



Scottish & Southern
Electricity Networks

North of Scotland Electric Vehicles

December 2017



Introduction

Electric vehicles (EVs) are viewed as a fundamental component to decarbonise the transport sector. Ambitious targets set by both the UK Government and Scottish Government to phase out petrol and diesel cars may encourage the transition to carbon-free transportation.

As the network owner in the north of Scotland, Scottish and Southern Electricity Networks (SSEN) is challenged with understanding the impact that EVs may have on the network.

Having undertaken initial research into this area, we are now seeking views on a number of identified issues that we believe may impact the development of electric vehicles in our area. Your responses will be used as an input into our planning process to determine the future requirements of the network in the north of Scotland.



About us

We are part of Scottish and Southern Electricity Networks, operating as Scottish Hydro Electric Transmission plc under licence and are responsible for maintaining and investing in the electricity transmission network in the north of Scotland.



Scottish
Hydro Electric
Transmission plc

Scottish Hydro
Electric Power
Distribution plc

Engagement process

Our initial research identified 3 groups, shown in Figure 1, with significant influence on EV development at a local level. These groups represent some of the organisations who play a role in setting and implementing electric vehicle policy and creating the required electric vehicle infrastructure to enable EV uptake.

| Groups | Organisations |
|-----------------------------------|--|
| Governments and Local Authorities | UK Government Scottish Government Highland Council Aberdeenshire Council Perth & Kinross Council |
| Community Energy Groups | Local Energy Scotland |
| Network Operators | SHEPD |

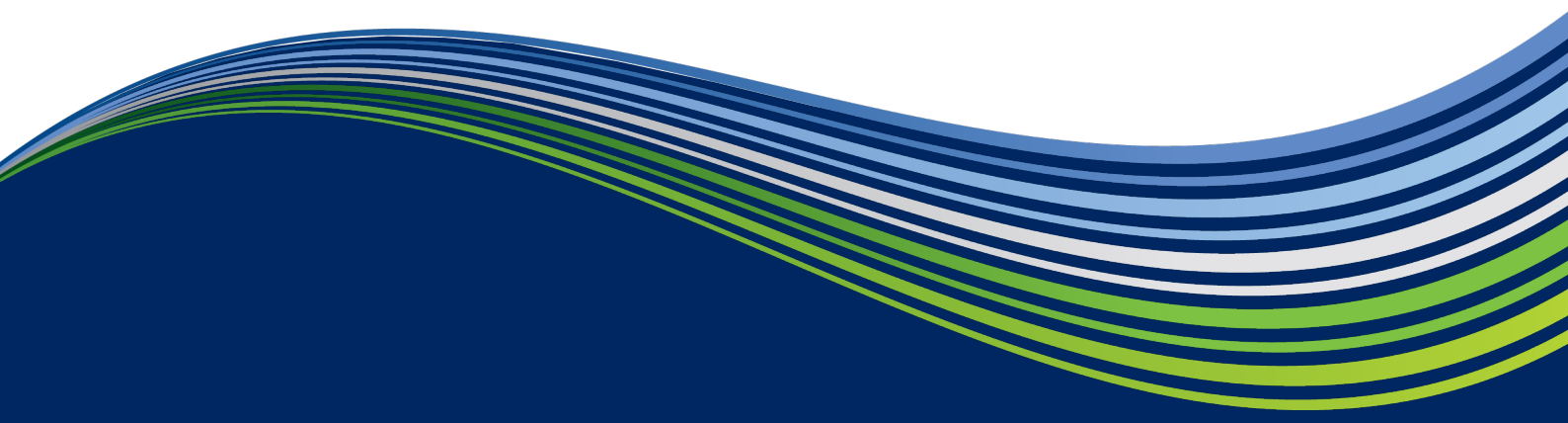
Figure 1: Key groups identified

To ensure we gained rich and varied feedback, we implemented a two-stage approach to capturing feedback:

1. Targeted interviews to identify issues affecting those in Figure 1 and;

2. This broader consultation with a wider group of stakeholders, including motor industry representatives.

Face-to-face roundtable meetings were carried out with a number of organisations from August 2017 to October 2017 and we also received written responses from the different groups which supplemented the feedback gained from the face-to-face meetings.



