

Agenda – Economy, Infrastructure and Skills Committee

Meeting Venue:

Committee Room 2 – Senedd

Meeting date: 29 November 2018

Meeting time: 09.15

For further information contact:

Gareth Price

Committee Clerk

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Private pre-meeting (9.15–9.30)

1 Introductions, apologies, substitutions and declarations of interest

2 Transport for Wales: Rail Franchise and Metro Scrutiny

(9.30–10.30)

(Pages 1 – 16)

James Price, Chief Executive, Transport for Wales

Alexia Course, Director of Rail Operations, Transport for Wales

Attached Documents:

EIS(5)–28–18(P1) Research Brief

Break (10.30–10.45)



Cynulliad
Cenedlaethol
Cymru

National
Assembly for
Wales

3 Policy Approach: Electric Vehicle Charging in Wales Evidence Session

(10.45–11.45)

(Pages 17 – 42)

Shea Buckland-Jones, Re-Energising Wales Project Coordinator, Institute of Welsh Affairs

Dr Liana Cipcigan, Co-Director Electric Vehicle Centre of Excellence, Cardiff University

Neil Lewis, Manager, Carmarthen Energy

Attached Documents:

EIS(5)–28–18(P2) Research Brief

EIS(5)–28–18(P3) Evidence from Institute of Welsh Affairs

EIS(5)–28–18(P4) Evidence from Cardiff University Electric Vehicle Centre of Excellence

EIS(5)–28–18(P5) Evidence from Neil Lewis, Carmarthenshire Energy

Private de-brief (11.45–12.00)

Agenda Item 2

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Agenda Item 3

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MAKING
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GWNEUD
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WELL

The Economy, Infrastructure and Skills Committee inquiry into ‘Electric vehicle charging in Wales’: Institute of Welsh Affairs’ Response

1. About the Institute of Welsh Affairs (IWA)

- 1.1.** We are the Institute of Welsh Affairs, Wales’ leading independent think tank. We challenge, inspire and drive change, making Wales a better place to live and work for everyone.
- 1.2.** We are independent of government and political parties. We bring together experience and expertise from all backgrounds to collaborate on the most important issues facing Wales.
- 1.3.** We come up with ambitious but practical and informed ideas to improve the economy, education, governance, health and social care and the media. Our vision is to create a Wales where everyone can thrive.

2. About Re-energising Wales

- 2.1.** ‘Re-energising Wales’ project is a 3 year project (April 2016-April 2019) that will deliver a plan to enable Wales to meet its projected energy demands entirely from renewable sources by 2035. Detailed information about the Re-energising Wales project is available on the IWA [website](#).
- 2.2.** Through our Re-energising Wales project we have brought together representatives from industry, regional stakeholders and academia that have an interest in the future development and transformation of the energy system in Wales. We have produced a number of evidence based studies which outline the types of actions needed in order to ensure that Wales maximises its renewable energy potential. In our response, we provide a summary of the evidence to date from our reports. We encourage the committee to consider in detail the [Re-energising Wales reports](#) we refer to in our response. Namely, the [Swansea Bay City Region: A Renewable Energy Future](#), [Building a Picture of Energy Demand in Wales](#), [A Framework for Action: Next steps for Regulatory and Policy Powers over Energy in Wales](#), and [Decarbonising Transport in Wales](#) reports.

3. Key messages

- 3.1.** Electric vehicles (EVs) can make an important contribution to decarbonisation in Wales if we are to meet climate change targets. There are a number of obstacles to EVs uptake in Wales that need to be overcome, including the higher cost of electric vehicles, the capacity of the grid and the sparsity of charging points.

