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Switched On Scotland Phase Two:

An Action Plan For Growth

Following consultation, this action plan was developed by Transport Scotland and Urban Foresight

Ministerial Foreword

Our Switched On Scotland Plug-In Vehicle Roadmap, was published in 2013, establishing a vision that by 2050, we'll have freed Scotland's towns, cities and communities from the damaging emissions of petrol and diesel fuelled vehicles. The Roadmap also set out a clear strategy and a suite of actions to realise this vision.

Good progress has been made. Our ChargePlace Scotland network of electric vehicle (EV) charge points continues to grow and usage is increasing every year. We've provided funding to enable individuals and businesses to buy and recharge EVs and through our Switched On Fleets initiative, we've supported Scotland's 32 Community Planning Partnerships in introducing new EVs into their fleets.

The EV market is growing. The choice of EVs is increasing and technology is rapidly evolving, enabling longer all-electric journeys. We're also seeing a rising number of drivers and fleets making the switch away from fossil-fuelled vehicles.

This action plan focuses on continuing to support this growth in Scotland. It contains a set of 10 outcome-focussed actions covering the period 2017-2020, which will collectively help deliver three important impacts:

- reducing the cost of owning and driving an EV;
- making EVs a convenient fit with the needs and lifestyles of drivers; and
- promoting a change in culture whereby EVs are widely recognised as a preferred alternative to fossil fuelled vehicles.

As with the Switched on Scotland Roadmap, this action plan has also been developed in collaboration with our E-cosse EV partnership, enabling direct engagement with a range of experts from across the EV community to help shape our policy and strategy in Scotland.

This action plan has also been informed by analysis and consultation on a suite of related Scottish Government strategies, such as Cleaner Air for Scotland, the Draft Climate Change Plan and the Draft Scottish Energy Strategy, confirming that the widespread adoption of EVs will not only help tackle climate change but also improve the quality of our air, support our thriving renewable energy sector and catalyse the creation of new jobs and business opportunities across the EV supply chain.

This action plan, is the next step in the long-term strategy established by the Switched on Scotland Roadmap, will help to sustain the considerable progress that has been achieved to date. I'd like to thank everyone who has contributed so far and I look forward to continuing to work together to make Scotland one of the best places in the world to drive an EV.

Minister for Transport and the Islands

Executive Summary

In September 2013, Transport Scotland published the Switched On Scotland Roadmap, which set out a long-term vision and strategic approach to advance widespread adoption of electric vehicles (EVs). The Roadmap anticipated that markets for EVs would develop in three distinct phases – launch, growth and take-off – and identified 37 actions to provide comprehensive support in the launch phase.

This action plan defines the activities that Transport Scotland will undertake in the second phase of implementing the Roadmap, in the period 2017-2020. This places an emphasis on growth, focusing on actions that accelerate the uptake of EVs as part of both a wider sustainable transport system and a smart energy grid.

It is informed by extensive consultation, with four workshops bringing together the views of over 130 people from 60 different organisations.

The approach taken in this action plan is summarised in
Figure **1**. Ten outcome-focused actions are defined which collectively will deliver three positive impacts, namely: decreased costs; enhanced convenience; and a change in culture whereby EVs are preferred to fossil fuelled vehicles.

The first level of actions establish foundations for growth, making provision for the continued development of infrastructure and support that responds to the changing needs of the market:

- **Action 1**: Support the increased deployment of public charging infrastructure by developing the ChargePlace Scotland network.
- **Action 2**: Provide financial support for the purchase of EVs and installation of private charging infrastructure.
- **Action 3**: Work with partners on procurement approaches that encourage investments in EVs.
- **Action 4**: Continue to work with partners to promote EVs as an alternative to fossil fuelled vehicles.
- **Action 5**: Embed support for EVs in strategies for transport, energy, climate change, air quality and the built environment.

The second level of actions recognise the importance of emerging electric mobility services in improving the cost, convenience and overall experience of using EVs. This includes developments in business models, technologies and incentives that will bring new customers into the market for EVs, create new revenue streams and incentivise private-sector investments. Four specific actions are identified to support these developments:

- **Action 6**: Improve the user experience of the ChargePlace Scotland network.

- **Action 7**: Support the development of innovative EV charging hubs across Scotland.

- **Action 8**: Support local authorities in deploying measures that encourage adoption of EVs.

- **Action 9**: Consider the impact of emerging technologies and business models on EV adoption and infrastructure deployment.

The final action in this 10-point plan recognises Transport Scotland's role in providing evidence-based analysis and feedback that will help to sustain progress and motivate more people to switch to EVs. This will establish the contribution made by EVs to related policy areas including climate change, renewable energy, air quality and public health. It will also help to evaluate the impact of different activities and build positive support amongst individuals and organisations.

- **Action 10**: Support improvements in the collection, analysis, interpretation and dissemination of data and evidence on the economic, environmental and social benefits of EVs.

The outcome-focused approach established by this 10-point plan will ensure that Transport Scotland can work with partners to deliver a comprehensive package of support across a range of different types of vehicles and applications.

This action plan, alongside the long-term strategy established by the Switched On Scotland Roadmap, will help to sustain the considerable progress that has been achieved to date and make Scotland one of the best places in the world to drive an electric vehicle.

