



energy
taskforce

Work Package Two:

Engaging EV Users in Smart Charging and Energy Services




Office for
Low Emission
Vehicles

CATAPULT
Energy Systems

LowC^{VP}
Low Carbon Vehicle Partnership

Contents

1. Introduction	4
2. Executive Summary	6
– Enabling informed decision making	7
– Delivering a good user experience for EV charging	7
– Protecting the consumer	8
3. Context of Work Package 2	9
– Aims and objectives of Work Package 2	10
– Scope of work	10
– Methodology	11
– Key assumptions	11
4. Ensuring a Good Customer Journey	13
– 1. Awareness / research	14
– 2. Choose / buy	17
– 3. Install	22
– 4. Charging	23
– 5. Switching providers	28
– 6. Obtaining redress	30
5. Further Considerations	33
– Using the smart meter infrastructure as the communication system for smart chargers	34
– Engaging with depot-based fleets, dispersed fleets and owner operators	35
– Vehicle to Grid and other EV services	37
6. Conclusion	39
References	41

1

Introduction



Introduction

The Electric Vehicle Energy Taskforce [1] was set up to address a range of questions related to meeting the demands of the wide scale adoption of Electric vehicles (EV) on the electrical networks. The Electric Vehicle Energy Taskforce established four Work Packages to consider the following issues;

- **Work Package 1** - A common strategic understanding of the requirements of the energy system to support mass EV uptake.
- **Work Package 2** - Engaging EV Users in Smart Charging and Energy Services
- **Work Package 3** - Smart Charging Technical Requirements
- **Work Package 4** - Accessible Data for Decision Making

Work Package 2 looked at how to engage users with smart charging and electric vehicle (EV) services. The methodology, findings and Recommendations of Work Package 2 are outlined in this report.

Work Package 2 participants

Work Package 2 was fortunate to have had input from a wide array of stakeholders, as part of the six-weekly meetings, as topic leads, and through interviews and stakeholder workshops.

- Work package leader: Joseph Cosier, Energy UK
- Work package sponsor: Professor Jillian Anable, University of Leeds (Institute for Transport Studies)

Topic leads:

- The British Vehicle Rental and Leasing Association (BVRLA)
- ChargePoint
- Citizens Advice
- Scottish and Southern Electricity Networks (SSEN)
- Shell

The organisations represented at the Work Package 2 six weekly meetings (in addition to the topic leads) were: Lex Autolease, British Electrotechnical and Allied Manufacturers' Association (BEAMA), BMW UK, British Gas, BT, Energy Saving Trust, Energy Systems Catapult, ev.energy, Geo, Imperial College London, Kaluza, National Grid ESO, National Grid Electricity Transmission, Npower, OVO Energy, PodPoint, RAC Foundation, Renewable Energy Consumer Code (RECC), Smart Energy GB, Tesla, Western Power Distribution (WPD), Zenith, Zenobe.

Additional organisations that fed into Work Package 2 through workshops or interviews were: Centrica, EDF Energy, Engenie, EV Driver, Gemserv, Greater London Authority (GLA), Nissan, Ofgem, Renewable Energy Association (REA), UK Power Networks (UKPN).

2

Executive Summary

Executive Summary

This report outlines a set of concrete and ambitious recommendations, with wide industry backing, to deliver a good user experience for smart charging and EV services and meet the following outcome: “Consumers should be empowered to make informed decisions about EVs and EV charging, feel confident that they will be treated fairly, and be able to easily navigate the market.”

Enabling informed decision making

To encourage consumer action and mass uptake of smart charging offers, consumers need to be empowered and able to make an informed decision.

Individual companies will play a strong role in informing and educating consumers about EVs and smart charging – each with their own perspective and motivations to incentivise the behaviour change.

However, information given to consumers cuts across different industries, companies and consumer touchpoints. For example, a consumer may learn about smart charging from a car manufacturer, dealership, energy supplier or chargepoint operator. The risk here is that there is no consistency in what information people receive and at what junctures; if delivered poorly, this can lead at best to misunderstanding and at worst to misinformation. At the moment, misinformation is one of the most common reasons people contact Citizens Advice in relation to EVs.

It will be important that consumers can access good quality, trustworthy information throughout the decision-making process, including at the point of sale. Work Package 2 has therefore put forward three recommendations to support consumer decision-making and promote smart charging:

Recommendation 1: An independent body to campaign for the benefits of smart charging

Recommendation 2: Government to fund an independent advice service for EVs and smart charging

Recommendation 3: Industry to establish best practice standards for point of sale information

Delivering a good user experience for EV charging

Ensuring that public EV charging infrastructure is effectively developed, operated and maintained is important to growing public confidence and trust in EVs. Poorly maintained and operated chargepoints create the risk of delivering a poor charging experience for EV users and adversely impacting public perception and uptake. Competition is increasingly driving better customer experiences and standards however more can be done to improve the user experience, including on data availability, ease of use and maintenance responsibilities.