- 3.2.** The IWA Re-energising Wales [Decarbonising Transport in Wales](#) report recognises the important contribution that EVs could make to decarbonisation but does not accept that they are a panacea. When analysed in the light of the Well-being of Future Generations (Wales) Act 2015, it is clear that more sustainable transport modes make a greater contribution to more of the national goals.
 - 3.3.** Wales needs to reduce its reliance on the car. Transport in Wales is dominated by the car, more than in any other region or nation in the UK, and transport accounts for [13% of Wales' emissions](#). As highlighted in our report's evidence, carbon emissions from transport are flatlining and action to date has not been effective in bringing about any meaningful reduction. Wales needs a radical new approach to transport if it is to achieve its targets as most emissions emanate from the private car. The car is a key barrier to more people using the less polluting and more sustainable modes: active travel and public transport. We were disappointed that the Welsh Government's recent [Achieving our low-carbon pathway to 2030](#) consultation document suggests allowing electric cars in bus lanes, which ultimately favours private vehicles over public transport and active travel.
 - 3.4.** Investment in EVs should be prioritised in rural areas where the absence of effective alternatives makes the use of the car essential. Yet there are also opportunities to move to shared or community ownership, reducing the number of vehicles on the roads. [Decarbonising Transport in Wales](#) sets out how actions that reduce emissions also impact on areas such as health, the economy and equalities, and makes recommendations based on achieving the maximum benefit for all of the Well-being of Future Generation Act national goals. EVs offer some health benefits by eliminating NOx, though brake and tyre particulates will still be an issue and they will have no impact on levels of physical inactivity or injuries from road traffic accidents.
 - 3.5.** Detailed analysis of transport in Wales is seriously hampered by the lack of specifically Welsh data. We believe that the Welsh Government should commission a national transport survey with a sufficiently large sample to collect high quality transport data which would allow accurate analysis down to local authority level. The first survey should be undertaken as quickly as accuracy permits.
- 4. The current charging infrastructure in Wales, and to what extent it is fit for purpose**
- 4.1.** Wales has seen a lower than average uptake of EVs. In 2017, of the 1.5 million cars registered in Wales, [around 2,500 of them were EVs](#), making up just 0.019 of the UK's 130,000 strong 'plug in' fleet.

- 4.2.** Of further concern is the deployment of EV charging points, which appears to be [lower in Wales](#) compared to the rest of the UK. Wales risk falling behind if there is not an effective plan to provide EV charging infrastructure. [According to the Committee on Climate Change](#), as of June 2017, Wales had 390 charging points, a share of 3.2% of UK charging points. This is in contrast to Scotland where there were 1,811 public charging points equating to 14.7% of total charging points in the UK. Significantly, these points had, in the main, been paid for by the UK Government. We are concerned that Wales does not access a fair share of the money that Westminster has made available for EV infrastructure. Welsh councils will need to raise awareness of the funding that is available and develop a direct relationship with the UK Government to ensure they do not miss out.
- 4.3.** There is little certainty about how the infrastructure for charging EVs will develop. According to a report by Regen, [Harnessing the Electric Vehicle Revolution](#), there has been little coordination in the early roll out of charging facilities with different companies competing to establish market leadership. There are 11 major public electric vehicle charging networks within the UK and a further 10 minor networks. The lack of standardisation between these networks creates an obvious barrier to EV adoption with consumers confused by the systems of membership payments, cards and apps.

5. How infrastructure needs to develop to support an increase in EVs on our roads

- 5.1.** EVs must be considered as part of Wales' decarbonisation plan, however we must ensure they do not obstruct the development of the more sustainable alternatives. Wales' plan should be based on the sustainable transport hierarchy and should, wherever possible, prioritise interventions at the top of the hierarchy, aiming to provide viable alternatives to the car. It is only where those alternatives, because of population sparsity, topography or journey length, are not practical that the EV should be prioritised. This is even acknowledged by the UK Government in [Making the connection: the plug-in vehicle infrastructure strategy](#). Fundamentally that means the priority area for the development of EVs should be rural Wales. EVs need to be seen much more as a solution to rural rather than urban transport problems. The Regen report, [Harnessing the Electric Vehicle Revolution](#), states: '*Commercial models are unlikely to address rural needs*'. Improvements in battery technology resulting in increased range between charges are reducing the initial concerns about taking an EV far from centres of population. There is arguably a greater potential for rural areas to devote space to local renewable energy generation. EV charging provides a great opportunity to make good use of Wales' renewable energy resources.
- 5.2.** There are practical reasons why Wales needs to ensure a proper charging network, whether private or public, is in place on its strategic road network. Wales' economy and transport system is intricately linked to the UK's

systems. If Wales is not able to cater for people coming into the country with EVs from the rest of the UK then our economy, particularly tourism, will suffer. There are significant opportunities to link rural EVs with tourism. Visitors to the Brecon Beacons National Park can already hire small electrically powered Twizy cars and recharge them at an network of locations across the park.