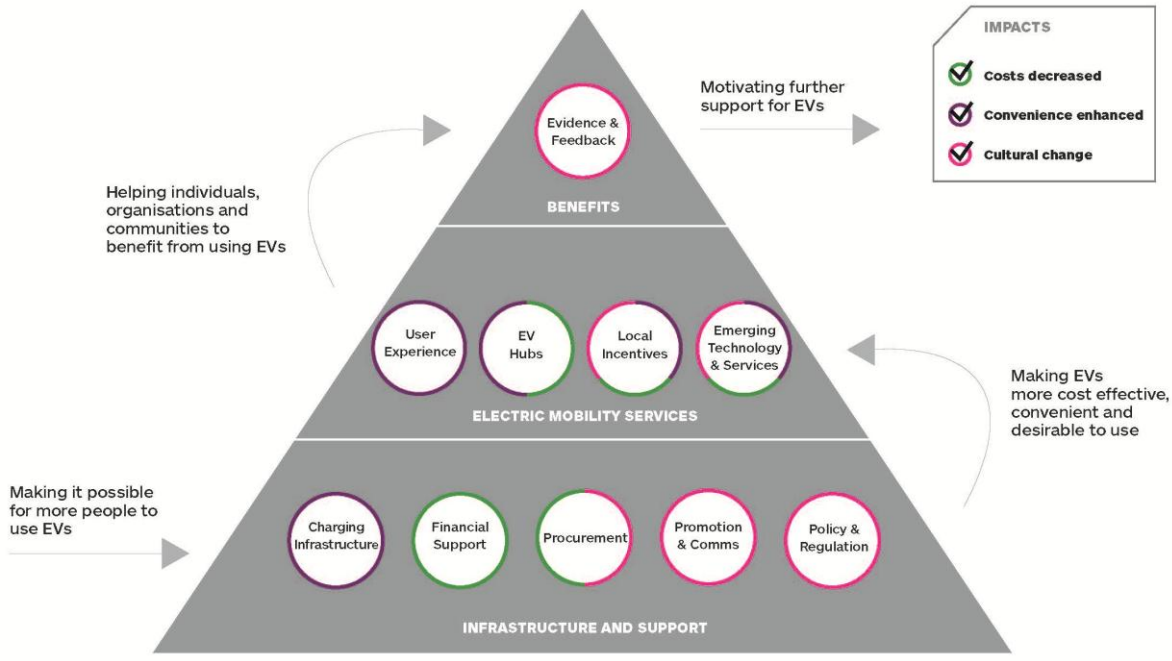

Figure 1 - Overview of the 10-point plan for growth of EV markets

Contents

1 Introduction

This document establishes a 10-point plan to implement the second phase of Switched On Scotland: A Roadmap to Widespread Adoption of Plug-in Vehicles. It defines the actions that Transport Scotland and wider partners will take between 2017 and 2020 to accelerate the uptake of EVs and to realise the benefits that this will offer to individuals, communities, businesses and to the country as a whole.

1.1 Background

The Switched On Scotland Roadmap sets out Scotland's long-term strategy for advancing electric and plug-in hybrid electric vehicles (EVs/PHEVs). The Roadmap was published in September 2013 and drew on extensive consultation with stakeholders. It is a comprehensive strategy to achieve a vision to "free Scottish towns, cities and communities from the damaging emissions of petrol and diesel-fuelled vehicles by 2050."

The long-term strategy established by the Roadmap characterised the development of markets for EVs into three phases: launch, growth and take-off (see Figure 2). It recognised that each of these phases would require different actions to sustain and accelerate adoption of EVs.

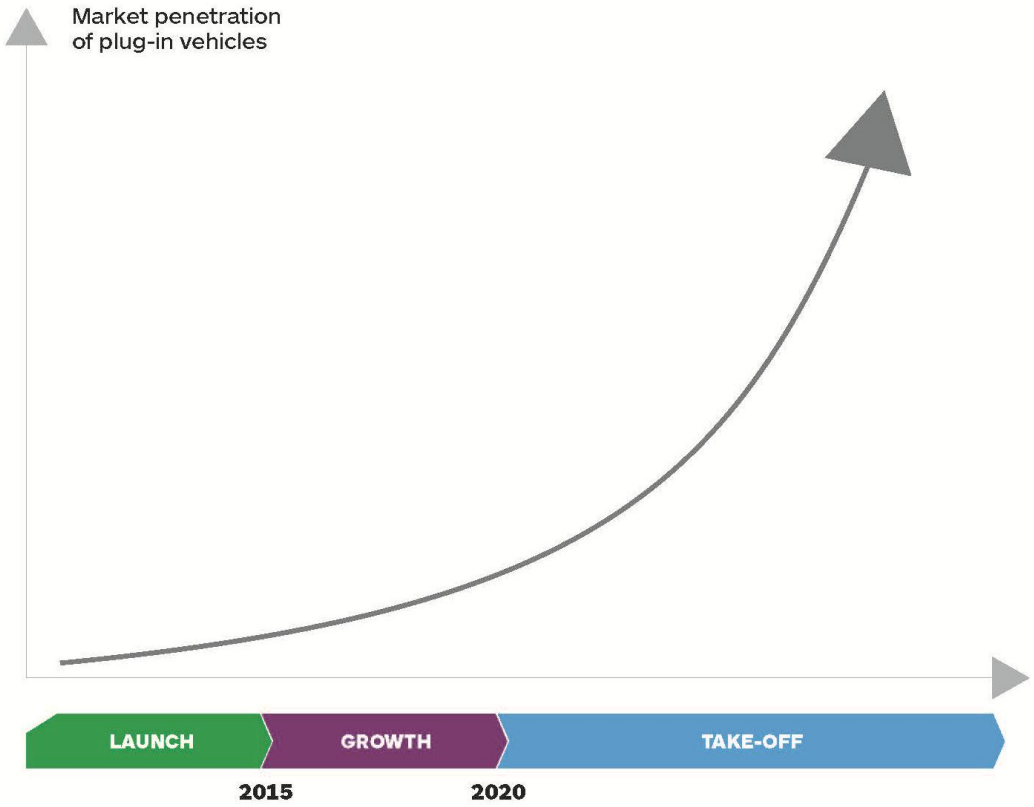

Figure 2 - Three phases of market penetration of EVs

This 10-point plan sets out the action required by Transport Scotland and wider stakeholders in the second phase of activity, with a focus on accelerating growth in markets for EVs as part of both a wider sustainable transport system and smart energy grid.

