesla "supercharger" station at the city's Hilton hotel with space for eight of its electric vehicles.<sup>76</sup>

The Mobility Innovation Living Laboratory (The MILL) is a £1.4 million programme run by Urban Foresight for Dundee City Council, to create Scotland's national test bed for smart mobility solutions.



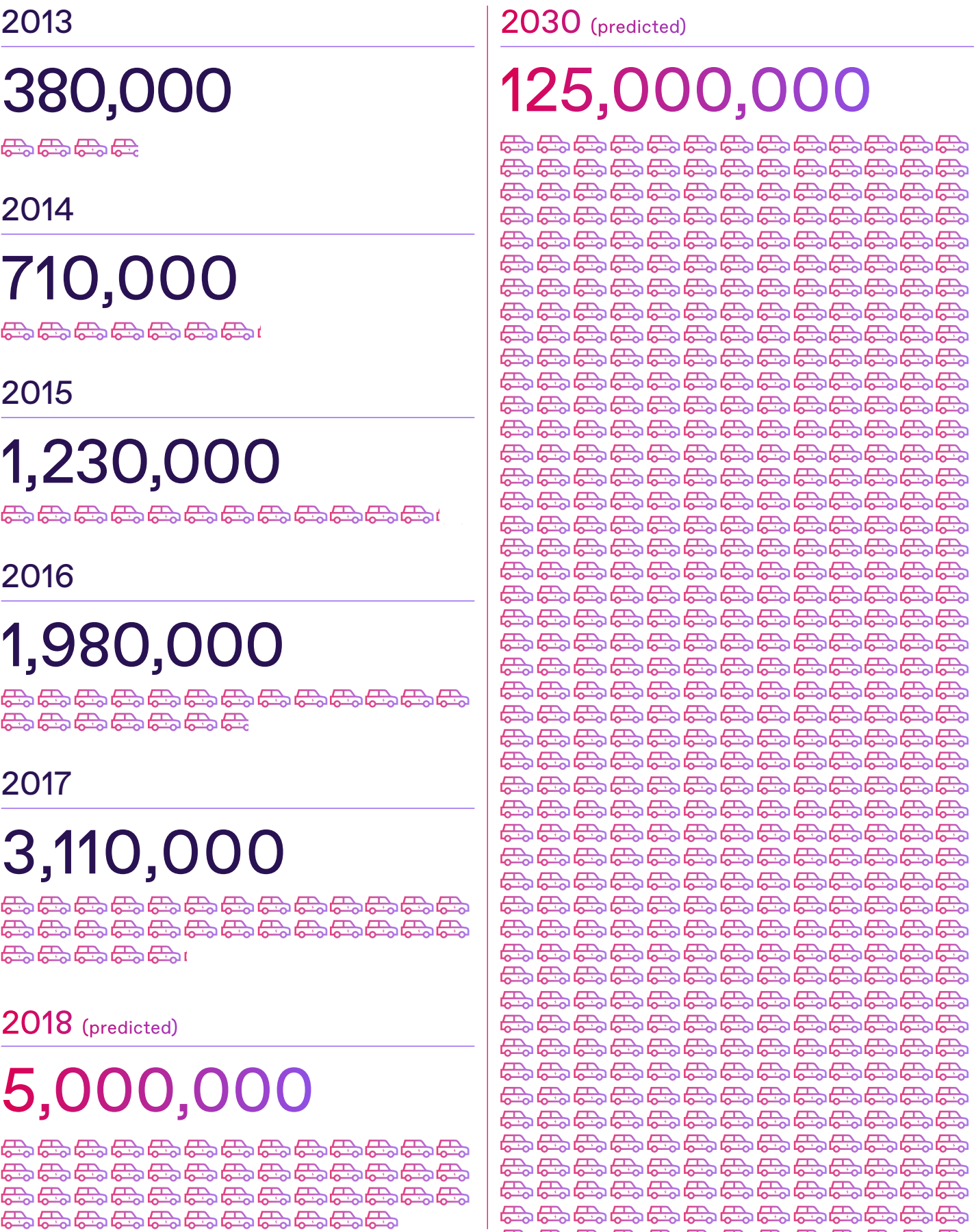
THE GLOBAL EV  
MARKET IS  
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WORLDWIDE EV USE  
INCREASED BY 56% IN  
2017 TO MORE THAN  
3 MILLION VEHICLES