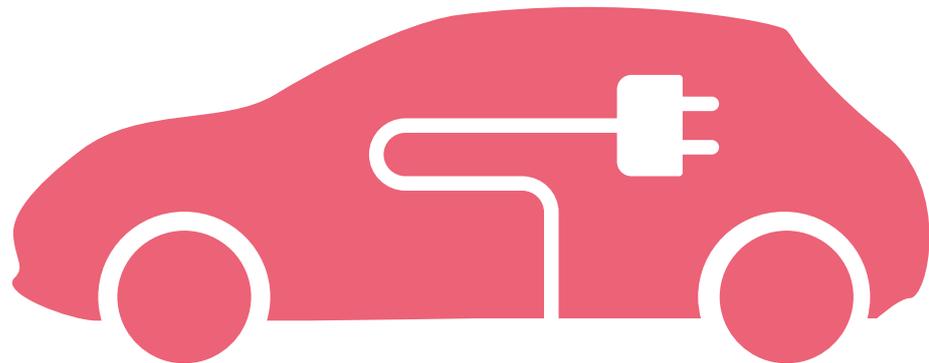
Recommendation 4: Making chargepoint data open and available for consumer and system benefits

Recommendation 5: Industry to deliver roaming services for a seamless EV charging experience everywhere

Recommendation 6: Provide guidance to local authorities to drive up standards in public charging infrastructure

Within the home, smart charging offers customers new tariff propositions and control. The energy system can also benefit through building fewer network and generation assets. Smart charging can deliver grid flexibility, reduced renewables curtailment, energy trading benefits and reduced network costs. Given the savings to the user and the reduced network costs smart charging can deliver, smart charging should be installed as standard, with the option to opt-out, based on customer preference.

Recommendation 7: Asking consumers to opt out of smart charging rather than opt in



Protecting the consumer

Key to a successful mass uptake in EVs will be providing robust consumer protections. Embedding consumer protection into smart charging from the outset must be a priority for policy makers and industry alike. Whilst there are existing protections covering the automotive and energy sectors the changing nature of EV services raises new questions and challenges, which need to be tackled head-on.

The bundling of home energy, public charging and vehicle services as well as the range of actors involved in the customer journey creates complex interdependencies within service provision. In such circumstances, users need to be confident that there are robust protections in place, that any problems will be resolved quickly and fairly, that their data is safeguarded and that their EV can charge as expected without putting the rest of the energy system at risk.

Work Package 2 has developed four recommendations, covering both the normal operation of smart charging and potential emergency scenarios. We expect competition and innovation to be crucial in finding the most appealing propositions, but the potential movement of the market makes it difficult to detail specific consumer protection. Much of what has been considered therefore requires ongoing examination as markets develop and consumers are exposed to a variety of practice.

Recommendation 8: Ofgem and industry to develop governance arrangements for acceptable instances of curtailment of EV charging in emergency circumstances

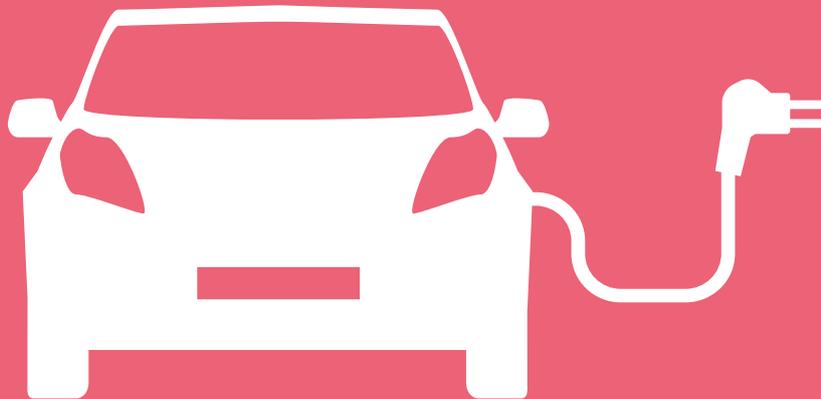
Recommendation 9: Government and Ofgem to introduce a data access and privacy framework for the EV sector

Recommendation 10: Industry to adopt common complaint handling standards across the EV sector

Recommendation 11: Government and Ofgem to undertake a full review of customer protections for EV drivers

3

Context of Work Package 2



Context of Work Package 2

Aims and objectives of Work Package 2.

Work Package 2 is one of four work packages of the Electric Vehicle Energy Taskforce. It considers the education, enablement and engagement of EV users to participate in smart charging, aiming to provide a perspective on the following:

- How best to deliver consumer engagement with smart charging?
- Adapting the energy system to engage EV users and the opportunities that might arise from this.

In particular, Work Package 2 was asked to consider the following questions:

- 1 How can the EV user be engaged to maximise the benefits and minimise the negative impact on the electricity system of the growth in EVs (e.g. through mechanisms that utilise price signals for shifting demand or procuring flexibility, including vehicle to grid (V2G)) in the short, medium and longer term?
 - i. What does a good end-user experience look like?
 - ii. What is the most effective way of educating consumers about EV smart charging and who would be the best at doing this? How do we reduce the amount of technical knowledge needed by the consumer to participate in smart charging?
 - iii. Could the 'green credentials' of smart charging (i.e. charging at times when more generation is from renewables) be similarly powerful to the consumer as price signals? If so, how can this be best utilised?
- 2 What happens if not enough EV users participate in smart charging? Should it ever be made mandatory or are there other options?
- 3 How much do consumers need to be protected from being locked-in to specific companies or products (e.g. do we need to require that chargepoints can switch operator companies)?
- 4 What are the roles and responsibilities of parties involved in the installation and operation of smart EV chargepoints and services, particularly in relation to the consumer (e.g. data breach)?
- 5 What are the potential benefits or disadvantages to the EV user of using the smart meter infrastructure as the communications system for smart chargers?
- 6 How will depot-based fleets, dispersed fleets and owner operators of EVs differ in their engagement with smart charging?
- 7 What other consumer benefits could or should be built into smart charging? V2G would be one, but are there others?