This plan builds on the 37 actions identified in the Switched On Scotland Roadmap, which largely focused on the launch phase, but many of which remain relevant and will continue to inform actions going forward.

This plan is informed by a detailed review[1], which was published in November 2016 and considered the progress that has been made, both at a strategic level and against the actions established in the Roadmap.

Further insights were collected in four workshops held between September 2016 and April 2017 by the E-cosse partnership[2]. These workshops brought together over 130 people from 60 different organisations to reflect on best practice and provide insights on the key challenges and opportunities presented by the growth phase of EV market development in Scotland.

It also benefits from extensive analysis and consultation undertaken for the 2017 Draft Climate Change Plan[3], 2017 Draft Energy Strategy[4], the 2016 Refreshed National Transport Strategy[5] and the 2015 Cleaner Air for Scotland Strategy[6].

1.2 Structure of this Document

The starting point for this plan is to explain how it builds on the Switched On Scotland Roadmap. The vision and joined-up strategy established by the Roadmap are restated in Chapter 2 with an explanation of how this will continue to guide Transport Scotland's approach.

Chapter 3 introduces an action plan for growth, explaining the approach of targeting key barriers and developing activities that will bring more customers into the market for EVs. This, in turn, informs a 10-point action plan that will:

- Develop the necessary infrastructure and support that responds to the changing needs of the electric vehicle market (Chapter 4)

- Encourage the development of new electric mobility services that improve the ease of use, experience, cost and overall desirability of EVs (Chapter 5)

[1] Switched on Scotland: A roadmap to widespread adoption of plug in vehicles – 2016 Review, Urban Foresight and Transport Scotland, 7 November 2016, www.transport.gov.scot
[2] E-cosse, is a partnership of Scottish Government, industry and other key stakeholders with the objective of advancing the adoption of EVs in Scotland. www.e-cosse.net
[3] Draft Climate Change Plan - the draft Third Report on Policies and Proposals 2017-2032, Scottish Government, 19 January 2017, www.gov.scot
[4] Draft Scottish Energy Strategy: The Future of Energy in Scotland, Scottish Government, 24 January 2017, www.gov.scot
[5] National Transport Strategy, Transport Scotland, January 2016, www.transport.gov.scot
[6] Cleaner Air for Scotland - The Road to a Healthier Future, Scottish Government, 4 November 2015, www.gov.scot

- Promote the economic, environmental and social benefits of EVs to sustain and motivate further progress (Chapter 6).

The final chapter considers how Transport Scotland will measure success across each of the 10 actions.

2 Building on the Switched On Scotland Roadmap

The Switched On Scotland Roadmap establishes a long-term strategy that will continue to guide Transport Scotland's comprehensive approach to promoting widespread adoption of EVs. This action plan provides an opportunity to restate the vision and approach established by the Roadmap.

2.1 Vision

"By 2050, Scottish towns, cities and communities will be free from the damaging emissions of petrol and diesel fuelled vehicles. A significant reduction in greenhouse gas emissions will be accompanied by marked improvements in local air quality, noise pollution and public health. Scotland will also enjoy increased energy security and new economic opportunities through leadership in sustainable transport and energy technologies.

A key ambition is that by 2040 almost all new car sales will be near zero emission at the tailpipe and that by 2030 half of all fossil-fuelled vehicles will be phased-out of urban environments across Scotland. EVs running on Scotland's abundant green electricity will make a substantial contribution to this. Electric and electric hybrid EVs will be widely used as part of a sustainable transport system and will support progress towards a cleaner and smarter energy grid.

Actions taken in the early market up to 2020 will see increasing adoption of EVs and establish foundations for long-term growth. This will be delivered through the commitments of all relevant public and private stakeholders and driven by increased awareness and confidence in the technology. Change will be made actionable through promotion of the opportunities and incentives for adopting EVs, as well as developments in the necessary skills and business models."

2.2 Scotland's Joined-Up Strategy

The Roadmap establishes a clear case for Scotland to promote widespread uptake of EVs as an alternative to fossil-fuelled vehicles and how this can support Government aims across several important policy areas, including climate change, air quality, energy and economic development. This case has been further strengthened by the 2017 Draft Climate Change Plan, the 2017 Draft Energy

Strategy, the 2016 refreshed National Transport Strategy and the 2015 Cleaner Air for Scotland Strategy.

The Roadmap also sets out a comprehensive framework of the measures that will enable Scotland to achieve its 2050 vision and identifies how Government can influence and accelerate this transition. As shown in Figure 3, the Roadmap explains that progress is required across seven distinct areas, with the cogs representing that all of these areas need to progress in unison. Figure 3 also shows that the actions taken by Government to drive this progress will be a combination of: leadership, incentives, investments, outreach, and work to mobilise key stakeholders from across Scotland and beyond.

This action plan builds on the long-term strategic approach of the Roadmap and establishes a set of priority actions that will drive further progress in the period 2017-2020.