- 5.3. Strategic deployment of EV charging points in urban areas, where necessary, should prioritise major transport nodes, city park and ride locations and destination sites. Smart transport systems using low emission technology, integrating transport modes, harnessing data and communications, can provide the means to transform the way people and businesses utilise mobility services.
- 5.4. We are unaware of the extent to which the Welsh Government intends to reduce emission targets in the transport sector as a result of the [interim targets set](#) within the carbon budgeting process. In considering the UK Government's carbon budgets, the [Committee on Climate Change has projected](#) that total transport emissions need to fall by 44% by 2030 to meet their 5th Carbon Budget.
- 5.5. [Swansea Bay City Region: A Renewable Energy Future](#) presents a case study of the targets, challenges and actions that would be needed to achieve a radical transformation of an energy system at a regional and local level up to 2035. These insights can be applied to other Welsh regions and at a national level. In order for the SBCR to be on track to achieve the 44% transport carbon reduction referenced above, we envisaged the SBCR becoming a leading region for the reduction of vehicle emissions through:
 - the electrification of transport with 80% of new cars, and over 30% of all cars electric by 2035
 - growth and decarbonisation of public transport with 100% Ultra Low Emission Vehicles by 2035.
- 5.6. Within our scenario, by 2035, SBCR will have reached over 131,000 electric vehicles, including 110,000 cars which comprise 34% of the cars registered within the city region. The total electricity required will be 399 TWh per year. Overall, within the scenario, electric vehicles (cars, light goods vehicles, heavy goods vehicles and public transport) can deliver a carbon saving of 324,000 Mt CO₂, which equates to 30% of the current SBCR CO₂ emissions from road transport. Together with other Ultra-Low Emission Vehicle technology, such as vehicles run on biogas and hydrogen, increased use of public transport and active travel and conventional fuel efficiencies, the SBCR would be on track to achieve the 44% transport carbon reduction. This gives us an indication of the scale of the challenge to meet future emission targets. Of course, by pushing active travel and public transport whilst reducing reliance on the car,

emissions savings could be greater and the electricity generation capacity needed to power electric vehicles would be lower.

6. How the Welsh Government, private sector and third sector can work together to develop EV charging infrastructure

- 6.1.** Welsh Government has created a budget line for charging infrastructure of £2m from its own resources, yet this has not yet translated to clear coordination and planning at a national level. It can be assumed that the market will provide for EVs in some areas, as there are already privately operated charging networks. However, without proper planning, Wales runs the risk of seeing a charging network develop only where there are people wealthy enough to purchase electric vehicles and patronise the privately owned facilities. That would almost certainly mean they would predominate in urban areas, the areas most suited to the development of active travel and public transport. Welsh Government should be creating and coordinating a plan at a national level, working with the private and public sectors, to ensure Wales secures coverage of Wales with the necessary electric vehicle and hydrogen refuelling facilities that meets Wales' needs and aspirations.
- 6.2.** [*Decarbonising Transport in Wales*](#) argues that the advent of EVs and the decline of the conventionally powered car will seriously impact on Wales' economy, most notably in the automotive manufacturing sector. Wales also has specialist manufacturers of vehicle parts that simply have no future with EVs, as for example exhausts are entirely unnecessary. Added to the uncertainty caused by Brexit, there is real concern that the Wales based branches of multinational automotive companies will not receive the investment needed to adapt their plants to production for the new electric vehicles. Welsh Government should be more proactive in seeking the job opportunities available from encouraging green technology.
- 6.3.** A strategy should be in place to ensure Wales can cope with the threats and opportunities that the transition to EVs poses for Welsh industry. Welsh Government, working with the automotive industry and the trade unions, should put in place an 'Automotive Industry Task Force' to ensure that Welsh manufacturing is able to respond effectively to the threats and opportunities of the transition to electric vehicles.

7. Whether the electricity grid in Wales is able to deal with a significant increase in EV infrastructure, particularly in rural areas

- 7.1.** It is fairly well known in the energy sector that the electricity grid capacity in Wales, both in distribution and transmission, is a significant challenge. This has resulted in many new renewable generators facing costs to upgrade the system, leaving many projects unviable. The grid is squeezed across the whole of Wales and this impacts on renewable generation, storage and smart use.

Electricity grids need to be ‘future proofed’ for decarbonisation when considering electric vehicle rollout and the need for EV charging points in such areas.