Scope of work

In scope:

- Engaging EV users with smart charging.
- Educating EV users and ensuring customers can make informed decisions.
- Organisations and bodies that play a part in the smart charging user experience, in particular their roles and responsibilities.
- The customer journey, including identifying what a good user experience / customer outcome is.
- Customer protection issues.
- The potential consumer benefits of using the smart meter communications system for smart charging.
- The potential benefits of other EV energy services, such as vehicle to grid, vehicle to home or peer-to-peer trading.

Out of scope:

- Specifying or providing recommendations on the absolute level of EV charging costs. However, relative costs and price premiums for ad hoc access are considered.
- Identifying or testing the viability / attractiveness of future EV business models.
- The technical aspects of the follow are not considered unless – and then only insofar as – they impact the customer experience:
 - Using the smart meter communications infrastructure for smart charging,
 - Mandatory smart charging,
 - Smart charging standards for EV chargepoints, and
 - V2G or how it is implemented.

Methodology

Work Package 2 was led by Energy UK, supported by Jillian Anable from University of Leeds Institute for Transport Studies (ITS).

To seek to answer the seven key questions above and provide insight on the education, enablement and engagement of EV users with smart charging, the questions and work of Work Package 2 were divided into four key topic areas: communicating the benefits of smart charging; customer acceptance of mandatory charging; the user experience and customer protections; and engaging fleets with smart charging.

Each topic area was led by a 'topic leader' who was in turn supported by a 'drafting group' of experts. The topic leaders – supported by their drafting groups – were tasked with developing responses to their respective questions which were then presented and reviewed by a wider group of industry stakeholders at six-weekly meetings.

These six-weekly meetings ran from October 2018 to August 2019 and included a wide range of industry stakeholders, covering the energy and automotive sectors, technology companies, chargepoint operators, consumer bodies, research bodies, and universities. A list of the organisations represented in these meetings and that fed into the work can be found in the appendix.

The approach taken to develop recommendations and answers to the seven Work Package 2 questions varied across the topic areas and included:

- Stakeholder workshops, including customer journey and function mapping,
- Teleconference calls and face-to-face meetings among the drafting groups,
- Qualitative interviews with industry stakeholders,
- Literature reviews, and
- Stakeholder surveys.

The findings and conclusions of Work Package 2 were then integrated with those of the other work packages to create a joint set of proposals, as outlined in the Electric Vehicle Energy Taskforce's Main Report.

Key assumptions

- All homes and businesses will be offered a smart meter by 2020.
- Half-hourly pricing for domestic electricity customers will be introduced.
- Ofgem will consult on locational pricing.
- The role of a Distribution System Operator will be created to actively manage local distribution networks.
- The number of times of use tariffs offered to the market will increase.
- The Office for Low Emission Vehicles (OLEV) will consult on and mandate that all chargepoints have smart functionality in 2019/20 which will not extend to existing chargepoints or three-pin plugs.
- It will remain possible to switch energy suppliers with all chargepoint models and retain its full functionality, unless explicitly specified in the contractual terms.
- It will no longer be possible to buy a pure internal combustion engine vehicle from 2040 and 2032 in Scotland, and this date could be bought forward further.
- EV uptake will be at least as fast as the trajectory outlined in the Road to Zero and could be faster.
- Mainstream EV adopters may not behave in the same way as current EV users, who are by definition innovators or early adopters.
- There will be a greater choice of EV models over the coming years.
- Waiting times for EVs will reduce as EV supply chains catch up with demand.
- The upfront cost of an EV will drop and reach parity with ICE vehicles before 2030.
- The most common / attractive customer offerings of today will not necessarily be the common customer offerings in the future.
- There may be a variety of business models in the EV charging market, which may be significantly different to those in today's market. These will be determined by market forces and customer preferences.
- The current dominant providers of EV and energy services will not necessarily be the most important players in the future.

With the EV sector in its infancy there is considerable uncertainty around the customer offerings that will be brought to market, the business models that will underpin these offerings and who will provide them. There is further uncertainty around where EV charging takes place and whether vehicle ownership levels change significantly. Work Package 2 has expressly avoided trying to pre-empt these variables, instead it focused on making recommendations that are applicable with a range of viable future outcomes.



4

Ensuring a Good Customer Journey



Ensuring a Good Consumer Journey

A customer mapping exercise was undertaken at the start of Work Package 2 whereby the current customer journey was identified and contrasted to an ideal customer journey. Six steps were identified as part of this journey: awareness / research; choosing and buying; installation; charging; switching; and, consumer redress.

The findings of Work Package 2 have been laid out according to this structure. Key recommendations to deliver improved customer outcomes have been included where there was consensus within Work Package 2, along with the rationale for intervention.