# Our Electric Future

The Global EV market is growing fast. Worldwide EV use increased by 56% in 2017 to more than 3 million vehicles<sup>67</sup>





The International Energy Agency forecasts that there will be 125 million cars on the road worldwide by 2030.<sup>67</sup>

This growth is partly due to an increase in the numbers of models of EVs available. Consumers around the world placed more than 380,000 orders for the Tesla Model 3 between the start of pre-ordering on 31st March 2016, and year-end – the largest number of pre-orders for any car in history.<sup>69</sup>

The new Nissan LEAF is regarded as the fastest selling EV in the world. In just over a month since the new Nissan LEAF officially went on sale, a new Nissan LEAF was **sold every 12 minutes in Europe**.<sup>70</sup>

Growth in EV uptake is in part a result of falling costs of EV manufacturing, especially falling battery costs. Between 2010 and 2016, battery pack prices have **fallen by 77% from \$1,000/kWh to \$230/kWh**.<sup>69</sup>

Current projections put EV battery pack prices below **\$190/kWh** by the end of the decade and suggest the potential for pack prices to fall below **\$100/kWh by 2030** reaching price parity with combustion engine models by **2025**.

Several national governments have pledged their intention to end sales or registrations of new fossil fuelled vehicles. Norway has pledged to ban sale of new fossil fuelled vehicles as early as **2025**, with Ireland, the Netherlands and Slovenia aiming for **2030**.<sup>67</sup>

Scotland’s 2032 Ambition

In February 2018 the Scottish Government published the Third Report on Proposals and Policies 2018-2032, demonstrating progress against the Scottish Climate Change Plan.<sup>8</sup>

The Climate Change Plan outlines the following targets to be reached by 2032:

- 100% of new car and van sales to be ultra-low emission vehicles.
- 50% of the Scottish bus fleet will be low emission vehicles.
- 37% reduction in transport emissions compared to current levels (4.7MtCO<sub>2</sub>e).

From 2018, there are plans to establish low emission zones (LEZs) in the four biggest Scottish cities by 2020. The aim is to limit the access of vehicles that exceed emissions benchmarks, while permitting unrestricted access for low emission cars, vans and buses.

Progress to 2032

By the end of 2017 there were 7,089 EVs registered in Scotland. Despite EVs representing just 1.2% of car sales in Scotland in 2017, total EV sales increased by 67% compared to 2016.<sup>41</sup>