- 7.2. In mid Wales, where there is significant wind resource, there is a particular grid problem with schemes being halted. Schemes have been pending the development of the mid Wales connection, a 400kV connection which could facilitate Wales in meeting its renewable energy targets. Furthermore, this grid is not only insufficient, stopping Wales generating and exporting renewable energy, it is insufficient in terms of making use of new technologies such as electric vehicles and heat pumps. This further disadvantages rural dwellers, and could potentially lead to communities becoming increasingly dependent on unaffordable ways of heating and transport
- 7.3. The Wales Act 2017 includes provisions which give a formal consultative role to the Welsh Government and National Assembly for Wales in designing renewables incentives and Ofgem strategic priorities. Welsh Government should use its convening power and strengthened relationship to engage with Ofgem, and the distribution and transmission operators serving Wales, to secure enhanced RIIO-2 outcomes for Wales. With 2019 seeing the submission of network company business plans for the 2020s to Ofgem, the Welsh Government should urgently resource a dedicated Wales Ofgem team, to support Ofgem and the network operators over the next 18 months to secure the best RIIO-2 settlement for Wales.
- 7.4. Welsh Government should be setting out Wales’ energy priorities and their expectations of Ofgem in supporting the delivery of these priorities. This would build on commitments recently made by the Cabinet Secretary for Energy, Planning and Rural Affairs to convene a future networks group, which should involve all three fuel networks (petroleum, gas and electricity supply). Having a representative from each of the Welsh regions would also enhance the ability of the future networks group to secure appropriate benefits region by region. The convened group should develop a collective understanding of a proactive grid improvement plan to future proof the grid for Wales so that it can be utilised to respond to Wales’ specific energy aspirations.
- 7.5. The pan-Wales future networks group could create a regionally engaged plan for the networks in a holistic and future proofed way, moving on from some of the historic issues of grid connectivity to a way of using RIIO-2 to give Wales the networks it requires for homes as power stations, universal fossil free vehicles re-fuelling, as well as reflecting regional priorities. Specifically, Wales needs to be clearer about what we want from the grid before network operators can be expected to plan to build it.
- 7.6. Network reinforcement will likely be needed to accommodate EV charging points. One of the key questions is who should pay for the additional electricity infrastructure. Is it fair for customers in fuel poverty who may

never own an EV to pay more on their electricity bill for grid upgrades due to EV charging infrastructure?

- 7.7. In developing strategies at a local level, there are opportunities to link EV use with the potential to generate electricity from domestic properties, with benefits for both domestic travel and electricity bills, intra-day electricity storage and climate-friendly energy efficiency domestic investments. Improved battery technology offers the possibility of using additional used EV batteries to store the locally produced energy until it is needed, and hence restricting impacts on grid usage. Advocates of EVs argue that improved storage capacity in batteries and smarter charging technologies will mitigate grid capacity problems.
 - 7.8. We need to understand how much energy we currently consume in Wales, how this energy demand will change and therefore how the grid networks could be able to adapt to changes in energy demand. Our [Building A Picture of Energy Demand in Wales](#) report data suggests that the electricity supply system for Wales needs to supply a minimum of 200 MW and a maximum of just under 2,000 MW to meet the electrical demands of the domestic sector at present. Electrifying transport across Wales could potentially be accommodated within this peak demand of 2,000 MW with controlled vehicle charging, but it is anticipated that if every house had an electric vehicle then average domestic electricity use could increase from around 10kWh per day to 15 - 20kWh per day.
- 8. To explore the potential for electric vehicles to promote behaviour change, for example in terms of vehicle ownership and car sharing initiatives**
- 8.1. For many people, EVs seem a panacea for decarbonising transport. They have the significant advantage of being the lower carbon alternative transport that is closest to the transport system we currently have in Wales. They hardly require any behaviour change on the part of the population and that alone makes them the most attractive option. For many parts of Wales, mainly rural areas where public transport is inadequate and significant improvement unlikely, the EV does offer the best, if not the only, low carbon alternative to the conventional car for longer journeys.
 - 8.2. We are aware of two community projects in Wales that are providing shared EVs. [Talybont on Usk](#) Energy Community Car sharing operate a Kangoo van/people carrier, charged by locally generated solar power, alongside a biodiesel-powered (actually recycled vegetable oil-powered) Skoda Octavia. The project is now signed up to participate in a trial of a Riversimple hydrogen-powered car.
 - 8.3. [Rev Cymru](#) is a group of four car clubs in Pembrokeshire which all use pure electric vehicles, charging with renewable energy when they can. One of their

aims is to ‘actively encourage people to let go of unnecessary vehicles in their household’. This provides an important example for the way Wales should be looking to shape the relationship with the new vehicle, away from private ownership and towards shared ownership. Changing the form of propulsion will not necessarily reduce the problems caused by the sheer numbers of cars in Wales, but changing our relationship with the car could. Wales should be encouraging a new form of ownership as an intrinsic part of the shift to EVs. Municipal car clubs can help remove the higher purchase cost of EVs and pass on the lower running costs. For many disabled people, for example, the car is their only viable form of transport. Accommodating their mobility needs following the demise of the conventional car will be vital, as is ensuring the greater cost of EVs does not make transport unaffordable for them.