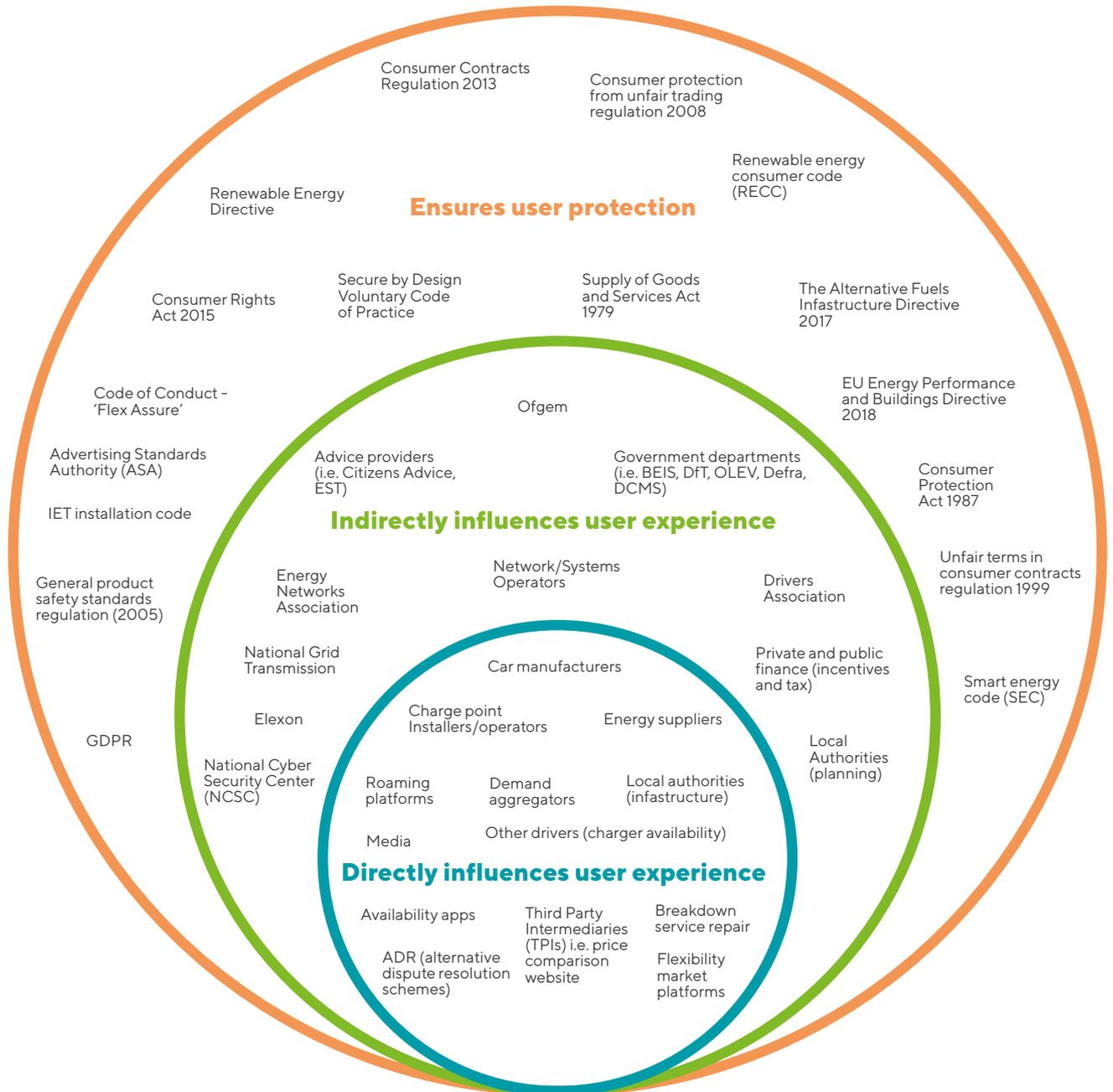
1 – Awareness / research

The arrival of plug-in battery electric road vehicles marks a significant change from the fossil-fuelled world of motoring with which we are familiar. To refuel a petrol or diesel car we go to a refuelling station where our choice of options is limited, and we pay a per-litre price for fuel which is generally displayed on a large sign at the front of the fuelling station forecourt. In its way this is a 'closed' system, quite different to the world of electricity supply, provided for multiple uses, domestic and industrial, and paid for under contract, and generally in arrears.

This raises both challenges and opportunities - it means there are many touchpoints where users can go to find out about the various aspects of EVs and EV charging, which is good if they are all easily accessible, accurate and readily understood. The downside is that the prospective EV owner needs to find out more before they get started, including the different requirements and capabilities of different vehicles, the options for installing domestic chargers, the nature of public on- and off-street chargers and the many payment packages on offer via smartphone apps. Choosing an EV is currently perceived as being more complicated and riskier by consumers, who are concerned about the accuracy and quality of the advice they are receiving [2].

Whilst a range of organisations could play a role in educating prospective users about smart charging (as seen in the figure below), few organisations have an obligation to do so. Even those with an obligation to educate consumers (like energy suppliers) risk not being able to do so in a timely manner, if they are unaware of an EV purchase. Many organisations might play a role in informing and advising users about smart charging, at the point of enquiry.

The following organisations and protections were identified as influencing the user experience of smart charging:



The risk here is that information given to consumers could cut across different industries, companies and consumer touchpoints. For example, you may learn about smart charging from a car manufacturer, dealership, energy supplier or charge point operator. As a result, there risks being a high degree of variability in the information, advice and support given, and much of the information offered to consumers in the form of support and advice could contain within it marketing and sales messaging which is not designed to inform the consumer.