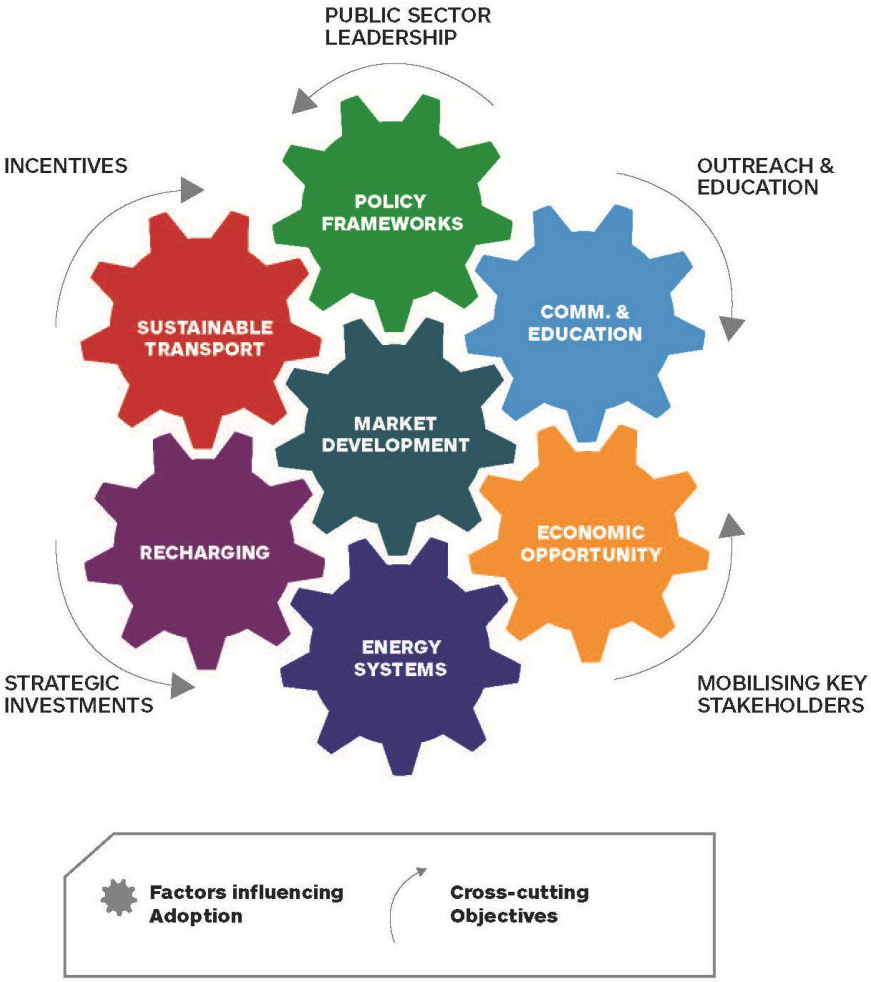

Figure 3 - The strategic approach set out in the Switched On Scotland Roadmap

3 An Action Plan for Growth

The research and consultation undertaken to develop this action plan highlighted that markets for EVs are showing signs of entering a new phase of maturity. This includes a greater range of EVs being offered by all major car manufacturers. Battery costs have also been cut by a factor of four in the period 2008-16 and are set to decrease further in the coming years[7,8].

Advanced markets around the world have demonstrated that today's EVs can meet the needs of a high percentage of the population. For example, in 2016 pure EVs and plug-in hybrids achieved a 29% market share in Norway[9]. Sales of EVs are also booming in China and at the UK level, alternative fuel vehicles (mainly electric cars) reached a record 4.2% share of new vehicle registrations in January 2017[10].

A similar upward trend has been experienced in Scotland, with more EVs sold in 2015 than the previous three years combined and 2016 sales exceeding the 2015 total. However, sales still remain at a relatively low level and support is required to achieve widespread adoption of EVs.

The challenge is therefore to focus on actions that accelerate the uptake of EVs, considering the barriers that need to be overcome and the requirements to be satisfied for EVs to become the preferred alternative to fossil fuelled vehicles.

3.1 Overcoming Barriers

The barriers to electric vehicle adoption are well understood and continue to be relevant have changed little since publication of the Switched On Scotland Roadmap in 2013. An important point of learning from the extensive consultation to develop the Roadmap and this action plan, is that the factors that influence adoption decisions, and that overcome many of these challenges can be broadly categorised into three areas:

1. **Cost –** ways to reduce the cost of EVs will play a major role in encouraging drivers to choose electric over fossil-fuelled vehicles.

2. **Convenience –** working to make EVs easy to drive, recharge and a convenient fit with the needs and lifestyles of an increasing number of drivers.

3. **Culture –** recognising the challenge of positively influencing choices and behaviours, as well as the need to embed EVs as a widely recognised and preferred alternative to fossil fuelled vehicles.

Focusing on positively impacting on these three areas provides a basis to prioritise actions that will accelerate the widespread adoption of EVs.

[7] International Energy Agency (2016) Global EV Outlook
[8] Element Energy (2017) Greenhouse Gas Emissions Reduction Potential in the Scottish Transport Sector, for Transport Scotland www.transport.gov.scot
[9] Source: European Alternative Fuels Observatory (2017)
[10] Source: SMMT (2017)

3.2 Increasing the Uptake of Electric Vehicles

Progress towards a mainstream market for EVs will require actions that address the diverse needs of an increasing number of potential users. The consultation undertaken for this action plan emphasised that people have different motivations and requirements, ranging from basic needs to more challenging expectations. Figure 4 illustrates that satisfying these needs requires specific actions and strategies to:

- ⇒ Continue to develop the underpinning infrastructure, policy frameworks and financial support to meet the changing needs of a growing market;
  - ⇒ Support the development of services that improve the ease of use, experience, cost and overall desirability of EVs;
    - ⇒ Promote the economic, environmental and social benefits offered by EVs to sustain and motivate further progress.

