

Electric Vehicle developments in the UK

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<https://www.turing.ac.uk/research/research-projects/vehicle-grid-integration>



Exciting times in the UK for electric vehicle development

Government Support

Policy paper
The Grand Challenges

Updated 21 May 2018

Contents

- Artificial Intelligence and data
- Ageing society
- Clean growth
- Future of mobility



The [Industrial Strategy](#) sets out Grand Challenges to put the UK at the forefront of the industries of the future, ensuring that the UK takes advantage of major global changes, improving people's lives and the country's productivity.

Put the UK at the forefront of the design and manufacturing of zero emission vehicles and for all new cars and vans to be effectively zero emission by 2040.



The Road to Zero

Next steps towards cleaner road transport and delivering our Industrial Strategy



Setting out government support

Policy paper
Charging Infrastructure Investment Fund

A request for proposals to raise and manage the government's Charging Infrastructure Investment Fund.

Published 23 July 2018
Last updated 14 September 2018 — [see all updates](#)
From: [HM Treasury](#) and [Infrastructure and Projects Authority](#)

Documents



[Charging Infrastructure Investment Fund Request for Proposals](#)

PDF, 148KB, 13 pages

This file may not be suitable for users of assistive technology. [Request an accessible format.](#)

News story

£30 million investment in revolutionary V2G technologies

Electric vehicles to help power people's homes helped by almost £30 million funding.

Published 12 February 2018
From: [Department for Transport](#), [Office for Low Emission Vehicles](#), [Innovate UK](#), [Department for Business, Energy & Industrial Strategy](#), and [Jesse Norman MP](#)

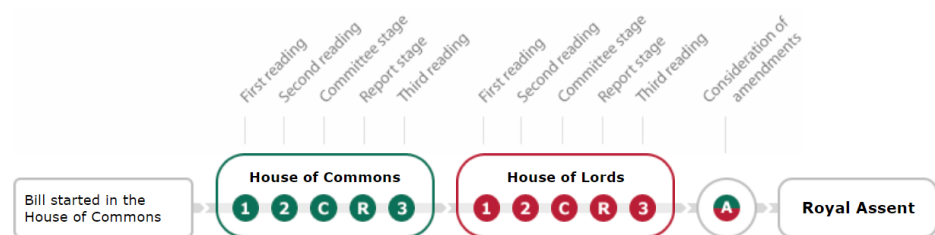


Policy Support- The Automated and EV Act 2018

Automated and Electric Vehicles Act 2018

Type of Bill: Government Bill
Sponsors: Chris Grayling
Transport
Baroness Sugg
Transport

Progress of the Bill



Last events

- RA** Royal Assent (Hansard) 19 July, 2018 | 19.07.2018
- RA** Royal Assent (Minutes of Proceedings) 19 July, 2018 | 19.07.2018

■ Read debates on all stages of the Automated and Electric Vehicles Act 2018

Act of Parliament

House	Act	Date
○	Automated and Electric Vehicles Act 2018 (c. 18)	19.07.2018

Stay up to date

Keep up to date with the progress of Bills going through Parliament. Sign up for email alerts or use our RSS feeds.

[RSS feed for this Bill](#)

Empower the government to set standards and to regulate some aspects of the EV industry if necessary, in future year- Smart Charging

PART 2 Electric vehicles: charging

Introductory

9. Definitions

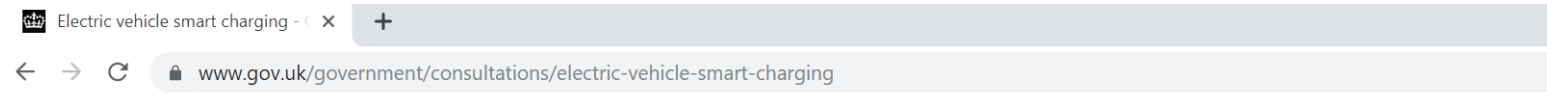
Requirements and prohibitions

10. Public charging or refuelling points: access, standards and connection
11. Large fuel retailers etc: provision of public charging or refuelling points
12. Duty to consider making regulations under section 11(1)(a) on request by elected mayor
13. Information for users of public charging or refuelling points
14. Transmission of data relating to charge points
15. Smart charge points

15 Smart charge points

- (1) Regulations may provide that a person must not sell or install a charge point unless it complies with prescribed requirements.
- (2) The requirements that may be imposed under subsection (1) include requirements relating to the technical specifications for a charge point, including for example the ability of a charge point—
 - (a) to receive and process information provided by a prescribed person,
 - (b) to react to information of a kind mentioned in paragraph (a) (for example, by adjusting the rate of charging or discharging),
 - (c) to transmit information (including geographical information) to a prescribed person,
 - (d) to monitor and record energy consumption,
 - (e) to comply with requirements relating to security,
 - (f) to achieve energy efficiency, and
 - (g) to be accessed remotely.
- (3) Regulations under subsection (1) may also prescribe requirements to be met in relation to the sale or installation of a charge point.
- (4) In this section—
 - (a) "sell" includes let on hire, lend or give;
 - (b) references to a prescribed person include references to—
 - (i) a person of a prescribed description, and
 - (ii) a device operated by one or more prescribed persons.

Open Consultation- Ingredients of a smart charger



Open consultation **Electric vehicle smart charging**

Published 15 July 2019
Last updated 19 July 2019 — [see all updates](#)
From: [Department for Transport](#) and [Office for Low Emission Vehicles](#)

Summary

Proposals for regulations to ensure that electric vehicle chargepoints sold or installed in the UK have smart charging functionality included.