8.4. Electric Bikes

The potential for promoting electric bikes in Wales should also be considered. They still have some of the health benefits of conventional bikes and make cycling in hilly areas more accessible for much of the population. They are much more affordable than electric cars, some now costing less than £1,000.

Contact details

If you have any questions or would like to discuss our response in more details please contact:

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ELECTRIC VEHICLE CENTRE OF EXCELLENCE

<https://www.cardiff.ac.uk/research/explore/research-units/electric-vehicle-centre-of-excellence>

Economy, Infrastructure and Skills Committee
National Assembly for Wales
Pierhead Street
Cardiff
CF99 1NA

Cardiff, 31 October 2018

Dear Economy, Infrastructure and Skills Committee,
Respected National Assembly for Wales members,

We are writing in our capacity as co-directors of the Electric Vehicle Centre for Excellence (EVCE) at Cardiff University, in response to your recent consultation on Electric Vehicle Charging in Wales (<http://senedd.assembly.wales/mgConsultationDisplay.aspx?ID=318>).

The EVCE (<https://www.cardiff.ac.uk/research/explore/research-units/electric-vehicle-centre-of-excellence>) combines staff from engineering, business, psychology, geography, transport studies, and more in a unique breadth and depth of skills and experience focussed on electric vehicles.

We bring together experts from Cardiff University [School of Engineering](#), [Cardiff Business School's Centre for Automotive Industry Research \(CAIR\)](#) , School of Computer Science and Informatics, School of Geography and Planning, and the [School of Psychology](#) to investigate and help address the remaining barriers to the widespread introduction of electric vehicles.

The EVCE is a core component of the Cardiff University Transport Futures Network (<https://www.cardiff.ac.uk/research/explore/research-units/transport-futures-research-network>)

This network brings in expertise in key transformative technologies such as vehicle autonomous control, user and traveller behaviours, and the modelling of transport systems.

The automotive industry is undergoing a fundamental transition. A phase of rapid technological innovation is contributing to a dissolution of traditional boundaries. Emergent technologies in electric traction, charging networks, connectivity, autonomous control, big data, and the Internet of Things is enabling the realisation of novel automobility services. The implications for vehicle manufacturers, their supply structures, and their attendant business models are profound, but uncertain. The EVCE offers a multi-disciplinary collective approach to understanding the impact of electrification on the future of mobility and the future of the industry.

Examples of previous work on themes such as electric vehicles and low carbon policy include studies for the OECD (Wells and Nieuwenhuis, 2012), the European Commission (Wells et al., 2013), and the

LCVP (Chase et al., 2016). Professor Wells is currently engaged on two relevant studies. STARS is an EU H2020 project on car sharing (typically 10% of car share fleets are electric), and ReLib funded by the EPSRC Faraday Institution to investigate EV battery recycling.

With this letter, we will briefly address the following points of your consultation.

(1) To understand the current charging infrastructure in Wales, and to what extent it is fit for purpose;

The current charging infrastructure in Wales is not yet fit for purpose. The current funding round recognises this weakness. The coverage is sporadic, the number of available points is too few. In addition, the actual number of points available is lower than first imagined due to some being technically incompatible, proprietary, or out of service. It is notable how few public destinations like museums, hospitals, schools, and courts have charge points. Major cross-country routes such as the A470 require drivers to carefully plan ahead, with insufficient security that plans will be accomplished. A case study of Cardiff urban network with EVs was presented in the paper below.

Oliyide, R., Marmaras C., Fasina E., Cipcigan L., 2017. Low carbon technologies integration in smart low voltage network. IEEE 15th International Conference on Industrial Informatics (INDIN), Emden, Germany, 24 - 26 July 2017.