These three levels are used to structure the action plan as outlined in the next three chapters.

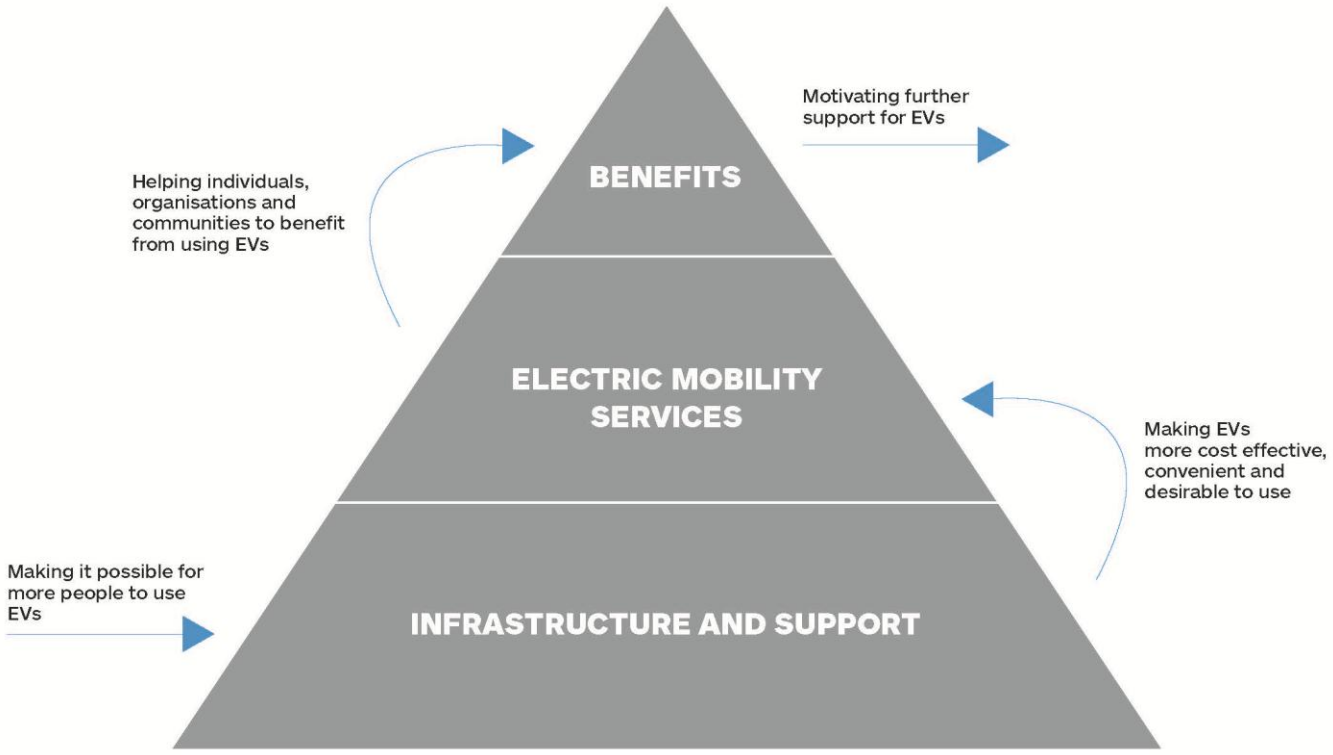

Figure 4 – Accelerating the uptake of EVs

4 Infrastructure and Support

The starting point in accelerating growth in markets for EVs is to continue to ensure that the enabling infrastructure and early-market support are in place and that they develop to meet the changing needs over time. This includes: charging infrastructure that enables drivers to make the journeys they wish to make; financial support to make EVs more competitive in the early market; communications activities that increase understanding of the opportunities to switch to EVs; and developments in policy, regulations and procurement that motivate investments and commitments across all sectors.

4.1 Progress to Date

Considerable progress has been made in Scotland, with a number of notable developments:

- ChargePlace Scotland is a network of electric vehicle charge points funded by Transport Scotland. It comprises the vast majority of Scottish charge points, at the start of 2017 over 600 of publicly available charge points (equating to over 1,200 charging bays). This includes over 150 publically available 'rapid' charge points, making it one of the most comprehensive networks in Europe.

- Over £3.7 million of Transport Scotland funding has been invested by EST to support the installation of charge points at over 1100 homes and around 350 workplaces across Scotland.

- Dundee City Council has secured significant funding from the UK Government to support the development of infrastructure in the city. This includes £1.86 million from the Go Ultra Low City Scheme and £515,000 from the Ultra Low Emission Taxi Scheme.

- Transport Scotland has provided around £3.5 million to introduce around 350 new electric vehicles across the fleets of 50 public sector organisations.

- The Low Carbon Transport Loan Scheme is funded by Transport Scotland and administered by Energy Saving Trust. In 2016/17, 248 carbon saving transport measures were funded with loans to the value of £7.4 million. 247 of these measures were vehicles (consumer and business EVs and PHEVs and Hackney cabs) and 1 loan for fleet telematics.

- The Scottish Green Bus Fund has provided around £14.8 million of funding over six rounds, enabling the introduction of 315 new low carbon emission buses into the Scottish fleet.

- Support for widespread adoption of electric vehicles now forms part of several significant national policies including the 2017 Draft Climate Change Plan, the 2016 refreshed National Transport Strategy, the 2015 Cleaner Air for Scotland Strategy and the 2017 Draft Scottish Energy Strategy.

- The majority of local transport strategies in Scotland now contain references to electric vehicles.