This consultation closes at
11:45pm on 7 October 2019

Consultation description

Consultation on proposals for electric vehicle chargepoint smart technology regulations. The proposed regulations would require that electric vehicle chargepoints sold or installed in the UK have smart charging functionality

Related content

[Whole House Retrofit \(WHR\) competition](#)

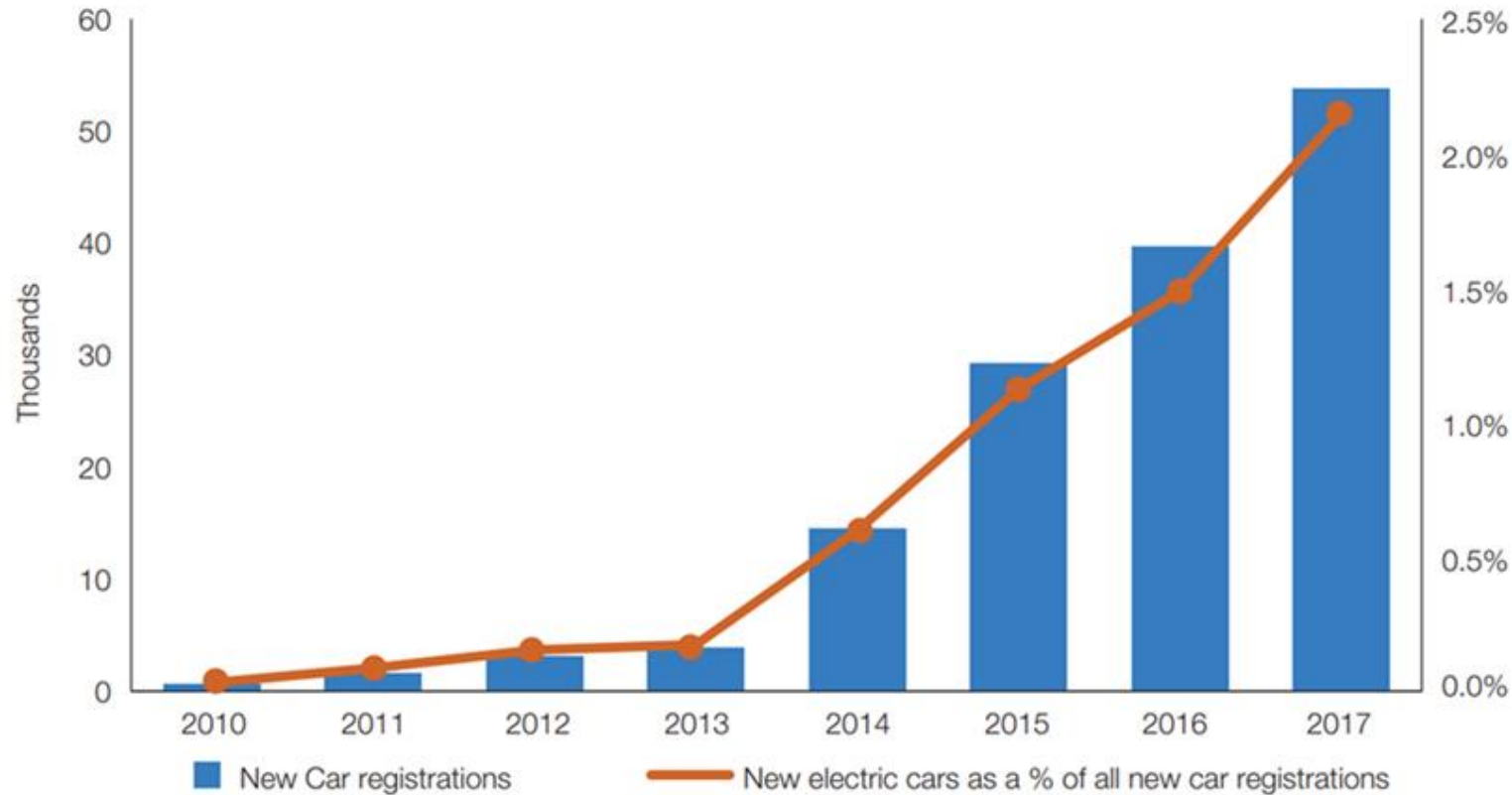
[Plug-in taxi grants: eligibility and applications](#)

[Electric Vehicle Homecharge Scheme authorised installers](#)

[Electric Vehicle Homecharge Scheme approved chargepoint model list](#)

[Workplace Charging Scheme minimum technical specification](#)

A lot of support but uptake is still low.



*Includes plug-in hybrids, 100% electric, range extended electric and fuel cell electric cars

Source: DfT, Vehicle Licensing Statistics, 2018 - table VEH0253.

Source : Road to Zero Strategy

All new cars and vans to be effectively zero emission by 2040.

22 years to go from just over **2% to 100%** market share.

