

Transforming Transport: Getting from A to EV



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Transforming Transport – Getting from A to EV

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TRANSPORT SCOTLAND

LOW CARBON ECONOMY DIRECTORATE – Collaborative, Imaginative, Focused TRANSPORT SCOTLAND



Context







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MISSION

Phase out the need for new petrol and diesel cars and vans by 2032

Priority 1 Support a user focused, state-of-the-art network of charge points supporting Scotland's energy needs Priority 2 Embed new skills and capabilities into the Scottish workforce Priority 3 Scottish businesses engage in and benefit from the shift to ULEVs Priority 4 Incentivise consumers to make informed choices on the purchase, access and use of ULEVs

OUTCOMES

Scotland at the forefront of growth in ULEV markets. A fair distribution of investment costs, benefiting all consumers. Business benefitting from new markets and technologies



How

ORIENTATION – making sure we're collectively focused on the right things.

The PfG 2032 commitment has set out a bold and clear mission that is already helping to motivate the public and private sector. It is now need to build on this motivation to establish a clear and common sense of purpose and activity across the public, academic and commercial sector that matches our ambition.



IMPACT – making sure we invest our time in the right things

Delivering transformative action will require us to translate the motivation, capabilities and evidence we develop into focused areas for collaboration, investment and influence.

CAPABILITY – making sure that we have the collective capacity and capabilities to deliver transformative action

Much of our success will depend on our ability to establish the explorative capacity and capabilities needed to deliver on the SGs PfG and low carbon ambitions. This means enhancing capabilities and collaborations across the public sector, and supporting the pull through of new technologies, business models and skills within the commercial sectors. Outputs from our orientation work will inform the focus of this work.





Current Delivery focus

- Circa £50 annual investment programme, co delivered by TS and EST.
- Supports vehicles uptake and deployment of charging infrastructure



Delivery initiatives will change substantially as policy framework develops (market facing and innovation focus)



Vehicles in Scotland, 2018



Cars Light Goods Vehicles Motorcycles Heavy Goods Vehicles Buses and coaches Other vehicles 1

Data from <u>Department for Transport Statistics</u> for Quarter 3 2018

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CPS: Unique Users per Year





CPS: Plug-In Market



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CPS: Utilisation





CPS: Hour of Charging







Future Challenges & Opportunities

- Repurposing our transport infrastructure
- Energy network issues
- Innovation and commercial investment
- Uncertainty in social & technological trends



Thank you
Andy Robinson
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Transport Scotland



Dr Simon Gill Energy Engineer Scottish Government



Transforming Transport – Getting from A to EV *Linking EV development to electricity networks*

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The Scottish Energy Strategy





The Scottish Energy Strategy





AN INCLUSIVE ENERGY TRANSITION



A SMARTER LOCAL ENERGY MODEL

2030 Whole System targets

50% EUR

THE EQUIVALENT OF 50% OF THE ENERGY FOR SCOTLAND'S HEAT, TRANSPORT AND ELECTRICITY CONSUMPTION TO BE SUPPLIED FROM RENEWABLE SOURCES



AN INCREASE BY **30%** IN THE PRODUCTIVITY OF ENERGY USE ACROSS THE SCOTTISH ECONOMY

The future of energy in Scotland: Scottish Energy Strategy



Scottish Government Riaghaltas na h-Alba gov.scot

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24%

Transport accounts for nearly a quarter of all energy consumption in Scotland (measured as gross consumption)





What is the potential impact of EVs on our energy system ?





Scottish Energy strategy



-OF



Source: National Grid FES 2018



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National Grid ESO November 2018	Operability Strategy 2018	
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- Aligning electrical demand with low carbon generation
- Delivering sufficient low carbon electrify generation
- Ensuring sufficient generation Capacity when required
- Ensuring resources and flexibility and fast
- Managing frequency



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Helping with the integration of Wind:

with intermittent

Impacts



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The electricity system needs a wide range of series – not just energy. Traditional service providers (large power stations) are closing. EVs have the opportunity to provide many if the markets are designed properly







Local Network Capacity : 1 – 5 kW per house





Diversity



Home charging of EVs has substantially changes some of the key assumptions on which networks are designed and operated



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Local Network Capacity : 1 – 5 kW per house





Local Network Capacity : 1 – 5 kW per house How much more for EVs?