- Work has been undertaken to understand the impact and opportunities of increased electric vehicle adoption on Scotland's energy system. The results of this were published in the Energy Systems and Electric Vehicles Report[11] in July 2016.

- The Switched on @Work programme was established in 2016 to support organisations interested in helping their employees identify the benefits of switching to EVs.

- There has been a broad programme of activities to engage a wide number of people through a range of marketing campaigns, including the Greener Scotland campaigns.

4.2 Forward Actions

To build on these achievements and ensure continued development of the infrastructure and early-market support, Transport Scotland will focus on the following five actions:

Action 1: Support the increased deployment of public charging infrastructure by developing the ChargePlace Scotland network.

As adoption and use of EVs increases there will be a need to further increase the number of public charge points. Working with partners and other stakeholders, Transport Scotland will continue to develop the ChargePlace Scotland network, investing until at least August 2019, in public infrastructure that enables people to confidently charge their EVs across Scotland.

As well as geographic spread, Transport Scotland funding will deepen and strengthen the network through installing more than one charging point at locations where there is sufficient demand.

A further area of support will be infrastructure for private locations. This includes workplaces, taxi depots, leisure facilities and other car parks that are not open to everybody, but offer charging opportunities for a large numbers of vehicles.

Transport Scotland will also investigate ways to encourage private sector investments in infrastructure.

[11] Energy Systems and Electric Vehicles, Urban Foresight, July 2016, www.urbanforesight.org

Action 2: Provide financial support for the purchase of EVs and installation of private charging infrastructure.

While the operational and maintenance costs of EVs are typically significantly lower than internal combustion engine vehicles, the costs to purchase EVs are comparatively higher. The need to purchase and install charge points for homes and workplaces adds to this cost and can also discourage people from investing in EVs. Developments in technology and the overall market for EVs are expected to reduce these upfront costs. However, in the early market they are expected to remain a perceived barrier to many people.

To address this, Transport Scotland, through the Energy Saving Trust, will continue to offer individuals and organisations a number of financial incentives to encourage a faster uptake of EV ownership. This includes interest-free loans, until at least 2020, which currently provide up to £35,000 towards the cost of purchasing a new electric vehicle. It also includes financial support towards the cost of installing charge points at homes and for fleet vehicles.

Transport Scotland will also build on the success of the Switched on Fleets programme and explore the potential to provide further support for the deployment of EVs in public sector fleets and towards the cost of installing charge points in depots.

Transport Scotland will also continue to work closely with the UK Government's Office for Low Emission Vehicles (OLEV) on the EV Homecharge Scheme, on vehicle excise duty and tax incentives for EVs, and purchase grants for electric cars, vans, trucks, taxis and motorbikes.

Action 3: Work with partners on procurement approaches that encourage investment in EVs.

The spending power of the public, private and third sector presents an opportunity to give a significant boost to markets for EVs. Working with partners, Transport Scotland will develop practical guidance by the end of 2018 which will provide advice and support on procurement approaches that can be adopted to encourage both public and private sector organisations to incentivise the use of EVs. This includes the adoption of EVs by fleets and the procurement of transport services that incentivise the use of EVs, such as taxi and logistics contracts.

Action 4: Continue to work with partners to promote EVs as an alternative to fossil fuelled vehicles.

The market for EVs is still in the early stages of development. As such, there continues to be a need to address low levels of awareness of the capabilities, and advantages of EVs. Transport Scotland will continue to build on its existing communication and educational activity, working with Energy Saving Trust and other partners to identify further opportunities to deliver targeted and effective messaging that promotes EVs as an alternative to fossil fuelled vehicles.

A particular focus will be on the promotion ChargePlace Scotland Network, giving people the knowledge and confidence to drive EVs across Scotland.

Action 5: Embed support for EVs in strategies for transport, energy, climate change, air quality and the built environment.

Transport Scotland will continue working across Government, with businesses, local authorities, the wider public sector and third sector organisations to embed support for EVs in all relevant strategies and wider policies. A key part of this will be the finalisation of the Climate Change Plan and Energy Strategy and the preparation of the National Transport Strategy. This action also includes working with the European Commission and UK Government on developments in these areas, including vehicle emission standards.

As well as embedding EVs in relevant strategies and wider policies, delivery is essential. Therefore Transport Scotland will continue to offer support, where possible, to enable organisations to adopt EVs.

5 Electric Mobility Services

In addition to establishing solid foundations in the form of infrastructure and early-market support, there is also a need to encourage the development of new business models, technologies and incentives that will make EVs more cost effective and convenient to use. Such developments will also improve the overall experience of using an EV, improve cultural acceptance of these new technologies and bring new customers into the market. Examples identified in the consultation to develop this action plan are summarised in Table 1.

Table 1: Examples of developments in electric mobility services that could improve the cost, convenience and cultural acceptance of EVs.

Development	Examples	
Business & operating models	• Vehicle and battery leasing • Car clubs/ car sharing • Private infrastructure networks (e.g. for specific makes of vehicle, taxi operators, logistics companies) • Integration with other transport modes • Parking services • Energy storage and grid services	• EV filling stations/ low carbon transport hubs • First/ last mile logistics • Bundled service offerings (e.g. leasing agreements, energy supply contracts) • Performance-based contracting, public private partnerships and new financing models
Technologies	• Network communications • Charge point fault detection and reporting • Real-time availability • Smart ticketing • Booking and payment platforms	• Mapping and journey planning • High power charging • Wireless charging • Bidirectional charging/ vehicle-to-X • Connected and autonomous vehicles
Incentives	• Preferential parking • Access to bus lanes • EV-only taxi ranks • Low emission zones	• Tariff models • Non-financial incentives (e.g. time saving, status, convenience, community benefit)

5.1 Progress to Date

A number of actions have already been taken to improve the experience of driving EVs in Scotland:

- In August 2016, Charge Your Car was appointed as the operator of the ChargePlace Scotland network and committed in its contract to provide an enhanced customer service interface with 24/7 telephone helpdesk, dedicated Twitter and Facebook social media platforms, an enhanced fault management system and a new dedicated ChargePlace Scotland Operations Manager based in Scotland.