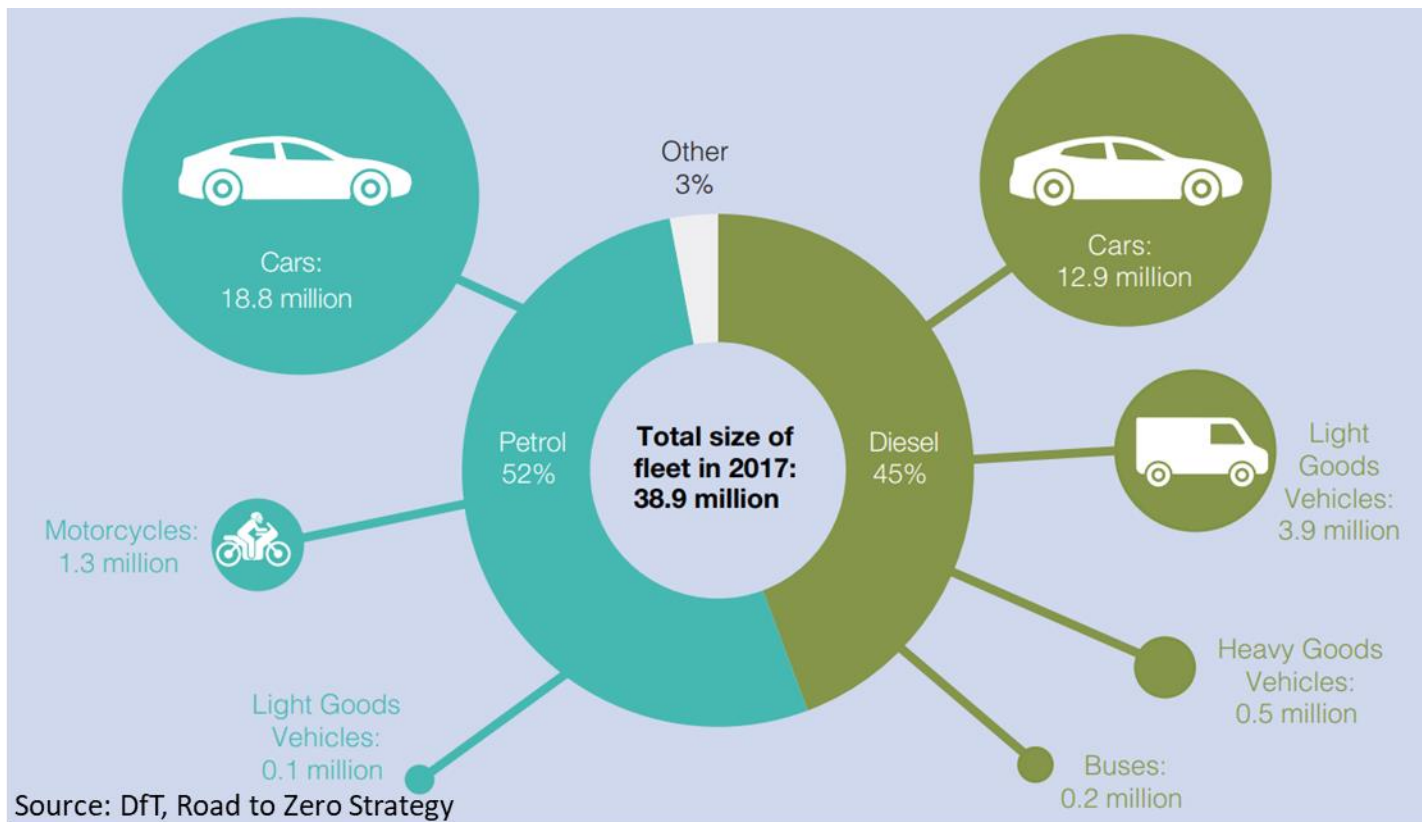
New electric car registrations in GB

EV mass adoption requires...

- ▶ Available and affordable cars
- ▶ Range
- ▶ Charging infrastructure

...developing the next generation battery technologies is crucial

39 million vehicles in 2017...how many BEVs in 2050?



- ▶ Battery development to support the transition
- ▶ battery diagnostic and testing
- ▶ Battery re-use, recycling
- ▶ Materials for the batteries

Government support- £246 million Faraday Battery Challenge

FARADAY BATTERY CHALLENGE

The Faraday Institution is the research vehicle for the ISCF Faraday Battery Challenge, which comprises a £246m commitment over the next 4 years to develop, design and manufacture world-leading batteries in the UK. The programme is split into three separate elements, delivered in parallel, to provide connectivity across research and innovation strands.

RESEARCH + INNOVATION + SCALE UP



The Faraday Institution

A new, virtual research institute comprising a headquarters at the Harwell Science and Innovation Campus and a series of research projects carried out in UK universities to accelerate fundamental science and its translation directly related to batteries.



Research and Innovation Projects

An innovation programme to support collaborative research and development with co-investment from industry (led by **Innovate UK**).



UK Battery Industrialisation Centre

An open access facility with technology scale-up capabilities to ensure solutions are ready for manufacturing technologies at high volume (led by **APC**).

Extending Battery Life



Led by the **University of Cambridge**, this project will examine how environmental and internal battery stresses (such as high temperatures, charging and discharging rates) damage electric vehicle (EV) batteries over time.

Battery System Modelling



Imperial College London (ICL) will lead a consortium to equip industry and academia with new software tools to understand and predict battery performance, by connecting understanding of battery materials at the atomic level all the way up to an assembled battery pack.

Recycling and Reuse



A project led by the **University of Birmingham** will determine the ways in which spent lithium batteries can be recycled. With the aim to recycle 100% of the battery, the project will look how to reuse the batteries and their materials, to make better use of global resources.

Next Generation Solid State Batteries



The University of Oxford will lead an effort to break down the barriers that are preventing the progression to market of solid-state batteries, that should be lighter and safer, meaning cost savings and less reliance on cooling systems.

FOUNDING UNIVERSITIES

The Faraday Institution unites the expertise and insight from its 7 founding partner universities, along with industry partners and other academic institutions, to accelerate fundamental research to develop battery technologies.