Our research and your feedback

We undertook research into EVs using a variety of different sources and received responses from those we engaged through face-to-face meetings.

A summary of our research and the feedback we received, grouped by theme, is noted below.

Clustering of EVs

In the analysis that we carried out in August 2017, we found that the total number of EVs licenced increased from 96 in 2012 to 1,240 in 2016 in the north of Scotland, representing a 1192% increase. In the same four years, the total number of EVs licenced in GB increased from 4,855 to 83,482 vehicles, an increase of 1620%. Figure 2 includes numbers for plug-in hybrid electric vehicles (PHEVs) as well as pure electric vehicles.

demand could lead to instances where network reinforcement may be required.

Figure 2 shows the local authorities in the north of Scotland with the highest total number of licenced EVs; Aberdeen City, Aberdeenshire, Dundee City, Perth and Kinross and Highland. The most recent figures published by the Department for Transport confirms that the above local authorities remain the local authorities with the highest number of licenced EVs in the north of Scotland. The number of EVs in Aberdeenshire rose by 58% to 323 at the end of Q2 2017, highlighting that consumers are continuing to invest in electric vehicles.

Whilst the total number of EVs in the north of Scotland has increased at a slower rate than across GB, our analysis shows that EVs in the north of Scotland are concentrated in areas with existing high electricity demand. Adding EV demand to the existing high

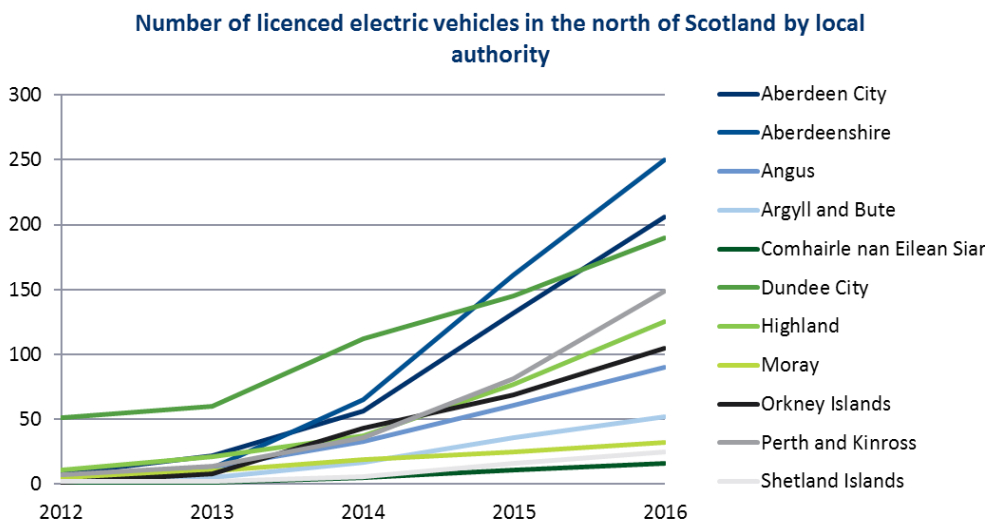
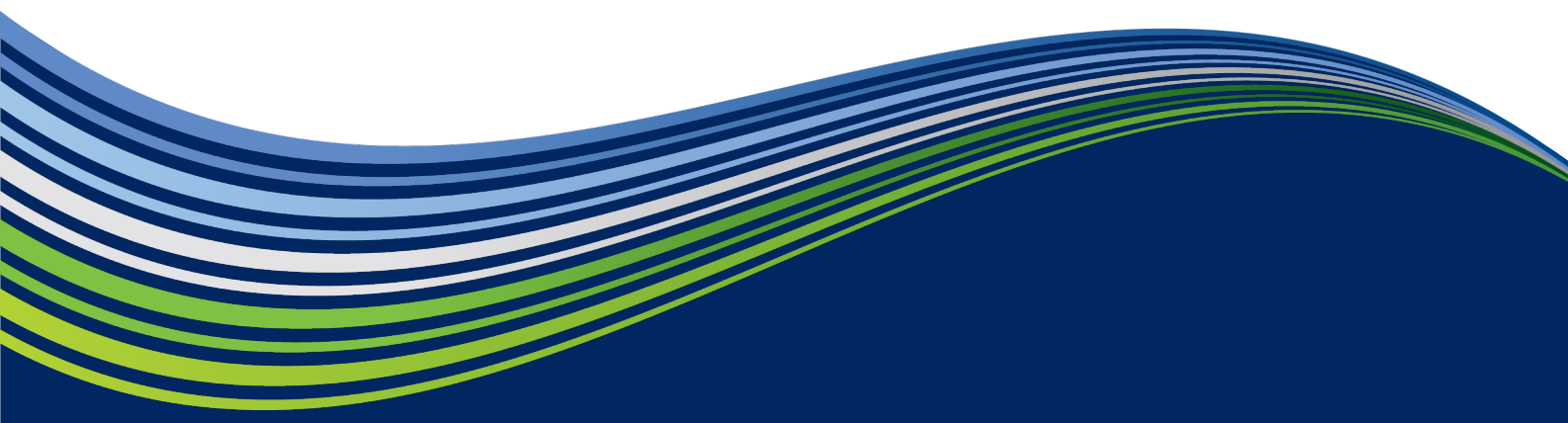