My Electric Avenue – impact of 3.5 kW EV chargers used with Nissan Leaf's in 2014 - 2016



Source: My Electric Avenue

"32% of low voltage (LV) feeders (312,000 circuits) will require intervention when 40% – 70% of customers have EVs, based on 3.5 kW (16 amp) charging"



Challenges for the Electricity networks of getting from A to EV









 \bigtriangleup *





Denis Naberezhnykh Technical Director – Sustainable Transport Ricardo

Delivering Excellence Through Innovation & Technology





Agenda

1. Introduction to Ricardo

2. Overview

- 3. Vehicle manufacturers
- 4. EV charging infrastructure

5. Conclusions

6. Q&As





Introduction to Ricardo

Introduction to Ricardo Group

- A global, multi-industry consultancy for engineering, technology, project innovation and strategy
- Revenue £332m
- Over 2,900 staff working in 40 offices worldwide
- Strategic acquisitions and business reorganisation; Vepro and Power Planning Associates, Lloyd's Register Rail and Cascade Consulting.





Engines





Vehicle Systems



Critical Systems



Strategic Consulting



Driveline & Transmission Systems

Environmental Consulting



Hybrid & Electric Systems



Energy Consulting



Independent Assurance

Niche Manufacturing



Test Services



Software





Introduction to Ricardo Energy and Environment

- Internationally-renowned consultancy
- Heritage of world-leading scientific/technical capability
- Providing analysis and solutions for major environmental challenges
- Client base of international governments and businesses
- Headquartered at Harwell Science Park, near Oxford
- Over 450 scientists and technical staff











Overview

Overview – current state of EV take up











A look at vehicle manufacturers

Vehicle manufacturers - regulations require automotive OEMs to increasingly shift to zero emission vehicles



Normalised CO₂ targets



Vehicle manufacturers - OEMs state they are committed to electrified and electric vehicle introduction; the number of models available is increasing rapidly





Plans 30 new

for up to 25%

of sales

EVs accounting

few years.

electric

2022

models in

production by

Expects 27

Electrified will include hybrids

FCEV = hydrogen fuel cell electric vehicle

© Ricardo plc 2017

GROUPE

To have 7

on EMP

PHEV and 4

BEV models

February 2019

45

Vehicle manufacturers – manufacturing estimates







EU vehicle production 2030 Split









Use of EV charging infrastructure

EV charging infrastructure – Charging infrastructure is available to support different recharging behaviours and business models



Typical Recharging Times for >400 km EV range with 85 kWh battery pack



EV charging infrastructure – Charging at locations where the vehicles are stopped for prolonged periods is #1 priority



- UK: 200K PiVs (~60K BEVs)
- UK: ~60K domestic chargers
- UK: 93% of EV owners have offstreet parking – likely to continue to at least 2025



Organisation	Region	Ideal public charger to EV ratio
European Council	EU	1:10
NDRC	China	1:8 – 1:15
IEA Electric Vehicle Initiative	Worldwide	1:8 - 1:15
EPRI	United States	1:7 – 1:14
NREL	United States	1:24
CEC/NREL	United States	1:27

Sources: Hall & Lutsey, 2017

- UK: ~19K public chargers
- UK: >4K rapid chargers)
- UK: ~1:10 (public charger : EV ratio)
- Public rapid chargers have very low utilisation (<10%)





Take up of EVs	Charging Infrastructure	Implications for Policy
 May be limited by vehicle availability 	• Charging at home and at work is a	 Need to incentives EV sales (e.g. ZEV
 2030: OEMs targeting up to 40% plug-in vehicle sales sales 	 Public charging utilisation appears to 	 scheme) – not just purchasing Continue to support hybrids and
2030: Around 20% BEVs		PHEVs – they are a critical transitional technology
 Most OEM focus is still on hybrids and PHEVs 	 Lack of successful business models and potential stranded assets 	 More focus on supporting domestic (including on-street) and workplace
 Strong demand in China – priority 	 Integration with smart grid, renewables, storage and smart 	charging
Drive of EV/a remains a key barrier		 Support emergence of new charging infrastructure business models
Price of EVS remains a key barrier	 Rapid chargers for longer journeys, commercial vehicles, taxis and car clubs are key 	 No ICE sales by 2032 would require extensive policy support













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