To research next generation battery technology

Government support- funding the next generation of charging technologies

News story

£30 million investment in revolutionary V2G technologies

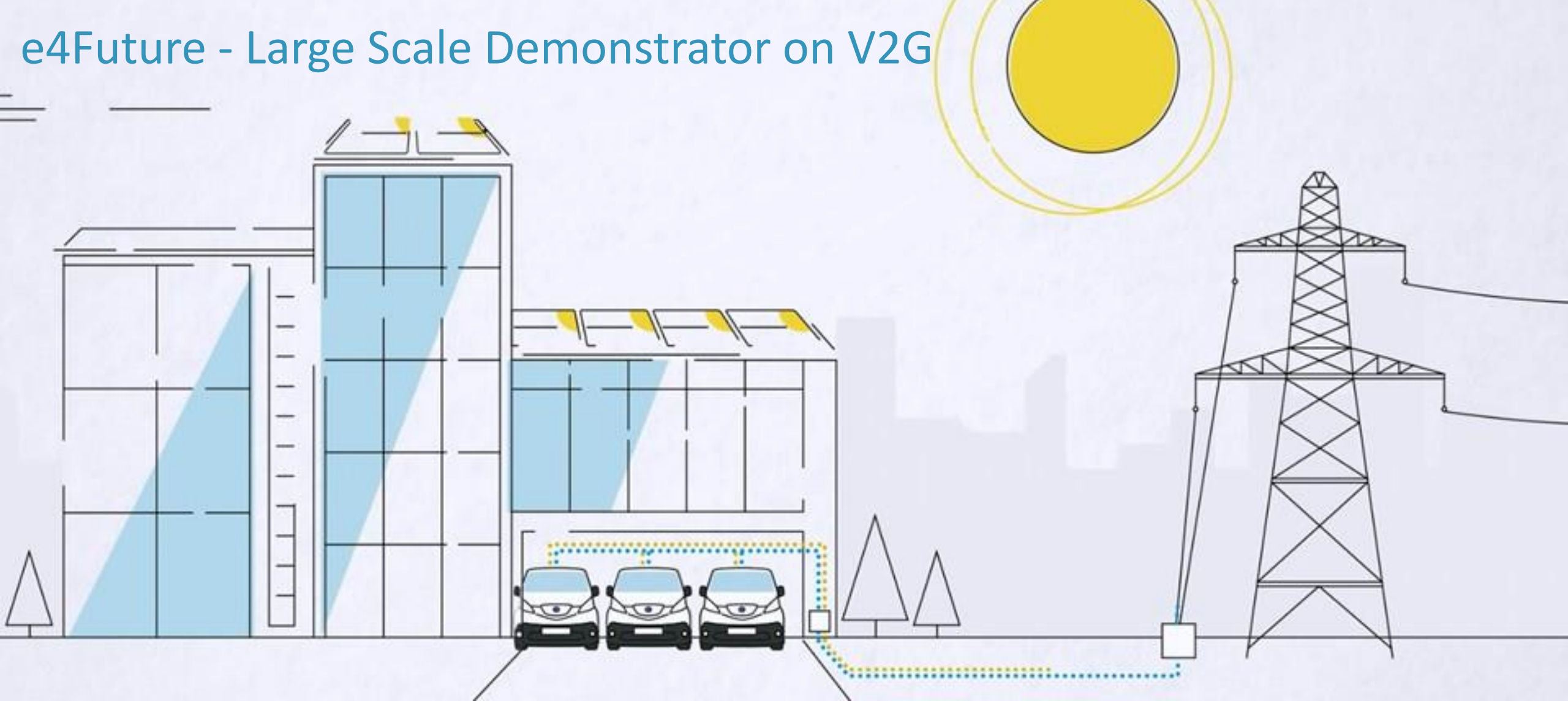
Electric vehicles to help power people's homes helped by almost £30 million funding.

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e4Future - Large Scale Demonstrator on V2G