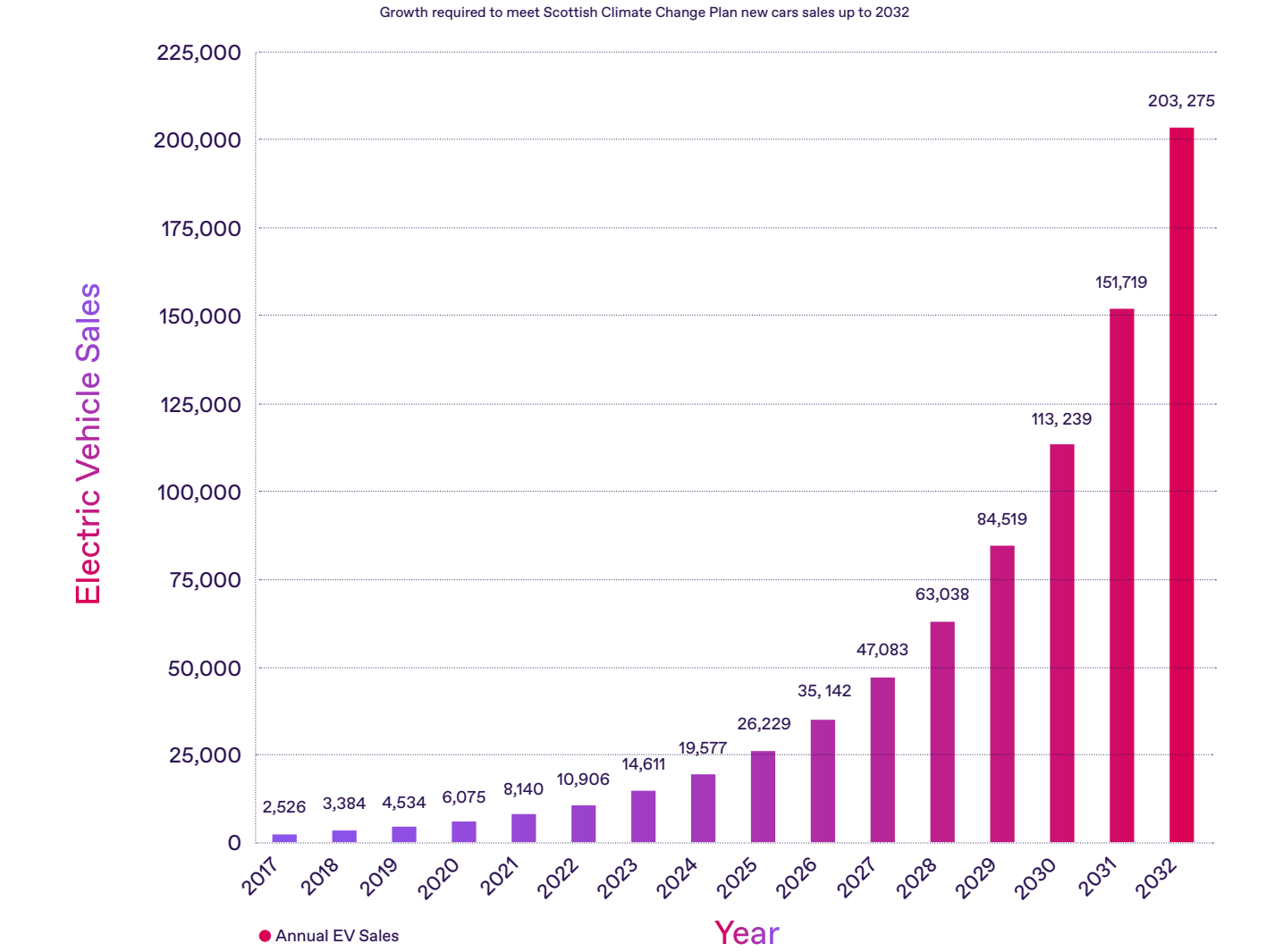
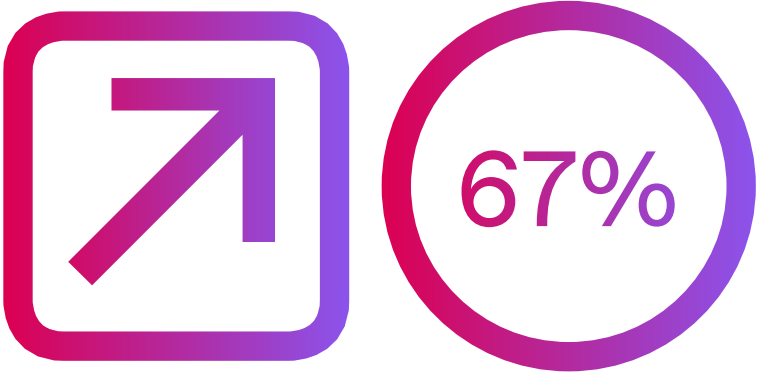
In just six months to June 2018, total EV registrations grew a further 25% to 8,869, suggesting that demand for EVs in Scotland are growing at pace.<sup>4</sup>

However, to meet Scotland’s new Climate Change Plan target of phasing out new petrol and diesel sales by 2032, accelerating rates of EV adoption need to continue.

Based on current sales of EVs in Scotland and targets for 2032, annual vehicle sales would need to grow at an average annual growth rate of around 28% every year.

The number of EVs registered in Scotland is growing, and growing faster

By the end of 2017 there were 7,089 EVs registered in Scotland, a 67% increase from 2016





# Initiatives to Increase EV Uptake

“Our aim is for new petrol and diesel cars and vans to be phased out in Scotland by 2032”

Nicola Sturgeon, First Minister of Scotland, 5th Sept 2017<sup>77</sup>

Transport Scotland delivered a number of initiatives during 2017 and early 2018 to promote and encourage use of EVs. This included:

**£8.2m**

to support the Low Carbon Transport Loan Fund.