- Transport Scotland, COSLA, SCOTS, and local authorities worked together to explore the potential for local electric vehicle incentives to be introduced in Scotland. This resulted in the publication of 'A National Framework of Local Incentives for Electric Vehicles'[12] in October 2016.

- In 2016, the Transport Scotland funded Developing Car Clubs in Scotland programme, run by Carplus, had supported the introduction of 82 EVs to car clubs across the country, more than the rest of the UK combined at that time.

- There has also been targeted investment to provide charge points at hubs for multi-modal journeys including installations at 11 ferry terminals and at Park & Ride sites. As part of the ScotRail franchise agreement, Abellio ScotRail are committed to providing charging facilities at 50 stations across Scotland by the end of 2017.

- Through its Low Carbon Travel and Transport Pre-Application Support Fund, Transport Scotland provided financial support (of £332,000 in 2016/17) to 32 public, third and community sector organisations to review opportunities to deploy low carbon travel and transport hubs. This included the ambition of stimulating innovation to facilitate integration between transport modes and, for a significant number of these, to enhance the overall experience of EV charging.

5.2 Forward Actions

Four actions will be taken to develop services that further improve the convenience, cost-effectiveness and cultural acceptance of using EVs in Scotland:

Action 6: Improve the user experience of the ChargePlace Scotland network.

A key component of the experience of using an electric vehicle is recharging. Working with the ChargePlace Scotland operator, and other partners, Transport Scotland will continue to look at ways to enhance the charging experience.

This includes continuing to work with the ChargePlace Scotland network operator to improve reliability and fault management. The charge point network relies on the mobile phone network which can have limited coverage in some areas. Solutions will be explored to improve network telecommunications.

Increased use of social media, further stakeholder engagement and other communications channels will help to improve the driver experience from home to destination. In addition, the role of new technologies such as booking and alternative payment methods will be explored.

[12] National Framework of Local Incentives for Electric Vehicles, Urban Foresight, October 2016, www.urbanforesight.org

Action 7: Support the development of innovative EV charging hubs across Scotland.

EV charging hubs are an innovative new development that have the potential to facilitate the provision of new mobility services, enhanced user experiences and deliver efficiencies in the deployment of infrastructure for sustainable transport and linked smart grid technologies. The concept is somewhat flexible, but hubs can offer infrastructure at a single location to support a variety of different modes of transport, from walking and cycling to electric bicycles, cars, taxis and buses, and hydrogen vehicles.

Increased provision of clusters of charge points will reduce waiting times to recharge and give users options to select the appropriate higher or lower powered charge point depending on their needs.

By placing an emphasis on innovation at these hubs, there are also opportunities to encourage pilots of new technologies and business models that will further improve the experience and potentially the cost of recharging.

Through the first phase of the European Regional Development Fund Low Carbon Travel and Transport Programme, Transport Scotland as Lead Partner, has been awarded £7.6 million to December 2018 to invest in the development of low carbon travel and transport hubs across Scotland, which includes electric vehicle charging facilities.

RUGGEDISED (Rotterdam Umea and Glasgow: Generating Exemplar Demonstrations in Sustainable Energy Districts) is a smart city project funded under the European Union's Horizon 2020 research and innovation programme. Working in partnership with businesses and research centres, the cities will demonstrate how to combine ICT, e-mobility and energy solutions to design smart, resilient cities for all. Part of the Glasgow project will focus on the deployment of rapid EV chargers in Duke Street car park to increase revenue opportunities, and supporting the development of electric taxis in the city. These chargers will be powered by renewable energy and connected to an innovative smart grid with battery storage, ensuring that EVs have a minimal impact on the environment and play an important part of cities carbon reduction strategies. Implementation of LED street lighting EV chargers will also increase on-street charging availability.

These investments will also offer opportunities to encourage the integration of EV charging with other sustainable transport modes.

Action 8: Support local authorities in deploying measures that encourage adoption of EVs.

Local authorities are best placed to understand the needs of their communities, and have a range of powers that can be used to support and incentivise electric vehicle adoption. To assist local authorities in exploring solutions to encourage EV use, Transport Scotland will explore the development of a programme that provides support to allow the identification of practical and affordable measures that meet the needs of local communities and encourage adoption of EVs. This will also explore the development of innovative solutions to important challenges, such as infrastructure solutions for residents of flats and tenements.

Action 9: Consider the impact of emerging technologies and business models on EV adoption and infrastructure deployment.

The rapid pace of technological development and business model innovations are changing the way people travel and interact with transport services. Mobile technologies, connected and autonomous vehicles, big data, wireless charging, bidirectional charging, energy storage and mobility as a service platforms are all examples of disruptive developments that could enhance the convenience and value of EVs.

Transport Scotland will continue to review such developments and work to realise opportunities to positively influence the use of EVs, the provision of infrastructure and to understand what steps could be taken to realise wider benefits.

6 Realising the Benefits

Transport Scotland's investments and support for EVs are motivated by achieving beneficial economic, environmental and social outcomes. These outcomes will be realised by individuals and organisations across Scotland. They will also benefit local communities and the country as a whole.

Collecting data and evidence on progress will help to evaluate the impact of different activities and ensure that incentives are properly aligned with emerging market needs.