NISSAN  **Newcastle University**
UK | Malaysia | Singapore

Imperial College London

UK Power Networks 

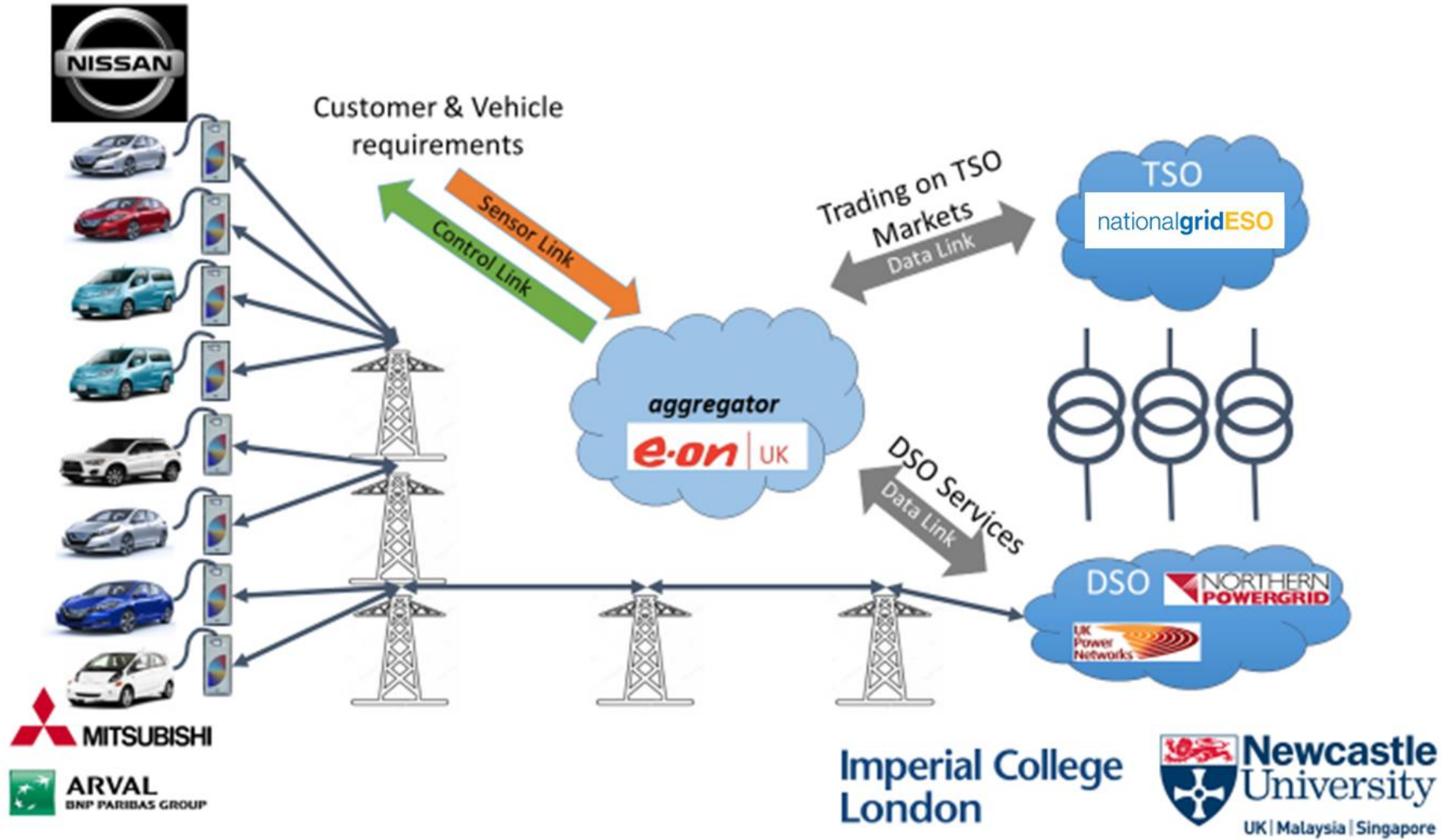
NORTHERN POWERGRID

e-on | UK **nationalgrid** **ESO**

 Department for Business, Energy & Industrial Strategy

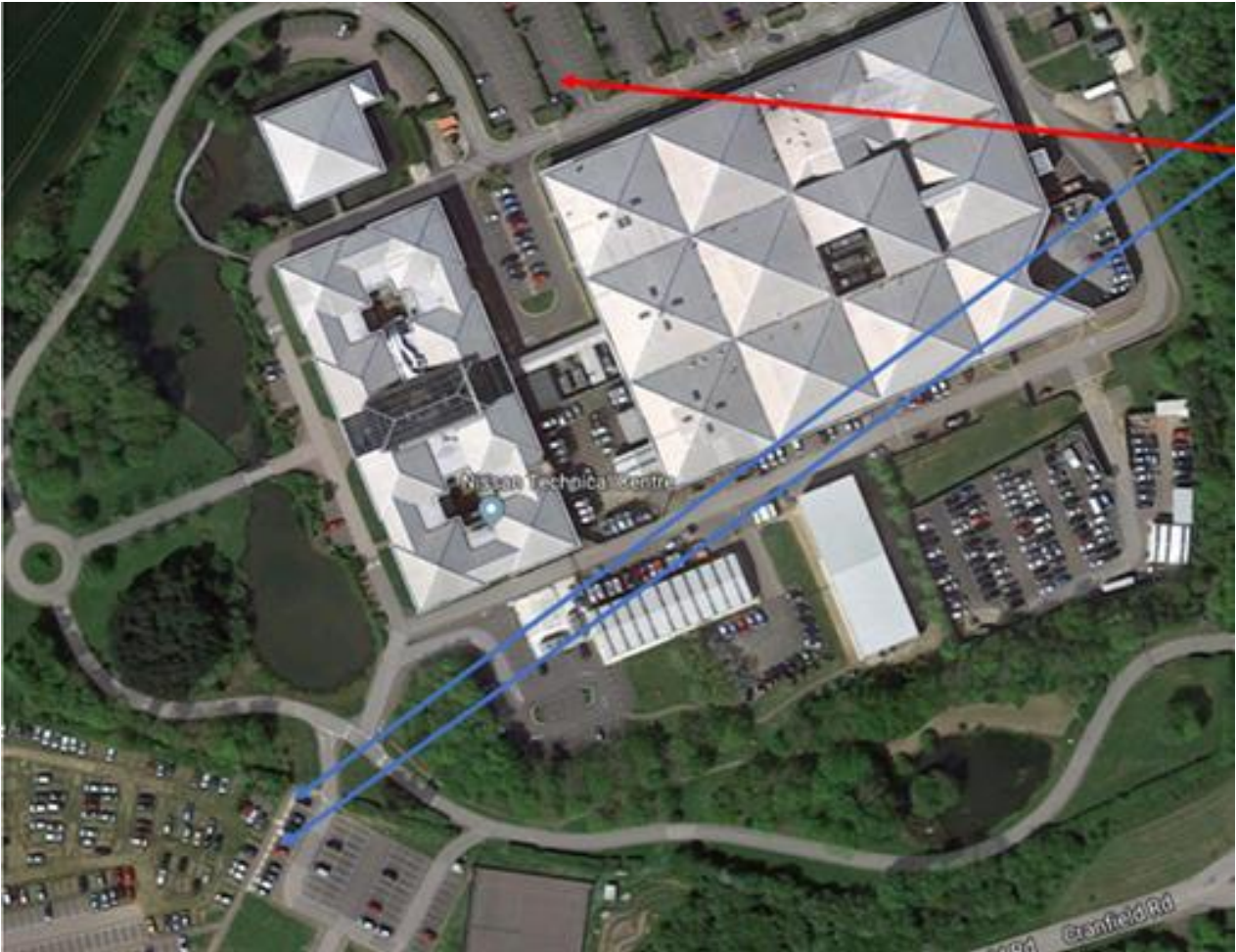
 Office for Low Emission Vehicles

E4future consortium



Large-scale UK deployment of 1000 V2G chargers with fleets to offer power system services

Preparation for First Install at NTCE Cranfield



E4future- work packages

WP1 Vehicle to grid participant experience

WP2 Understanding potential and impact of V2G to the grid

WP3 Pilot implementation and data analysis

WP4 Privacy and Cybersecurity

WP5 Policy and regulatory framework for V2G

WP6 Dissemination

WP7 Project coordination

E4future- topics not addressed

End to end modelling: molecules to markets

(importance to understand degradation outside the lab)

Real world demonstrators of EVs and charging infrastructure (2010- ongoing)

Electric Vehicles Usage Patterns

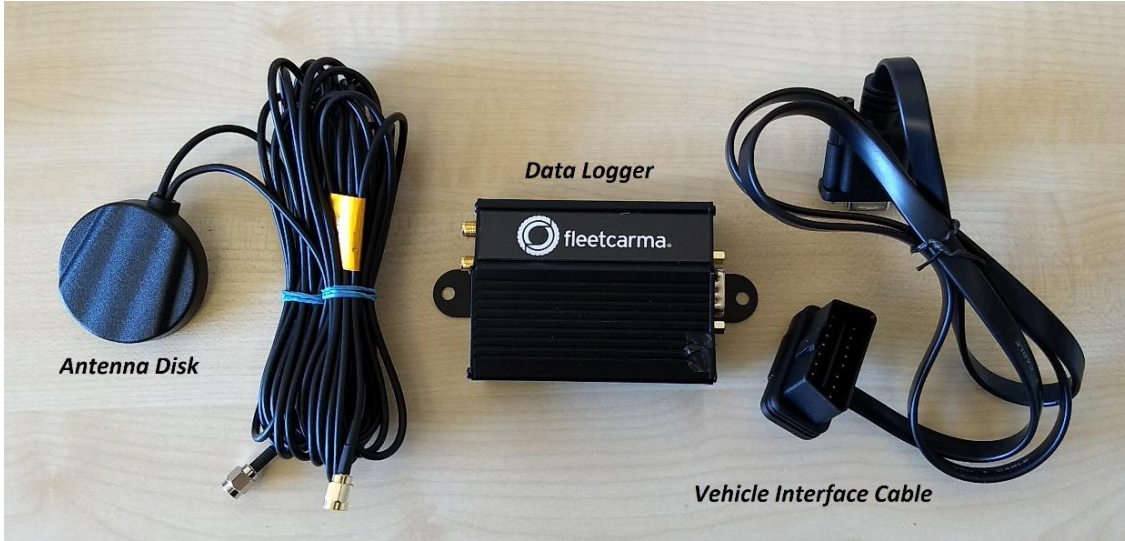
EV Infrastructure

Distribution Network Impact Assessment

- SwitchEV- Early EV demonstrator.
- RCN- Fast chargers
- CLNR- Access to data from 9,000 smart meters+ validated network models.
- E4future (bidirectional chargers)