**£1.2m**

to support the purchase of community vehicles through the Switched On Fleets initiative.

**£3m**

funding for a seventh Scottish Green Bus Fund.

**£7.4m**

of interest free loans were provided by Transport Scotland to purchase 248 EVs in 2016-17.



June 2017 saw the launch of an updated action plan for **Phase Two of Switched On Scotland**. This action plan builds on the long-term strategy established by the **Switched On Scotland Roadmap** which was published in 2013. It identified 10 outcome focused actions to accelerate increasing levels of EV use.

The **Switched On @Work** initiative also continued to engage with employers to promote the benefits of EVs to their employees. The programme is run by Energy Saving Trust, which held sessions with over 40 organisations across Scotland.

Transport Scotland also continued to support E-cosse, Scotland's national electric mobility partnership. The partnership, which is focused on supporting businesses and local authorities, continued its programme of forums which have connected over 770 people from 160 different organisations.

2017 ended with the publication of the **Scottish Government's new Energy Strategy**, supported by **£60 million funding from the Low Carbon Infrastructure Transition Programme (LCITP)**.

The programme will support projects that deliver low carbon heating solutions, integrated energy systems, and ultra low emission vehicle charging infrastructure. Funding up to a maximum of £10 million per project is available for capital-ready projects.

This included **The Low Carbon Travel and Transport (LCTT) Challenge Fund** Round 2 which awarded funding to 9 councils for the development of low carbon and active travel hubs for completion by the end of 2019.

Another project sees Perth and Kinross Council planning to develop a Low Carbon Transport Hub at Broxden Park and Ride site. The Hub will be home to the Scotland's first ultra-fast (150kW) EV charger, and located strategically to be useful to visitors, residents and those travelling across Scotland. The Hub will also include on-site micro-renewable energy generation facilities (3 solar PV canopies or small solar PV array and a small wind turbine) to support EV charging infrastructure and an energy management system.

Transport Scotland will also continue to develop a range of policies and proposals geared towards ensuring all new cars and vans are ultra low emission by 2032. These include expansion of the **ChargePlaceScotland network**, support for home charge points and creating Scotland's first electrified highway the '**Electric A9**'.

2018 will see Transport Scotland develop guidance on charge points to support planning authorities as part of a 2018 review of the National Planning Framework and Scottish Planning Policy – one of the proposals included in the **Scottish Government's Climate Change Plan third report**.

Working with partners, Transport Scotland will develop practical guidance by the end of 2018 which will provide advice and support to encourage public and private sector organisations to adopt procurement practices that encourage the use of EVs in their supply chains.

June 2018 also saw the launch of Transport Scotland's new **Switched on Towns and Cities Challenge Fund** aiming to achieve a step-change in the uptake of EVs. In September £16.7 million was committed to the **expansion of the programme** to include electric buses and charge point infrastructure to create 20 new 'electric towns'.





<sup>1</sup> Calculated from estimated energy use and fuel savings, maintenance costs, and tax relief.

<sup>2</sup> ONS Environmental Accounts, Low carbon & renewable energy economy survey, 2015 data.

<sup>3</sup> Plug-in cars, LGVs and quadri-/motor- cycles.

<sup>4</sup> DfT vehicle registration data tables VEH0105 and VEH0131, September 2018.

<sup>5</sup> Urban Foresight, Scotland’s EV Drivers Survey 2018.

<sup>6</sup> Communication from Transport Scotland, July 2018.

<sup>7</sup> ChargePlace Scotland session data for active units - 1st Jan – 13th Sept 2017.

<sup>8</sup> Scottish Government (2018) [Climate Change Plan: third report on proposals and policies 2018-2032 \(RPP3\)](#), February 2018.

<sup>9</sup> Transport Scotland: Transport and Travel in Scotland 2016 - Table TD4a: [Distance by main mode] Percentage of journeys by road network distance by main mode, 2016.

<sup>10</sup> Initial findings (unpublished) Horizon 2020 Project, EMPOWER, Switched on @Work Scotland Employee Survey.

<sup>11</sup> Source: Defra (2011) Air Quality Appraisal – Damage Cost Methodology.