Figure 2: Source - Department for Transport, Table VEH0131, Plug-in cars and vans licensed at the end of the quarter by location of registered keeper: United Kingdom.

In which areas of the north of Scotland are we likely to see clusters of EVs develop?

What impact do you think the Scottish Government's 2032 target will have on the uptake of EVs in Scotland?



EV Charging Infrastructure

From our initial analysis, we identified that local authorities would play an important part in rolling out the EV charging infrastructure required to enable EV uptake. The feedback that we received confirmed that the roll out of EV infrastructure is being led by local authorities with support from the UK Government, Scottish Government and Transport Scotland.

The feedback detailed that the initial focus for EV charging infrastructure was to increase the number of public EV charging locations. Typically, public EV charging locations are situated at train stations, park and ride locations, shopping centres and car parks. At public EV charging locations, there is usually a mix of charger types available for consumers to use¹; slow chargers (typically rated around 3-3.5kW), fast chargers (typically rated between 7-22kW) and rapid chargers (typically rated around 50kW). A few parties advised us that 150kW chargers are also being considered for public EV charging locations. Tesla has also begun to roll out more supercharger locations in the north of Scotland to cater for its growing number of customers.

We were advised that the long term vision is that consumers will shift to charging at home rather than use public charging infrastructure. This is already the preferred method on the Orkney Islands where 90% of charging is being carried out at home².

What, if any, types of generation technologies are being considered to power public EV charging locations?

What scale of EV chargers are used at public EV charging locations and at home and do you expect this to change in the future?

EV Charging Behaviour

There have been a number of studies carried out in the past few years, such as My Electric Avenue³ and the Low Carbon London Trials⁴, which contained objectives to understand the charging behaviour of EV owners. My Electric Avenue found that during the week EVs were being charged either before work in the morning or in the evening after work, creating a morning and evening peak. The findings from the Low Carbon London Trials showed similar results, to the My Electric Avenue project, with charging taking place between 6pm and midnight.

The projects showed that EV charging takes place at periods when there is peak demand on the electricity system which could lead to instances where network reinforcement may be required. However, studies also showed that the smart charging of EVs could potentially negate the need for network reinforcement by flattening load profiles.