BEV Data Collection



Renault ZOE installation



Nissan e-NV 200 installation



Nissan LEAF installations



BEV data collection

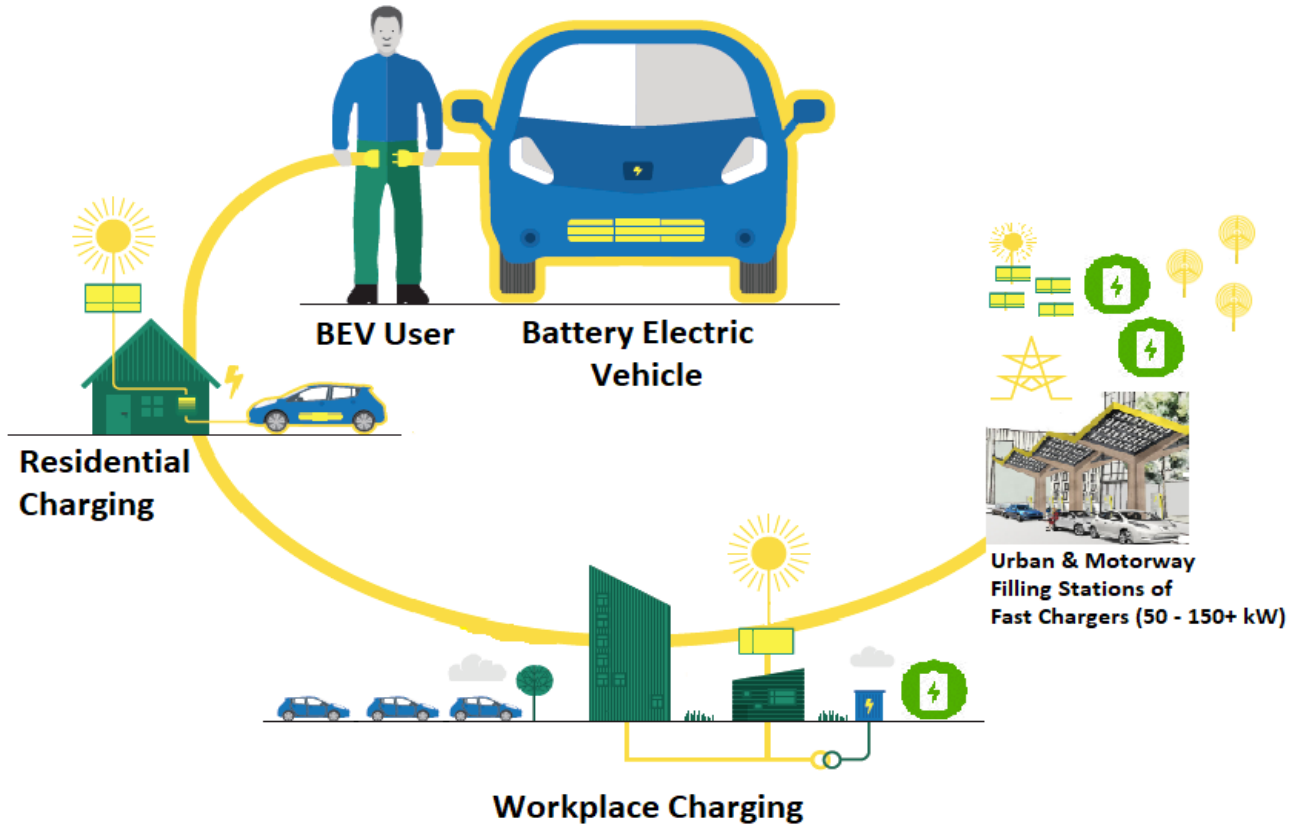


GPRS



- Over 1.3 million kilometres driven.
- Over 140,000 trips and 40,000 charging events.
- Private vs fleet drivers
- Urban vs rural users
- Home, work, public including fast chargers