<sup>12</sup> All vehicles with fully electric power, and cars and vans with tail-pipe emissions below 75 g/km of CO2 have been included.

<sup>13</sup> Transport Scotland Highland Survey, [Table TD2: \[Main mode\] Percentage of journeys made by main mode 1 of travel 2007-2016 2](#), 26th September 2017.

<sup>14</sup> Calculated from: Transport Scotland, Transport and Travel in Scotland 2016.

<sup>15</sup> SPICe Briefing, [Disabled Parking and the Blue Badge Scheme](#), 2016.

<sup>16</sup> [Scottish Transport Statistics No. 35: 2016 Edition](#), Transport Scotland, website accessed on 21st November 2017.

<sup>17</sup> [Taxi Driver Survey 2016](#), insure Taxi, 25th August 2016.

<sup>18</sup> [National Travel Survey: 2016](#), UK Government, 27th July 2017

<sup>19</sup> [Scottish Transport Statistics No. 36: 2017 Edition](#), Transport Scotland, website accessed on 1st March 2018.

<sup>20</sup> Transport Scotland, [Carbon Account for Transport No. 9: 2017 Edition](#).

<sup>21</sup> [Friends of the Earth Scotland, January 2018](#).

<sup>22</sup> Years of Life Lost = cases over 100 year period. Source: Defra (2011) Air Quality Appraisal – Damage Cost Methodology.

<sup>23</sup> Financial benefits also include Value of Life Years (VOLY). applied to the premature mortality endpoint, Cardiovascular Hospital Admissions (CHA) and Respiratory Hospital Admissions (RHA) using data from Interdepartmental Group on Costs and Benefits (IGCB).

<sup>24</sup> Calculated using NAEI emissions factors.

<sup>25</sup> Calculated using BEIS (2017) [2017 Government GHG Conversion Factors for Company Reporting](#).

<sup>26</sup> Calculated using DfT Basic Local Authority Carbon Tool.

<sup>27</sup> O’Malley, [Crashworthiness Testing of Electric and Hybrid Vehicles](#).

<sup>28</sup> [How Electric Vehicles Improve Fleet Safety](#), fleetcarma, 30th June 2016.

<sup>29</sup> Transport Scotland Household Survey, [Table 2: \[Fuel\] Amount spent on fuel in the past month, 2009-2016](#), 26th September 2017.

<sup>30</sup> Pod point, [Cost of charging an electric car](#), accessed 16th March 2018. Figures based on a 30kWh Nissan LEAF.

<sup>31</sup> UK Power, [Gas and Electricity Tariffs](#), accessed 15th March 2018.

<sup>32</sup> Go Ultra Low, [Motorists could save £304 a year on car maintenance by going electric](#), 24th February 2016.

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<sup>34</sup> Sustrans, [Tackling transport poverty in Scotland](#), 16th October 2017.

<sup>35</sup> ONS, [UK Environmental Accounts: Low Carbon and Renewable Energy Economy Survey: 2016 final estimates](#), 31st January 2018.

<sup>36</sup> Go Ultra Low, [Fleet & business; Tax benefits](#), March 2018.

<sup>37</sup> OLEV, [Workplace Charging Scheme-Guidance Document for Applicants](#), Chargepoint Installers and Manufacturers, July 2018.

<sup>38</sup> HM Government, The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018.

<sup>39</sup> All vehicles with fully electric power, and cars and vans with tail-pipe emissions below 75 g/km of CO2 have been included.

<sup>40</sup> Department for Transport and Driver and Vehicle Licensing Agency Statistical data set Table VEH0131 (March 2018).

<sup>41</sup> Committee on Climate Change (2018) [Reducing emissions in Scotland: 2018 Progress Report to Parliament](#).

<sup>42</sup> Nomis, [Population estimates – local authority based by single year of age, 2016](#), data query, all local authority areas.

<sup>43</sup> Scottish Transport Statistics, No 36, 2017 Edition, Table 1.1 New registrations by taxation group, body type and method of propulsion.

<sup>44</sup> Transport Scotland: Transport and Travel in Scotland 2016 - Table TD5a: [Distance] Distance summary statistics by mode of transport, 2016.