Promoting the benefits of smart charging

Introduction to smart charging concepts at the earliest opportunity will increase the likelihood of smart charging participation.

Not all users want or seek to find complete information before purchasing products. Nor can all users digest that volume of information in one go. However, all users should have access to information, whether from the auto or electricity industry or from independent, impartial sources, such as OLEV, which can help them make well-informed decisions in their best interest. Information should be available at regular and relevant touchpoints both to encourage engagement and to protect consumers from bad outcomes.

It is suggested that a multi-organisation, ongoing consumer information campaign supported by government as the provider of the overarching nudge and key motivator, with the industry campaigns galvanised around it, could be an effective way of educating consumers about smart charging.

Recommendation 1: The Taskforce proposes that an ongoing and proactive campaign be undertaken to promote the benefits of smart charging to the public. An existing independent organisation could be given this task, or a new consumer-facing body established.

- An independent body should be appointed to lead consumer-facing communications activity;
- The focus of this body should be on promoting the benefits of smart charging to consumers, myth and jargon busting and providing marketing tools that can be used and adapted by the private sector;
- It should also undertake ongoing market research to ensure that messaging and content is aligned with users' motivations to participate in smart charging, rather than based on assumptions of what drives behaviour;
- A new body could be created or the remit of an existing body or campaign (e.g. Go Ultra Low, Smart Energy GB, Citizens Advice, Energy Saving Trust) could be extended;
- Government should coordinate the implementation of the recommendation, passing on responsibility for the campaign and research activities once the body is in place; and
- The work should be undertaken in parallel with the implementation of Work Package 2 Recommendation 2, meaning that an organisation should be appointed and an independent body set up by the end of 2021/start of 2022. The launch of the campaign, however, should be in line with market availability of smart charging offerings and be kept open for review, to ensure that EV drivers are able to meaningfully act on the messaging.



2 – Choose / buy

In addition to general awareness raising, there is a broader requirement to ensure that consumers have sufficient information specific to their need to make informed decisions about EVs and charging options. The relative complexity involved in choosing which smart charging offer or EV service to engage with could be a barrier for new consumers. For example, as of September 2018 the number of EV tariffs on the market for home charging was relatively low, making comparisons wasn't easy, with few being available on price comparison websites[3].

During stakeholder interviews, many saw ease of comparability for charging solutions as crucial for consumers to make informed decisions about their service options, and that the role of intermediaries would be crucial in this. Although the market is changing rapidly with, for instance, Rightcharge [4] recently launching a comparison website for EV chargers, there is currently a lack of independent information for those contemplating installing a home charger eager to understand the different costs, capabilities and designs.

Providing a trusted source of impartial help and information

A collaborative, cross sectoral and government endorsed campaign, as suggested under Work Package 2 Recommendation 1, would present the best opportunity to maximise consumer engagement and smart charging uptake. However, it is important to recognise that not all consumers are equally empowered when they receive the same information. Complementing this proactive information campaign, the Work Package 2 proposes that an independent advice service be created to provide expert, personalised advice to consumers relating to smart charging and EVs. Impartial, consistent and independent information and advice will stimulate consumer confidence and will help to support marketing activity undertaken by the private sector.

Industry led marketing and sales activity will be crucial for informing, educating and advising consumers on specific products and services however, impartial consumer advice will be critical to provide support as the market matures. Independent advice will support consumers in their decision-making process, ensuring they can confidently make informed decisions on the products and services that are best suited to their needs.

Government may not be well positioned, or find it agreeable, to provide direct and impartial guidance but independent organisations exist who are well placed to provide supplier and equipment agnostic consumer advice on the government's behalf. Where directed, independent organisations should work with industry to research and identify effective messages and mechanisms for engaging with users on smart charging and related aspects. Such collaboration presents an opportunity to develop a holistic, market wide 'whole-system', and consumer focussed approach.

Recommendation 2: The Taskforce proposes that Government fund the provision of an independent, tailored advice and information service on smart charging and EVs

- An advice service with a remit of providing impartial and tailored advice to consumers on smart charging and EVs should be appointed by Government;
- To ensure that this advice service is seen as being independent and impartial, it must be delivered by an organisation that has no commercial interest. To achieve this, the advice service must be Government funded rather than funded by industry;
- The provider must be a trusted and impartial body with the expertise to deliver comprehensive and accurate information and advice in one easy to find location – a so-called 'one stop shop';
- The advice service will complement the activity of the body for consumer facing communications – outlined under Work Package 2 Recommendation 1 – by providing advice and information tailored to the consumer's individual circumstances. The body charged with delivering advice could also be tasked with providing the proactive consumer facing communications on smart charging if it had the relevant expertise or the two functions could be performed by separate bodies; and
- Government should procure the advice service through a competitive tendering process subject to the criteria above.
- The Electric Vehicle Energy Taskforce proposes that scoping work and engagement with industry and potential suppliers begin in 2020, the tender process be launched in 2021 with a view to appointing a provider by the end of 2021 / start of 2022.