Promoting these benefits will also help to motivate further support across Scotland, as well as building confidence and enthusiasm amongst individuals and organisations. This feedback will be further strengthened by information on the environmental and health consequences of the most polluting vehicles.

This will be part of a wider activity to help individuals and organisations that have switched to EVs to know that this is making a difference, to reinforce recognition of the rewards that they are receiving and encouraging them to take leadership in promoting the benefits of EVs.

6.1 Progress to Date

Investments in EVs by individuals and organisations across Scotland are already delivering tangible benefits. Transport Scotland and partners are also actively working to bring together stakeholders to share this learning, good practice and successes:

- In May 2017, Dundee City Council had 83 EVs in its fleet that had driven over 1 million miles and delivered an estimated 70% saving on fuel costs compared to equivalent diesel vehicles.

- Dundee taxi firm, 203020, reported that its drivers had driven over 2.5 million all-electric miles by May 2017 and that each driver is saving between £120 and £130 a week on fuel.

- The E-cosse partnership has run 15 forums since 2012, bringing together approximately 700 people representing over 150 organisations to share successes and receive regular updates on progress from Transport Scotland.

- The Switched On @Work programme was launched by the EST in 2016 to encourage employers to promote the benefits and opportunities offered by EVs to their employees and to generate evidence to better understand future demand for EV charging at workplaces.

- Twelve ECO Stars schemes are in operation across Scotland, helping fleet operators to improve efficiency, reduce fuel consumption, emissions and make cost savings.

6.2 Forward Actions

The final action in this 10-point plan recognises Transport Scotland's role in providing evidence-based analysis and feedback that will help to sustain this progress and motivate more people to switch to EVs:

Action 10: Support improvements in the collection, analysis, interpretation and dissemination of data and evidence on the economic, environmental and social benefits of EVs.

Transport Scotland will work with partners to collect and disseminate information to promote greater recognition of the economic, environmental and social benefits of EVs. This information will be summarised in concise reports that will communicate progress over time. This will provide an opportunity to celebrate milestones, successes and establish the net contribution made by EVs to related policy areas including: climate change; renewable energy and energy systems; air quality and public health; and economic development. Examples of these are shown in Table 2.

Transport Scotland will continue to share these insights at regular E-cosse forums, which bring together stakeholders from across the EV sector to share good practice and successes that motivate further investments in EVs.

Ongoing close working with industry will also support developments such as fuel economy labelling for new cars and driver feedback technologies that will help to quantify the advantages of EVs and promote energy efficient driving.

Table 2: Examples of benefits offered by EVs

- Air quality improvements
- CO_2 emission reductions
- Healthcare savings from mitigated emissions
- Savings on fuel and maintenance costs
- Energy storage potential/ peak shaving potential
- Reported benefits from local incentives (e.g. money and time saved)
- Renewable energy consumed by EVs
- Investments attracted
- Economic activity related to Scottish EV businesses (investment, jobs, exports)
- International exposure/ reputational benefits

7 Measuring Success

The outcome-focused approach established by this action plan will ensure that Transport Scotland can work with partners to deliver a comprehensive package of support across different types of vehicles and applications.

Table 3 identifies examples of performance indicators to evaluate progress against each of the 10 actions. These indicators demonstrate the range of positive outcomes that can be expected and that in combination these actions can greatly enhance the cost, convenience and cultural acceptance of EVs in Scotland. As part of the delivery of Action 10, Transport Scotland will consider the most appropriate indicators for each action.

Alongside the long-term strategic approach established by the Switched On Scotland Roadmap, this 10-point plan gives a clear focus for the actions to be taken in the period 2017-20. These actions will enable Transport Scotland to work with partners to accelerate the uptake of EVs and to realise the multiple benefits that this offers to individuals, communities, businesses and the country as a whole.

Table 3: Evaluation framework to measure the impact of each of the 10 actions

	Action	Example Performance Indicators
Infrastructure and Support	1 Support the increased deployment of public charging infrastructure by developing the ChargePlace Scotland network.	• Total investment by Transport Scotland • Number of public charge points and bays • Geographical coverage
	2 Provide financial support for the purchase of EVs and installation of private charging infrastructure.	• Funding allocated • Number of individuals/ organisations supported • Matched funding leveraged
	3 Work with partners on procurement approaches that encourage investments in EVs.	• Number of organisations engaged/ supported • Number of organisations and procurement contracts that incentivise provision of EVs • Total investments generated
	4 Continue to work with partners to promote EVs as an alternative to fossil fuelled vehicles.	• Number of individuals/ organisations engaged • Level of public knowledge/ understanding • Positive attitudes to EVs
	5 Embed support for EVs in strategies for transport, energy, climate change, air quality and the built environment.	• Number of policies/ regulations that reference and support EVs • Number of Government departments/ agencies/ local authorities/ and other organisations that reference and support EVs

Electric Mobility Services	6 Improve the user experience of the ChargePlace Scotland network.	• Levels of customer satisfaction • Use of public infrastructure • Reliability of infrastructure
	7 Support the development of innovative EV charging hubs across Scotland.	• Number of hubs created • Integration with other transport modes • Matched funding leveraged
	8 Support local authorities in deploying measures that encourage adoption of EVs.	• Number of local authorities introducing measures • Number of measures introduced • Customer benefits/ reported value
	9 Consider the impact of emerging technologies and business models on EV adoption and infrastructure deployment.	• Level of engagement with industry and researchers • Pilots/ trials supported
Realising the Benefits	10 Support improvements in the collection, analysis, interpretation and dissemination of data and evidence on the economic, environmental and social benefits of EVs.	• Number of external presentations • Number of case studies produced • Number of dissemination events

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