(2) How the infrastructure needs to develop to support an increase in EVs on our roads. How the Welsh Government, private sector and third sector can work together to develop EV charging infrastructure;

The development of EV market is completely dependent on the parallel development of the recharging infrastructure which will result in an increase in the electricity demand.

EV drivers need a seamless system of fast-charge points to achieve 80% charge in 30 minutes to enable in-transit charging along the major road network. In addition, many more destination charge points are needed in shopping areas and supermarkets, hotels, public service venues, airports, tourism spots and related locations. Workplace destination charging would accelerate the uptake, especially fleet uses of EVs. The ratio of EVs to (valid) charge points should be taken as a guide.

Domestic charging, including that for households lacking off-road parking, is important to ensure equality of access. Innovations in this area include the use of lampposts. Mobile charging capacity is needed for rescue and recovery, and to support major events such as the Hay Book Festival. The spatial distribution of charge points needs to ensure inclusion for disadvantaged communities, and to enable rural uses of EVs.

The Welsh Government need to decide upon a viable balance between commercial and social considerations to establish and maintain a charging infrastructure. Calculation of external benefits (clean air; improved health outcomes) would assist in justifying such decisions. It is vital that future-proofing is designed into the system. A single system for access and payment would be advantageous. A good example is the Manchester GMEV network (<https://cleanairgm.com/electric-vehicles>).

- (3) **Whether the electricity grid in Wales is able to deal with a significant increase in EV infrastructure, particularly in rural areas;**

We do not have a comment on this point.

- (4) **To explore the potential for electric vehicles to promote behaviour change, for example in terms of vehicle ownership and car sharing initiatives;**

Individual perceptions of mobility needs can constrain their use of alternative transport modes. Experience from car sharing found that the perceived fit of a shared car to their lifestyle was a predictor of individuals' usage of car sharing (Kim et al., 2016; see Section 2.3.2).

Burdens of ownership include (a) the risks (obsolescence, incorrect product selection, depreciation of value) and (b) responsibilities (maintenance, repair, the full cost) associated with owning an item (Belk, 2007; Moeller & Wittkowski, 2010; Schaefers et al., 2016). For some, a desire to avoid these burdens of ownership encourages use of sharing (access-based) services as an alternative to ownership. For example, in a German population sample, a greater desire to avoid responsibility for repair, maintenance, and storage of products (Moeller and Wittkowski, 2010) was positively associated with participants' desire to rent products. These factors are even more important in the case of EVs and therefore EVs are more likely to be accepted if shared rather than owned outright. Lack of charging infrastructure has repeatedly been singled out as a key barrier to EV adoption.

Being involved in a form of car sharing is related to greater interest in other car sharing activities, for instance peer-to-peer and station-based car sharing (Prieto et al., 2017) and a greater likelihood of owning an electric or hybrid vehicle (Clewlow, 2016). While causality is unknown, these findings suggest that users of car sharing and alternative fuel vehicles (AFVs) may enter a 'virtuous circle' of alternative travel means.

Belk, R., 2007. Why not share rather than own?. *The Annals of the American Academy of Political and Social Science*, 611(1), 126–140.

Chase, A.; Wells, P. and Alberts, G. (2016) UK low-carbon automotive investment: the role of policy in the UK automotive sector renaissance, *Engineering and Technology Reference*, doi: 10.1049/etr.2015.0069: pp1-8.

Clewlow, R.R. (2016). Carsharing and sustainable travel behaviour: Results from the San Francisco Bay Area. *Transport Policy*, 51, 158–164.

Kim, J., Rasouli, S. and Timmermans, H. (2017). Satisfaction and uncertainty in car-sharing decisions: An integration of hybrid choice and random regret-based models. *Transportation Research Part A: Policy and Practice*, 95, 13–33

Moeller, S. and Wittkowski, K. (2010). The burdens of ownership: reasons for preferring renting. *Managing Service Quality: An International Journal*, 20(2), 176–191.

Prieto, M., Baltas, G. and Stan, V. (2017). Car sharing adoption intention in urban areas: What are the key sociodemographic drivers?. *Transportation Research Part A: Policy and Practice*, 101, 218–227

Wells, P. and Nieuwenhuis, P. (2012) *New Business Models for Alternative Fuel and Alternative Powertrain Vehicles: An Infrastructure Perspective*, Report for the OECD, Paris.