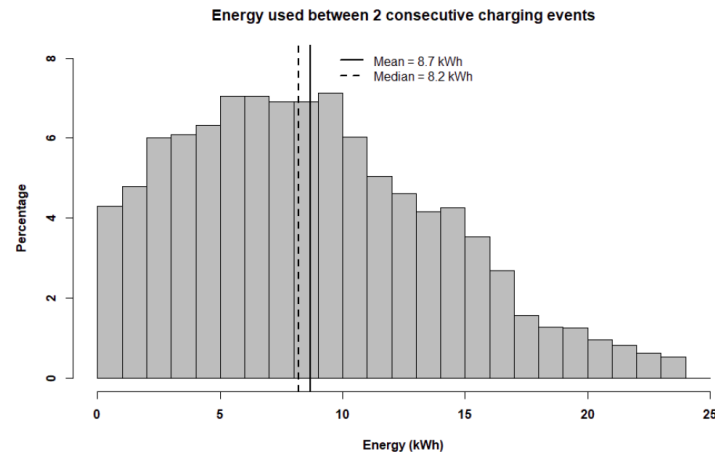
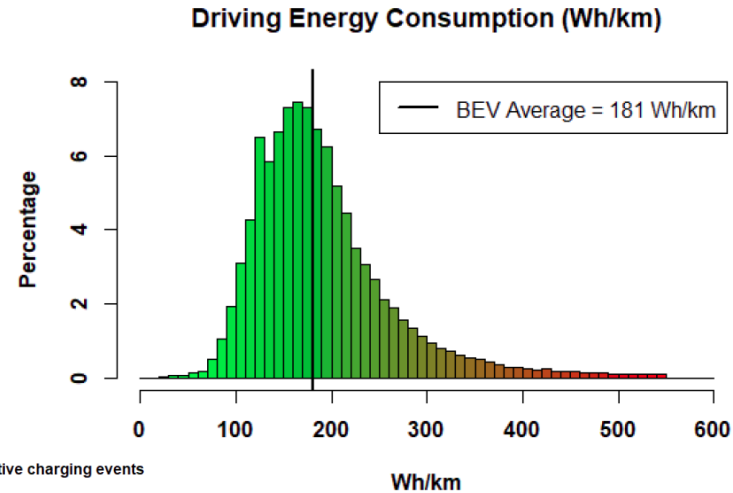
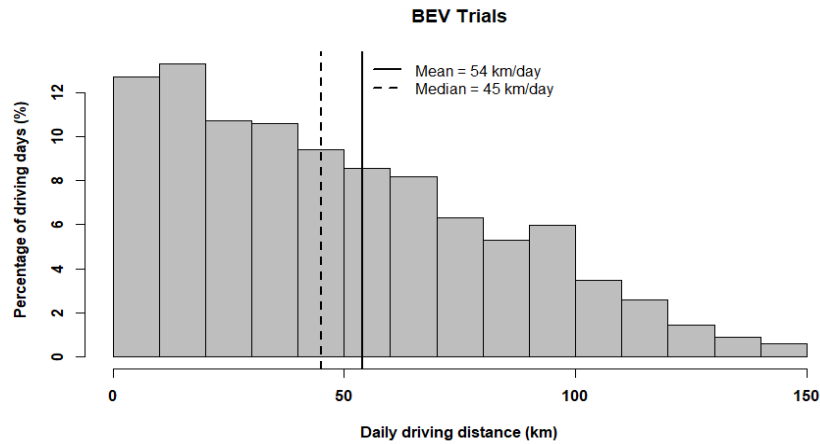
Charging locations for private passenger BEVs



Neaimeh and Andersen, 2019, *in review*

- ▶ Different refuelling paradigm
- ▶ Cars are routinely parked for most hours at home and the workplace, where the majority of charging demand could be met.
- ▶ Inherent flexibility in charging demand to allow charging management strategies.

Why do we need to manage charging? Plugging a whole new house?



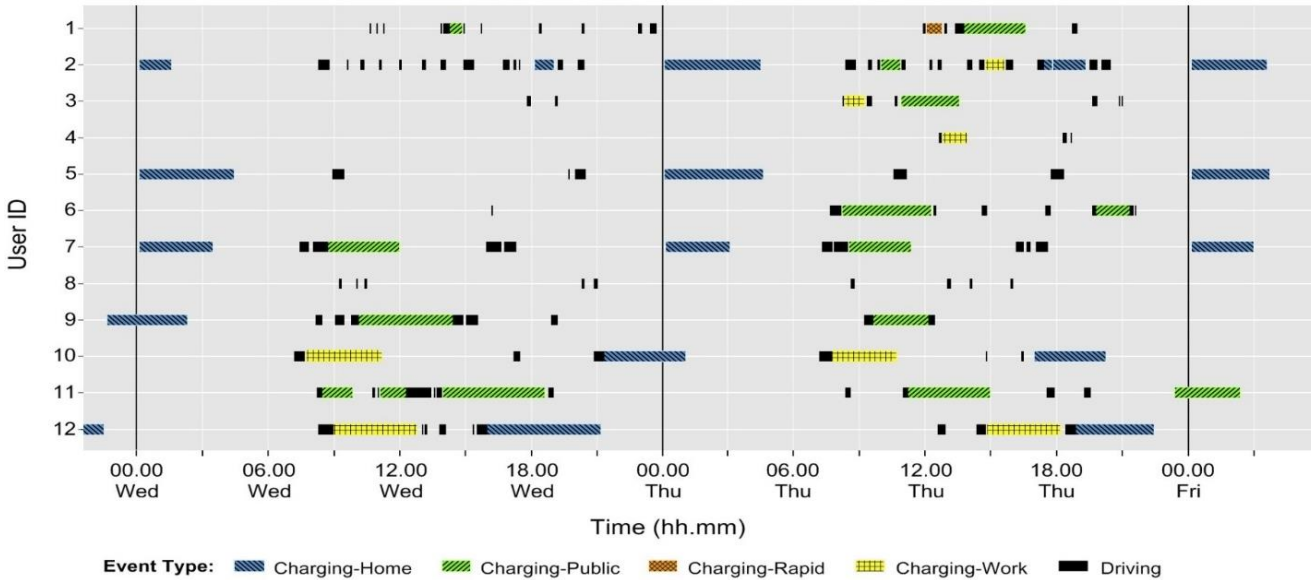
Neaimeh, 2018, [An integrated approach to planning charging infrastructure for battery electric vehicles](#)

Daily EV charging requirements 8kWh (45 km daily driving average NTS)

Average daily electricity consumption of a household-around 10.8kWh (BEIS, Energy Consumption in the UK (2016))

Spreading demand in time and in space

Charging and driving events for 12 EV users - 2 winter weekdays



Neaimeh M, Wardle R, Jenkins A, Hill GA, Lyons P, Yi J, Huebner Y, Blythe PT, Taylor P. [A probabilistic approach to combining smart meter and electric vehicle charging data to investigate distribution network impacts](#). *Applied Energy* 2015, **157**, 688-698.