<sup>45</sup> Transport Scotland: Transport and Travel in Scotland 2016.

<sup>46</sup> Department for Transport, [Vehicle Licensing Statistics: January to March 2018. Table VEH0120: Licensed cars at the end of the quarter by make and model, Great Britain, from 1994 Q4; also United Kingdom from 2014 Q4](#), 14th June 18.

<sup>47</sup> InsideEVs, [2016 Nissan LEAF: 107 miles EPA Range – Full Specs/ Pricing](#), 10th September 2015.

<sup>48</sup> Table TD4a: [Distance by main mode] Percentage of journeys by road network distance<sup>1</sup> by main mode, 2016.

<sup>49</sup> zap-map.com, accessed 13th March 2018.

<sup>50</sup> Car Plus Bike Plus, [Car clubs in Scotland 2018](#).

<sup>51</sup> Calculated assuming Petrol have undertaken 59% of Scotland’s car mileage (Scottish Household Survey) and produce 157.5 CO2/km (BEIS (2017) [2017 Government GHG Conversion Factors for Company Reporting](#)).

<sup>52</sup> Calculated assuming Diesel have undertaken 41% of Scotland’s car mileage (Scottish Household Survey) and produce 143.2 CO2/km (BEIS (2017) [2017 Government GHG Conversion Factors for Company Reporting](#)).

<sup>53</sup> [Carplus annual survey of car clubs 2016/17 Scotland](#), Steer Davies Gleave, March 2017

<sup>54</sup> The Scottish Government’s Climate Change Plan, Third Report on Proposals and Policies 2018-2032.

<sup>55</sup> HM Government, [The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy](#), July 2018.

<sup>56</sup> Bloomberg New Energy Finance, The Masdar Report on Technologies for Future Smart City Transit, 17th January 2018.

<sup>57</sup> <https://www.businesswire.com/news/home/20180510005547/en/Japan-Electric-Vehicle-Charging-Equipment-Market-2018-2023>.

<sup>58</sup> Bloomberg, [Electric Vehicles could displace 8 million barrels of oil per day by 2040](#), 28th November 2017.

<sup>59</sup> Charge Point Scotland Session Data for Active units - 1st Jan – 13th Sept 2017.

<sup>60</sup> ICCT, [Emerging Best Practices for Electric Vehicle Charging Infrastructure](#), October 2017.

<sup>61</sup> Transport Scotland (2017) [Switched on Scotland: A roadmap to widespread adoption of plug in vehicles: 2016 Review](#). November 2016.

<sup>62</sup> ChargePlace Scotland session data for active units - 1st Jan – 13th Sept 2017.

<sup>63</sup> Average annual energy consumption calculated using ChargePlace Scotland session data for active units - 1st Jan – 13th Sept 2017.

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<sup>65</sup> Department for Business, Energy & industrial Strategy, [Renewable electricity capacity and generation \(ET6.1\)](#), Scotland Annual Figures, 11th October 2018.

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<sup>67</sup> IEA (2018) [Global Electric Vehicle \(EV\) Outlook 2018](#).

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<sup>69</sup> Mckinsey & Company, [Electrifying insights: How automakers can drive electrified vehicle sales and profitability](#), January 2017.

<sup>70</sup> Nissan GB, [The new Nissan LEAF: the world’s best-selling zero-emissions electric vehicle now most advanced and accessible on the planet](#), 21st March 2018.

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<sup>72</sup> Gov.uk, [Grant schemes for electric vehicle charging infrastructure](#), March 2018.

<sup>73</sup> Dundee City Council, [Dundee is Europe’s most visionary EV city](#), 3rd October 2018.

<sup>74</sup> Dundee City Council, [Direct Correspondance](#), September 2018.

<sup>75</sup> <https://www.zap-map.com/dundee-rolls-out-charging-hubs/>

<sup>76</sup> The Courier, [Tesla opens Scotland’s biggest charging station in Dundee](#), 17th December 2016.

<sup>77</sup> Statement to Scottish Parliament, [https://www.snp.org/first\\_minister\\_nicola\\_sturgeon\\_scottish\\_programme\\_for\\_government](https://www.snp.org/first_minister_nicola_sturgeon_scottish_programme_for_government), 5th September 2017.



