Q - How will increased uptake of electric vehicles, to meet the Government's 2040 target to end the sale of new diesel and petrol cars, affect the electricity grid? What action is needed to manage impacts, and to make the most of opportunities afforded by vehicle-to-grid technologies?

**RESPONSE**

We broadly welcome plans to phase out diesel and petrol vehicles, due to their effect on air quality and carbon emissions. Electric vehicles have the potential to support a transition to cleaner transport modes, however we would stress this should be considered as part of a whole system approach.

**Electricity grid:** there is a strong and wide-ranging consensus that the adoption of electric vehicles could put significant pressure on the electricity grid, both locally and nationally, and both technically (e.g. grid stability, availability at times of peak demand). In addition, and when considered alongside the development of household battery storage and small-scale generation, they could disrupt current models of revenue generation for energy companies (which are typically based on charging per kWh used) and therefore require new financing models (e.g. based on availability).

We would suggest the following points:

- Electric vehicles require a change in thinking and a more coordinated approach between the transport and built environment sectors. The implications for how buildings, neighbourhoods and cities are planned need to be considered, including the technical, safety and financial implications of integrating charging points and batteries within individual homes.

- A small number of pilots have been announced into smart charging points allowing the network operator to control the timing of vehicle charging, with rewards for consumers adopting this option. We would expect the barriers not to be solely technical, but also related to consumer attitudes, and we would recommend research into this as well as into the technical and financial aspects. The very large majority of existing charging points do not have this “smart” capacity. Subject to positive trials, this could be required of all new charging points. EVs represent a significant change for consumers, and it is important that pilots address issues of consumer acceptability.

- The public sector should lead by example and commit to an early phasing-out of petrol and diesel vehicles. This could contribute to consumer awareness, while offering early feedback and driving commercial development. Early public sector commitment has the potential to drive investment and wider uptake.

- Research should be done into potential early adopters, for example construction sites: non-road vehicles and equipment can significantly contribute to noise and air pollution in urban areas, and a switch to electric or hybrid models could therefore bring significant benefits; they are typically un-used at night, therefore being able to be charged at night of low demand. Incentives should researched in order not to burden the sector.

- As a chartered engineering institution we generally encourage government policies to be technology-agnostic and focus instead on desired outcomes (e.g. air quality, carbon emissions). This applies to this consultation, as we are aware of several options in battery development (i.e. solid state as well as the currently more common lithium options), and other types of vehicles (e.g. fuel cell-based).

**Whole system approach:** the complexity of the challenges and the inter-relation between transport, built environment, electricity and heat infrastructure make a whole system approach crucial. This also represents an opportunity for the UK to demonstrate leadership in multi-disciplinary long-term approaches:

- We strongly recommend a broader and comprehensive strategy to reduce vehicle transport, especially single vehicle trips. This should include better and more attractive walking and cycling infrastructure, starting with how we plan our built environment, how safe and attractive our streets are to cycling and walking, and where new development is located in relation to cycling, walking, and
public transport infrastructure. We would draw attention to the fact that a very large proportion of trips in the UK are short and could be displaced by walking and cycling – (“in 2014, 56% of car driver trips were under 5 miles” [source]). In addition to carbon and air pollution benefits, this could reduce congestion and noise and improve physical activity levels, with a wide range of associated health and wellbeing benefits.

- Links between the development of electric vehicles with autonomous vehicles and with the shared economy should be explored: car pool models could bring benefits by reducing the number of vehicles (i.e. more space recovered from un-required parking, less use of natural resources in manufacture); they could also, as a managed fleet, offer better control over the location and timing of charging. We would encourage research and pilots into these models, including technological development as well non-technical barriers such as consumer attitudes and behaviour change. It is important that developments in relation to charging of EVs are taken forward as far as possible without compromising the development of AVs.

- Options should be reviewed as part of the whole energy system, including options for heat decarbonisation. Could battery charging be used to stabilize the electricity grid at times of excess renewables generation, or would this excess be better used to generate hydrogen for use in fuel cells or injection into the gas grid? Our understanding of the consensus at this stage is that a single solution is unlikely to meet the challenges of air quality, carbon emissions, energy affordability, and reliability, and a combination of approaches will be required.

We are aware of large R&D efforts in Europe in this area, including EU-funded research as well as private enterprises. We would encourage continued engagement and collaboration with European partners after April 2019.

Q - How do charging infrastructure requirements differ for alternative types of vehicle, journey, and user (including fleets)?

**RESPONSE**

Charging for those undertaking longer journeys beyond the range of a single charge may be an issue for consumer acceptance.

Q - How should new infrastructure for electric vehicles and associated grid reinforcements be sustainably funded?

**RESPONSE**

The planning process currently offers some opportunities, which currently contribute to a small provision of new charging points. This could potentially be used more extensively, either by requesting more charging points on new developments or via S106 contributions, which are subject to broader viability assessments and should not therefore place undue burdens on development.

However, if EVs are to become ubiquitous, there is a need for a firmer driver for widespread provision of EV charging points. With a higher level of demand prices for charging stations will be reduced. There may also be advantages to scaling the provision of charging infrastructure so that whole streets or areas are provided with charging. Some stimulus for the market is required.

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