- ▶ Initial demand management strategy to create diversity in charging demand.
- ▶ Case for workplace charging. More than just a top-up charging location, but help mitigate impact on networks.
- ▶ and create more demand management opportunities if the car is plugged to the electricity network most of the time
 - ▶ V2G
 - ▶ solar

The Alan Turing Institute

The national institute for data
science and artificial intelligence

The goals of the Institute:

Innovate and develop world-class research in data science and artificial intelligence

Apply our data science research to real-world problems, supporting the creation of new products, services and jobs

Train the next generation of data science and artificial intelligence leaders

Thought leadership: advising policy-makers and shaping the public conversation around data

The Institute's strategic partners and collaborators



The Institute's growing list of universities



THE UNIVERSITY
of EDINBURGH



UNIVERSITY OF
BIRMINGHAM

UNIVERSITY OF
EXETER



The University of Manchester



Queen Mary
University of London



University of
BRISTOL



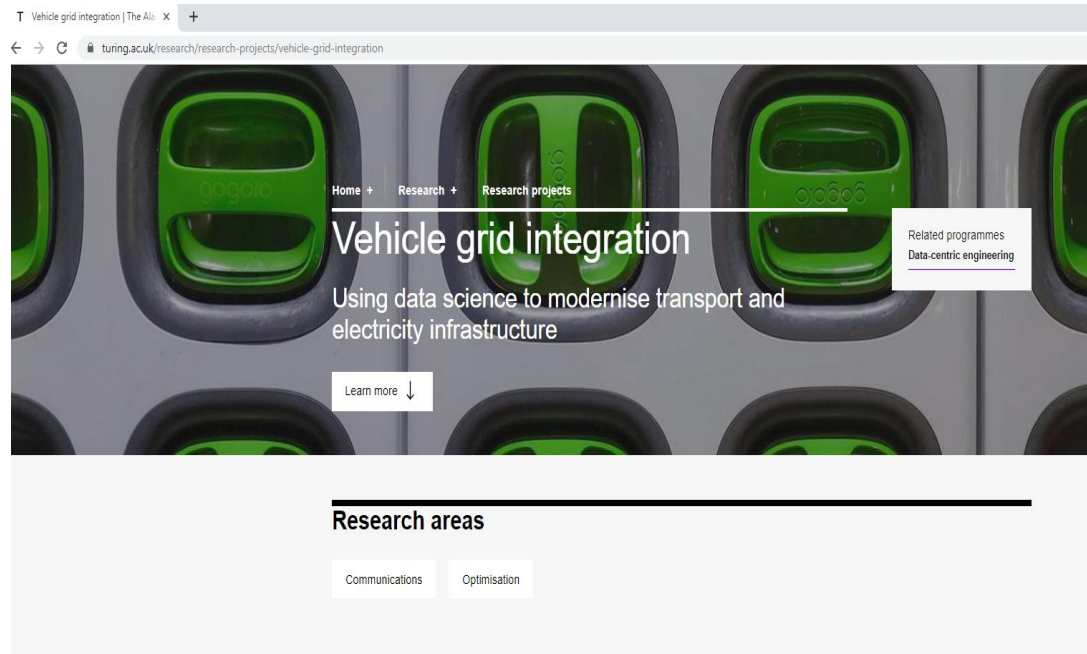
UNIVERSITY OF LEEDS



Newcastle
University
UK | Malaysia | Singapore

UNIVERSITY OF
Southampton

Turing DCE-Vehicle Grid Integration group



Apply and develop data science methods to modernise transport and electricity infrastructure.

Introduction

Electric vehicles (EVs) can break our dependence on fossil fuels in transport and energy sectors. However, mass adoption of EVs introduces significant and disruptive electricity demand to meet the charging needs of these vehicles. Vehicle grid integration strategies, underpinned by data science, ensure that electric vehicle charging infrastructure is synergistic with the electricity grid, reliable, cost effective and sustainable.

Explaining the science

Jump to

Research areas

Introduction

Explaining the science

Project aims

Applications

Organisers

Researchers

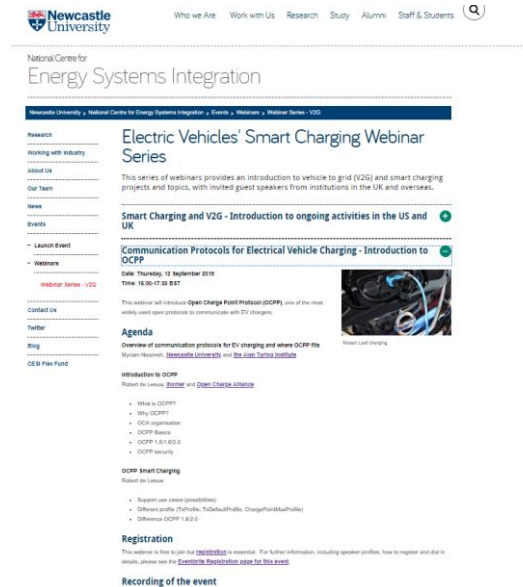
Contact info

Smart Charging and V2G Webinar Series

- ▶ Aim: Find out who is doing what on Electric Vehicle Charging Infrastructure.
- ▶ Objective: Collaborate in the development of a fit for purpose EV charging infrastructure.

<https://www.ncl.ac.uk/cesi/events/webinars/v2gwebinars/>

- ▶ Recordings and slides
- ▶ Details for future events



The screenshot shows the Newcastle University website page for the 'Smart Charging Webinar Series'. The page is titled 'National Centre for Energy Systems Integration' and 'Electric Vehicles' Smart Charging Webinar Series'. It provides an overview of the series, which aims to introduce vehicle-to-grid (V2G) and smart charging projects. The page lists two events: 'Smart Charging and V2G - Introduction to ongoing activities in the US and UK' and 'Communication Protocols for Electrical Vehicle Charging - Introduction to OCPP'. The second event is scheduled for Thursday, 12 September 2018, from 18:00-17:30 B.S.T. The page also includes an agenda, a registration section, and a recording of the event.

Upcoming events

- ▶ Robert de Leew- ihomer and Open Charge Alliance **(12th of September)**

Communication Protocols for Electrical Vehicle Charging- Introduction to OCPP

- ▶ Rolf Bienert, Technical Director- OpenADR Alliance **(2nd of October)**

Communication Protocols for Electrical Vehicle Charging- Introduction to OpenADR

- ▶ Stakeholder from California

Content TBC- California VGI roadmap; Overview of smart charging projects using open protocols

Energy storage for future mobility

All new cars and vans to be effectively zero emission by 2040.

- ▶ Available and affordable cars (battery)
- ▶ Range (battery)
- ▶ Charging infrastructure (supportive battery)

...developing the next generation battery technologies is crucial

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<https://www.turing.ac.uk/research/research-projects/vehicle-grid-integration>



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