Informing consumers about EVs and smart charging products and services

The EV point-of-sale is a vital part of informing consumers of charging options and the purchase of a vehicle is likely to be closely linked by the consumer to having a viable charging solution in place. In stakeholder workshops there were a series of concerns expressed about a lack of expertise on EVs and charging provided at the point-of-sale. This is seen as a challenge to the uptake of EVs in comparison with internal combustion engine vehicles.

Initiatives to share best practice in this area can be important to boost consumer awareness, understanding and the uptake of electric vehicles. Many stakeholders were supportive of the National Franchised Dealers Association's electric vehicle approved (EVA) scheme [5] that provides a set of standards for retail and after sales of electric vehicles to certify EV retailers' excellence. It is endorsed by OLEV.

It will be important to promote best practice on information provision at point-of-sale. This will help drive up knowledge within the supply chain and provide consumers with confidence that the person they are speaking to is knowledgeable and can support them in their purchasing decision. Work Package 2 therefore proposes industry wide best practice standards for the information provision of smart charging and EV services at the point of sale.

This work should build on existing work in the sector, notably the EVA scheme, and ensure that it covers EVs as well as smart charging and EV services.

Recommendation 3: The Taskforce proposes that industry develop and implement best practice standards, backed up by an independent accreditation scheme, for the information provision for smart charging and electric vehicle services at the point-of-sale by the end of 2021.

- Industry must develop and implement best practice standards for information provision at the point-of-sale;
- The standards must be backed up by an independent accreditation scheme to verify they are being applied consistently;
- This process should be voluntary and industry-led in the first instance with Government keeping the situation under review, taking powers to intervene at a later date if necessary;
- The National Franchised Dealers Association's (NFDA) Electric Vehicle Approved (EVA) scheme [5] can be used as a useful starting point. Other sector groups should seek to replicate and adapt the scheme to ensure that consumers are offered comprehensive and accurate information; and
- To give consumers added confidence, Government should endorse the standards, provided they are sufficiently ambitious.

Making public chargepoints easily accessible for EV drivers

In the context of public charging, users face other problems when it comes to choosing the right option for them, including not knowing where to charge, ability to compare prices and the risk of being overcharged due to lack of clear and transparent information. Digital and physical signposting are required to support consumers when they charge and purchase options should be fair and standardised, where reasonable. For example, having a common language and units.

For public charging, it will be essential that chargepoint operators offer fair and cost reflective pricing to all users, while recognising that consumers will be willing to pay more for higher service levels, such as shorter charging times. Market practice should be monitored by the government to support a good experience and itemised billing would support transparency within the market.

Consumers need to see and understand exactly what they are getting in terms of pace and cost of charging, particularly if they are using chargers which are slower or where the rate of charge varies when more than one vehicle is hooked up to one chargepoint. The experience of charging should be standardised, where reasonably possible, to simplify the process and assist users in the transition.

Public Charging checklist – when using public chargers consumers need to know:

- Where they are;
- What sort they are;
- How many of them there are;
- Whether they are working and available;
- What they cost to use; and

If it continues to be an issue, with whom they will need to have a contract in order to use them.

Making chargepoint data open and available for consumer and system benefits

Currently the best source of information on public chargepoints is ZapMap [6] which has become a must-have tool for EV drivers. However, journey planning and locating chargepoints remains imperfect [7], especially when compared with the incumbent technology.

EV users will require consistent, easily accessible, accurate data to be openly available on public chargepoint location, type, status, capacity, price and availability to enable them to find (and possibly reserve) an available, working public chargepoint that is suitable for their immediate charging needs.

There is considerable scope for innovative applications from the private sector if the right data is made available. Work Package 2 therefore proposes that chargepoint operators make static and dynamic data on their public chargepoints publicly available. Similar to the data that National Rail has opened up [8], and aligned with the ‘presumed open’ principle underpinning the Energy Data Taskforce [9], chargepoint data will enable innovators to bring forward compelling consumer-facing tools that help EV drivers meet their public charging requirements.

Improved data on public chargepoints could also act as a catalyst for improved reliability – an issue that was consistently raised over the course of Work Package 2 – through improved visibility of ‘up time’ across different networks and units.

Recommendation 4: Government should require chargepoint operators to make static and dynamic data on their public charging units publicly available.

- This data should be open access to encourage the development of innovative applications that help users identify how they can best meet their charging requirements.
- Static data should include: location; cost of charging; connector type; charging speed; operator contact details and access requirements (app, RFID card, etc.)
- Dynamic data should include: availability and working status. The regularity of updates will need to be further considered. ZapMap currently has partnership agreements with a range of chargepoint operators (POLAR, GeniePoint, Source London, InstaVolt, Transport for London, ecarri, ESB, Franklin Energy and EV Driver) whereby chargepoint operators provide dynamic availability data every five minutes.

Making public chargepoints easy to use

Since November 2018, all chargepoint operators have enabled some ability to charge vehicles on an ad hoc basis to comply with the requirements of the Alternative Fuels Infrastructure Directive, but for some, this still means downloading an app. This adds complexity to the billing process, which can be inconvenient for a myriad of reasons, such as requiring the need of a smartphone, WiFi and storage space on the phone.

In discussions within Work Package 2 there was some agreement that industry should enable a roaming platform for public chargers whereby similar to the mobile phone experience, the user has one contract with one charger provider, but can use chargers from different networks on the same conditions. Charger providers should be settling (clearing) all payments in the background.