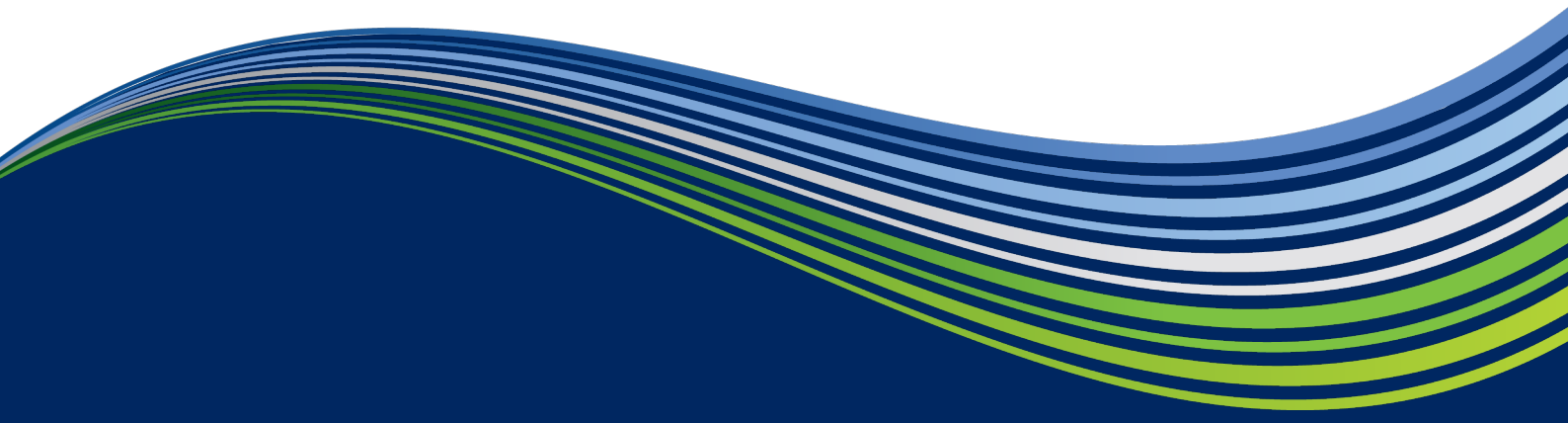
What are your views on smart charging being able to flatten load profiles at peak times?

¹ Charge Points, UK Electric Vehicle Supply Equipment, Accessed 05 December 2017

² EVs in Orkney What now? Where next?, OREF, 15 September 2017

³ My Electric Avenue Summary Report, EA Technology, December 2015

⁴ Impact & opportunities for wide-scale EV deployment, Low Carbon London Learning Lab, September 2014



Alternative Technologies

Electricity was not the only transport fuel under review as alternative fuel types such as hydrogen and compressed natural gas (CNG) were also viewed as having significant potential for long distance transport and haulage. We felt that it was important to reference this feedback as it highlights that other fuel types are being considered to decarbonise the transport sector.

A few parties said that they were exploring the potential to install electrolyzers near public EV charging locations, providing hydrogen refuelling stations for fuel cell cars. Shell has also been building hydrogen refuelling stations and now has multiple sites in England. The feedback also suggested that CNG could be used in road haulage vehicles as an alternative to diesel.

What are your views on hydrogen and CNG as an alternative or complement to electric vehicles?

Additional Considerations

Range anxiety was another factor considered in our review. Range anxiety refers to the worry felt by people that a vehicle has insufficient range to reach its destination. Due to the number of people living in remote, rural areas within the north of Scotland, range could be considered as an important factor when purchasing a vehicle. There may also be a requirement for specific types of vehicles, such as 4x4s, because of the terrain and towing requirements for both business and leisure. This may be a contributing factor to the lower uptake of EVs in more rural areas in the north of Scotland.

Do you think PHEVs provide an alternative to pure electric vehicles for those living in rural locations?