Wells, P.; Varma, A.; Newman, D.; Kay, D.; Gibson, G.; Beevor, J. and Skinner, I. (2013) Governmental regulation impact on producers and consumers: a longitudinal analysis of the European automotive market, *Transportation Research A: Policy and Practice*, 47, 28-41. doi: 10.1016/j.tra.2012.10.023

(5) To what extent the Welsh Government has acted upon the recommendations in the Low Carbon Vehicle Report;

In 2016 a group of experts completed “Low Carbon Vehicles” (LCV) report which was required by the Minister of Economy Science and Transport at Welsh Government. EVCE participated with three experts in that group. It was reported that sustainable transport through low carbon vehicles in Wales is offering environmental and social benefits for both urban and rural communities, promoting the economic growth and job creation. Our recommendations were based on facts. Some examples of these recommendations are:

- the Welsh Government considers installing LCV infrastructure at all its premises and encourages local authorities to do the same, making the information widely available in location, type and availability.
- the Welsh Government installs LCV infrastructure at all premises when they are undergoing major refurbishment or where new premises are being built. Local Authorities to consider installation of LCV infrastructure in changes or new road infrastructure projects across Wales, in particular transport hubs such as park and ride or major interchanges (road to train).
- any Welsh Government owned vehicle that needs to be changed is replaced with an appropriate LCV vehicle if there are no implications for health and safety; and the Welsh Government encourages local authorities to do the same.
- expert solutions are provided to help organisations across the public and private sectors improve their fleet efficiency through the adoption of LCV technologies
- the Welsh Government considers the use and usefulness of a ‘Green Bus Fund’ for the bus operators and establishing a fund to support the adoption and use of low carbon vehicle technologies for public transport.

According to recent BBC Wales Freedom of Information request not a single electric or hybrid car has been owned or leased by the Welsh Government in the last five years and all 72 vehicles it owned last year - including 12 ministerial cars - used diesel. Therefore, the facts shows that the recommendations from Low Carbon Vehicles were not implemented.

The WG has announced a £2m investment in EV charging facilities (<https://gov.wales/about/cabinet/cabinetstatements/2018/evi/?lang=en>). At present, there is no evidence for adoption of smart charging to reduce the peak burden on the electricity distribution system.

(6) Examples of best practice from Wales and further afield.

Research into charging applications and systems is underway on a global basis. Key areas of interest include integration of the EV into the domestic electricity system (e.g. Tesla Powerwall), and the use of domestic renewable energy and V2G systems for maximum economic efficiency. In terms of charge point locations the use of lampposts has been taken up by some local authorities (char.gy has just started work in London).

Innovate UK project “Ebbs and Flows Energy Systems” - Propose and demonstrate new balancing services: Demand Side Response from Electric Vehicles and storage (V2G) facilitated by Virtual Power Plant

<http://www.cardiff.ac.uk/news/view/757939-installation-of-the-uks-first-domestic-vehicle-to-grid-unit-for-energy-storage>

<http://www.cenex.co.uk/news/cenex-leading-installation-uks-first-domestic-vehicle-grid-unit/>

Our e-Bridge project (<http://www.ebridge-project.eu/en/>) also explored the potential of introducing EVs in fleets, pioneered in 7 sites across Europe and the UK; one of our findings also supported the need for charging infrastructure and shared ownership as ways forward for electric automobility (a sample video from this project here: <https://www.youtube.com/watch?v=ayMhT4f9oiU>)

With this short document, we aimed to provide you with an overview of our knowledge base and activity at EVCE, as well as pointers to specific aspects of your consultation.

Please do not hesitate to contact us for further information.

Dr. Neil Lewis,

Manager, Carmarthenshire Energy Ltd.

EV Consultation.

IMMEDIATE NEEDS

- Pairs of rapid chargers + 1 Fast charger at 40 mile intervals on trunk routes/major A-roads.
- Allow full, stress-free access East-West and North-South.
- Pairs of Fast-chargers at every town car park.
- Fast chargers at destinations-Beaches, Castles etc (Not just Tesla)
- Must be income generators. Contactless card payments.
- Fully policed to prevent ICEing and EVs just parking.

LONGER TERM

- Plug-ins account for 5% of sales. Diesel dive-Bombing!
- A million EVs in the UK by 2020!
- Lamppost chargers standard in urban landscape.
- Pairs of Fast chargers are now banks of 20-40+
- Rapids proliferate on a commercial basis.
- Role of Public bodies diminished.
- Wales to embrace the revolution in decarbonised transport!