

## Ref: Plan for a Smart, Flexible Energy System – A call for evidence

### Additional response from Innovate UK to questions 33 and 34

#### **Q33 How might Government and industry best engage electric vehicle users to promote smart charging for system benefits?**

**Interoperability standards** – Government should support the development of common standards and basic interoperability for charging infrastructure to ensure the best possible end user experience, maximum consumer (EV user) choice and as much freedom as possible for vehicle users to behave as they wish, whilst simultaneously making them aware of the cost saving opportunities and potential costs incurred by them related to their actions.

**Encouraging diversity of offerings** - Passenger cars whether used in a personal or business context are driven and used by an enormously diverse range of user types and in an enormously diverse range of circumstances. They represent very diverse lifestyles, diverse practical needs, and therefore very diverse preferences in a domain where users are used to significant levels of personal choice and freedom. Therefore regarding how a plugin vehicle might be controlled or influenced government should encourage the development of diversity of customer engagement offerings and choices, give maximum freedom to innovators in the sector to deliver this, and avoiding picking winners or “one size fits all” solutions.

#### **Q34 What barriers are there for vehicle electricity system participants (e.g. vehicle manufacturers, aggregators, energy suppliers, network and system operators) to develop consumer propositions for control or shifting of electricity consumption during vehicle charging or utilisation of an electric vehicle battery for putting electricity back into homes, businesses or networks?**

**Creating joined up user experiences** - Developing intuitive connected (joined up/seamless) and holistic experiences for vehicle users that form the basis for positive and engaging relationships between them and the needs of the grid, needs of other plugin users, availability of both charge infrastructure and network capacity. This is difficult in the current climate where the number of vehicles on the road is still quite modest (and so not a big commercial market), charge infrastructure is often dumb or often with limited intelligence/connectivity, charge networks are fragmented commercially and in terms of standards, and energy markets are not yet in a state where revenue stacking is easy.

**OEM confidence** - there are confidence issues amongst some of the automotive OEMs of “giving control” of their customers vehicle batteries to third parties such as demand response providers or network operators. This is likely to be driven by the two factors

- risks perceived by OEMs that potential “erosion of the driver user experience” of using “their products” such as a grid control action resulting in an unexpected or unwanted vehicle range limitation, and
- the perceived effects of grid support on battery life through additional battery cycling

**Reliability of public charge infrastructure** - public charging infrastructure has a poor reputation from a hardware reliability and availability point of view (either hardware chargers being out of order, or chargers not behaving as they should) with frequent case evidence and commentary on this on social media and web forums to support this observation. If this continues to be the case it could represent a barrier to the take up of grid support services by plugin users i.e. if trust levels or reputation levels of public charge equipment remain low, it will discourage vehicle users from giving over **MORE** control to such equipment

**Low power/cost V2G hardware availability** - the cost of vehicle-to-grid chargers is prohibitively expensive (£10k+) and extremely bulky requiring 3 phase connection and often with civils work to install. There are no products that are physically suitable for home use (where the majority of charging currently takes place and is expected to continue as such), or other low power charging locations such as at low impact street furniture level. As the V2G market is not developed and production volumes are very low, current V2G charger units are integrated with high power/rapid chargers to fit a “low volume/high price/high margin” entry market. There is therefore currently no market for low cost, compact, lower power V2G chargers which would be needed for wide scale rollout of new business models to support. It is very much a chicken and egg scenario that would benefit from government support in market seeding.

**V2G hardware design challenges** – there are significant design challenges in developing low cost/compact/low power V2G chargers for applications such as domestic or street furniture, because of a combination of the rigours of the grid code (G59) combined and the significant additional power electronics to build in “to-grid” functionality and divest waste heat when in use. From discussions we have had with relevant experts in the sector we feel a commercially attractive design

target would be a 3kW V2G capable charger with an retail cost of no more than £500 above the cost of conventional low power charger. This is a challenging target, but one that may be achievable with innovation support and the right design approaches.

**Sharing hardware costs and DC connectivity with local distributed generation** - There is a techno-economic opportunity to design both small scale renewables (principally PV) and plugin vehicle charging systems so that they can be linked in a locality using a shared DC interface or power bus. This would enable both PV and vehicle to share the same DC-to-AC inverter hardware and so save on the investment cost to achieve V2G in that installation. We do not believe the current MCS accreditation scheme for domestic and non-domestic renewables allows for this type of arrangement. Additionally, Innovate UK only knows of one innovation project developing technology in this area, in one specific niche technical trial. Greater flexibility in approaches allowable by the MCS system would stimulate this sector as would additional innovation funding support.

**Encouraging retro-fit of V2G in existing locations** - As of October 2016 there were approx fewer than 10 V2G charging points installed in the UK amongst a population of approx 11,750 charging points currently installed. Innovate UK would expect that at the point of installation of non-V2G chargers there is currently

- no assessment made as to whether the grid connection is suitable for V2G capabilities at a later date, and
- that there are no provisions encouraged to do so.

If such assessments and data were gathered during point of fit of standard charging points, and any necessary simple provisions made at the time of installation encouraged (e.g. additional inverter space, appropriate cutouts) this could

- cumulatively provide a database of sites for potential subsequent easy conversion to V2G and
- provide a "V2G ready" status for a charge point site

These actions could help :

- raise vehicle user and charge point owner awareness of the V2G opportunities as business models and suitable hardware emerge, and
- enable easier subsequent conversion and roll out of V2G chargers

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