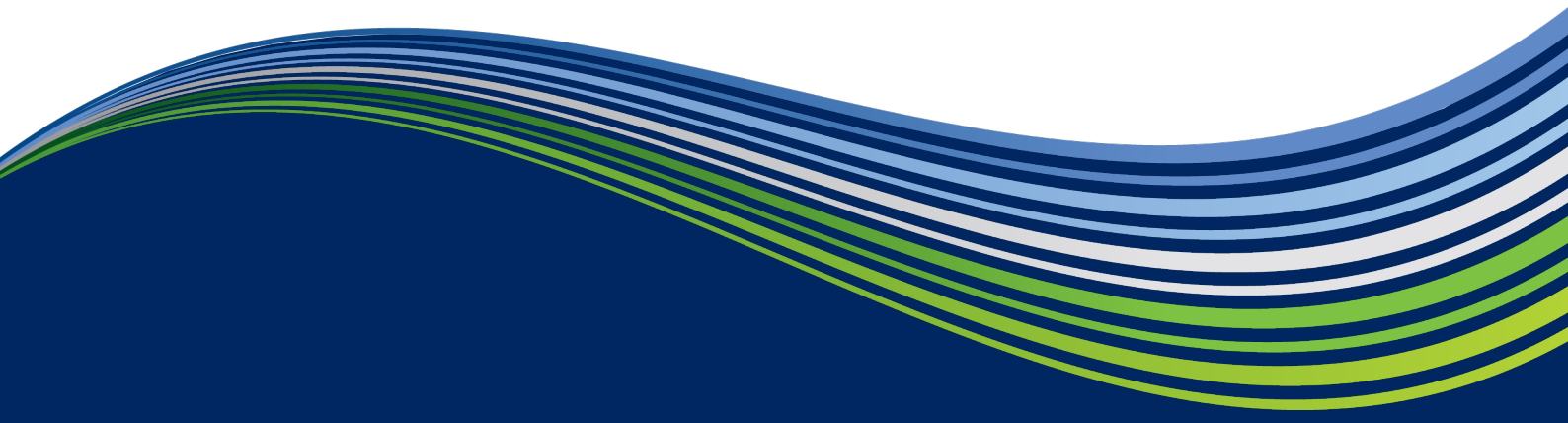
Summary

The research and feedback we received identified a number of factors and assumptions that have the potential to impact the development of electric vehicles in the north of Scotland. We will use these to inform our analysis;

1. Government and local authority intervention is one of the driving forces behind increasing the uptake of electric vehicles.
2. The clustering of EVs may occur in the major demand centres in the north of Scotland.
3. The scale and location of public EV charging infrastructure may impact the requirement for network reinforcement.

4. Charging of EVs occurs during peak times in the morning and evening.
5. Hydrogen and CNG have potential to be used for long distance transport and haulage.
6. Range anxiety could impact the likelihood of motorists switching from fossil fuel vehicles to electric vehicles.

Are there any other areas you believe would impact the development of electric vehicles in the north of Scotland?



What next?

In early 2018, we will be releasing our final consultation document on Generation & Storage and how this could evolve in the north of Scotland.

This will be followed by a paper which summaries the feedback and details the modelling undertaken to create Future Energy Scenarios for the north of Scotland.

Responding to this paper

We are inviting responses to this paper by 26 January 2018. If you have any queries on the content of this paper then please get in touch with Imran Mohammed at: imran.p.mohammed@sse.com.

Information provided in response to this consultation may be used in future documents related to Future Energy Scenarios. Responses will be generalised and not attributed to specific respondees. If you would prefer the information that you provide to be treated as confidential, then please make us aware of this when responding to the consultation.

To allow us to complete our assessment, we would be grateful to receive your comments on the following areas:

Q1. In which areas of the north of Scotland are we likely to see clusters of EVs develop?

Q2. What impact do you think the Scottish Government's 2032 target will have on the uptake of EVs in Scotland?

Q3. What, if any, types of generation technologies are being considered to power public EV charging locations?

Q4. What scale of EV chargers are used at public EV charging locations and at home and do you expect this to change in the future?

Q5. What are your views on smart charging being able to flatten load profiles at peak times?

Q6. What are your views on hydrogen and CNG as an alternative or complement to electric vehicles?

Q7. Do you think PHEVs provide an alternative to pure electric vehicles for those living in rural locations?

Q8. Are there any other areas you believe would impact the development of electric vehicles in the north of Scotland?

This paper will be hosted on www.ssen-transmission.co.uk/information-centre/industry-and-regulation/future-energy-scenarios.

An online feedback form is available on our website. Alternatively, please use the following contact methods to send in your responses:

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