Stakeholders who did not agree with this outcome believed there were other practices or protections, which could be offered to users to improve their experience. For example, offering some free charging time while users were able to download the necessary app. In addition, having visibility of charging activity was stated to be important and was seen to be valuable for the electricity system.

However, the latter point was challenged by other stakeholders, who suggested this added protection would not preclude presenting a strong value case to users, which might encourage them to download the app anyway. While there are data sharing platforms available today, few major chargepoint operators are willing to engage with these platforms. In contrast, interoperability platforms are rapidly becoming the norm in countries like the Netherlands [10] and France, with cross network agreements to simplify the payment experience.

In practice this might prove difficult should providers opt for different designs of charger with vastly different rates of charge, there is little point in access to super-fast chargers being blocked by vehicles only capable of accepting lower rates of charge. It will also be important to ensure that operators are able to offer value added services to avoid triggering a race to the bottom. The key here will be to convey accurately and conveniently exactly what is on offer.

The means of payment at public chargepoints is an area that is moving quickly at a technical level with a range of technologies such as RFID in operation. The introduction of the Open Charge Point Protocol 2.0 (OCPP) in chargers that enable a vehicle to be recognised through the charger mean that a user will not need to fill in any details. However, for consumers changing payment methods or borrowing vehicles the process for charging to the correct account needs to be as simple and intuitive as possible, and to that end, possibly standardised.

It is also important to recognise however that chargepoint operators have made significant private investment in charging infrastructure in UK and they should not be penalised or lose out for investing in good faith. Unlike in some other markets, an extensive public EV charging infrastructure has been deployed and funded in the UK through private investment. To ensure that this continues and the network continues to grow at pace any interventions in the market will need to be carefully managed.

Ensuring chargepoints are accessible for all consumers will require additional features – much like ATMs – that would come at a cost. The standards around accessibility for ATMs address many of the considerations that will also apply to public chargepoints (for instance height and reach, accessibility and floor space as well as having accessible interfaces). These standards include provision for access by disabled people and could therefore provide a useful model for public chargepoints.

There was much discussion during workshops about the transparency around the billing of electric vehicles, predominantly in public charging. This includes providing transparent and easily understandable information about the cost of charging – and that this should be easy to compare to other providers – as well timely information about the total cost of the charging event after the fact, with the provision of a cost breakdown. There was common agreement that consumers need a good level of information about their purchases.

Recommendation 5: Industry should enable roaming services to deliver a seamless EV charging experience between public chargepoints.

- Work Package 2 proposes the end of 2021 as a deadline, however additional time should be considered for converting legacy systems and units. Chargepoint operators should not be penalised for investing in charging infrastructure in good faith;
- Roaming should allow drivers to access any public chargepoint, without signing up to multiple apps or memberships, through a single identification or payment method or through use of an existing subscription;
- Roaming must not prevent market models that offer discounts to reward loyalty, as a perk of another service, different pricing structures within membership packages – for instance for access to high – powered chargers – or valued added services;
- Roaming should apply to all public chargepoints (i.e. slow, fast and rapid). The definition of public chargepoint under the Alternative Fuel Infrastructure Regulations excludes networks that are for the drivers of a particular vehicle brand or company (for instance Tesla’s Supercharger network). However, Work Package 2 would encourage the development of a universal system in time, for the benefit of all EV drivers; and,

- Work Package 2 believes that chargepoints with contactless payment options – in line with Government’s desire for all new rapid and high powered chargepoints from spring 2020 must offer credit and debit card payment – should be considered as meeting the roaming requirement.

Supporting the growth and operation of the public charging infrastructure

The reliability of on street, en route and destination chargers will be a critical factor in building acceptance of and familiarity with the electric future. Much needs doing to overcome the reputation public chargers have acquired for being unreliable. The responsibility for support and maintenance needs to be clear, monitoring and maintenance adequate, and information on who to contact in the event of failure clearly sign posted.

In addition to reliability, a number of areas of improvement [11] have been identified to provide a good user experience for public charging:

- Weather protection and lighting for the chargepoint;
- Good cable management to avoid cables / connectors getting dirty;
- Adequate facilities (refreshments, toilets, wi-fi etc); and,
- Clearly marked bays for EVs to prevent ICE vehicles from blocking the access to chargepoints.

Tackling these issues will be key to addressing ‘experience anxiety’ [12] and encouraging drivers to make the switch from an ICE vehicle to an EV.

Competition is increasingly driving better customer experiences and standards, improving reliability and tackling the issues listed above. Combined with Work Package 2 Recommendation 4 on improving access to data, which will empower consumers to make informed decisions, market forces will continue to drive up standards of public chargers. User surveys, such as ZapMap’s [7], already exist to help consumers.

It is not therefore felt that Government intervention is necessary at the moment. However, Government should keep this under review and if insufficient progress is made, action may be appropriate further down the line.

An area that could be progressed at present is improving guidance to organisations that are procuring public chargepoints. In-house expertise on EV charging infrastructure varies significantly across organisations, providing guidance on the do’s and don’ts of procurement could therefore help drive up standards for public chargepoints.

Recommendation 6: Provide guidance to organisations that procure public chargepoints (such as local authorities) to ensure that responsibilities for maintenance and customer support are clearly defined.

This guidance should account for long-term planning, including provisions following contract termination and provisions in the event of a chargepoint operator failure. Local authorities may also require appropriate resource to deliver some functions on an ongoing basis. Existing work, such as the ‘general procurement guidance for electric vehicle charge points’ produced by the EVSE (electric vehicle supply equipment) and the range of best practice guides produced by the Energy Saving Trust [13], should be considered for wider dissemination.

3 – Install

The installation of smart chargers at homes must be done well – most obviously as a safety issue, but also one of design and potentially of cost:

Case study

Samridh bought an electric car with a home charger included at no additional cost. The manufacturer gave his details to a third party to complete the installation. When the company came to install the charger, they were unable to do this because the cable would have to go over the ground, through a public footpath. It was possible to go under the ground, but this would be at an additional cost of £550 as the government grant would not cover this cost. The company is not responding to Samridh anymore.

Source: Citizens Advice, 2019, anonymised consumer service helpline case note.

Where there is not a straightforward installation, users need to be given clear next steps and redress, if appropriate. There also needs to be clear responsibility for who deals with customer complaints and how the problem will be resolved. Work Package 2 Recommendation 10 will be important to ensure a smooth complaints process in these instances.

Where they are contemplating the installation of home chargers, consumers should be able to make informed decisions based on the options available and the pricing regimes that will apply. The recommendations laid out above – for the creation of an independent advice service and for best practice at the point of sale – will be key to enabling informed decision making.

At a more basic level, intervention is needed to improve installation standards in the UK. Government must ensure all installations are safe, either by intervening directly or ensuring that appropriate frameworks are in place. Currently, only government funded installations require a qualified electrician and there is limited oversight of how installations are carried out. This means those who do not access the government grant may have weaker protections.

There are existing standards [14] and assessment processes in place to assess the safety of installations but more work is needed to ensure that they are consistently enforced. Work Package 2 did not identify a clear way forward for installation standards for EV chargepoints, as this fell somewhat out of scope of the work package's remit, however there was agreement that further work is needed in this area. Stakeholders suggested that OLEV should seek to engage with accreditation scheme providers (such as NICEIC, ELECSA, STROMA, NAPIT) and the Institution of Engineering and Technology to understand how it can support ongoing work and drive up installation standards.

4 – Charging

There is an array of options offered for EV charging. For EV charging to be readily acceptable to consumers, chargepoints will need to fulfil as many consumer requirements as possible to ensure their experience meets their expectations.

Consumer requirements for chargers – a checklist:

- Is the charger easy to use?
- Will it charge at the power output the consumer was expecting, so that they get the charge they were expecting within the time period they were expecting it?
- Will it charge at the price the consumer was expecting, so that they don't find themselves saddled with an unexpectedly high bill?
- Does the charger offer the opportunity to charge at times when the price per kWh is advantageous, ideally through some sort of automated programme or, as a minimum, by selecting a pre-programmed timer?
- Is it Safe to use and, for a home charger, will it integrate without safety or any other side effects on their domestic electricity supply?
- If the consumer has domestic (solar or other) generation capacity, can the charger be wired so as to enable this to be used to charge the car?

Consumers will want to know that their expectations for charging rates/times will be met, wherever they are charging. Not that they should be unreasonable, but they should be predictable.

If users are to be incentivised to charge smartly, as the Government intends, then users need to understand what 'smart' in this context actually means, and how in the charger / tariff combination they are contemplating they would need to act in a way that benefits themselves, with lower tariffs, and the system by spreading load demand. What degree of flexibility will a 'smart' charger offer by way of pre-programming?

Importantly consumers need to understand the extent to which being 'smart' is about offering them the discretion and the means to charge at a rate and at times when tariffs are low, and the extent to which it is creating a mechanism for DNOs to tune down supply, with the risk that consumers might then not be getting the rate of charge they are expecting. There is evidence that offering outcome-based guarantees and appropriate protections may provide confidence to users when engaging with smart charging offers [15].

If in practice users either choose not to participate in smart charging, or do so in a way that still creates extreme demands on local supply networks, strong safeguards need to be put in place to protect users' interests and prevent DNOs from opting for so-called 'managed' charging restricting electricity supply, referred to in this report as emergency charge limitation, to avoid overloading their networks, which is addressed under protecting consumers below.

Default settings will be a useful tool to increase participation in smart charging and some scope for emergency management could be considered to cover extreme cases, but regulation will be required to prevent the exception becoming the rule, as a way of avoiding the cost of system upgrades to satisfy the universal supply obligation.

The power of defaults – making smart charging the norm

Smart charging offers customers new tariff propositions and control and can support the energy system in avoiding instances where grid connection capacity is exceeded. Smart charging can deliver grid flexibility, reduced renewables curtailment, energy trading benefits and reduced network costs. Provided the correct pricing signals are in place and enough customer focused propositions come to market, EV users are likely to use smart charging as standard, and there is already evidence that this market trend is developing.

Given the reduced network costs smart charging can deliver, smart charging should be installed as standard, with opt-out function capability when necessary, based on customer preference. The power of default settings and opt-out has been widely documented [16] and has been applied to areas such as auto-enrolment into workplace pensions [17] and opt-out organ donation [18]. Findings from the CVEI project further demonstrate the power of default settings in the context of smart charging, with users using defaults in the majority of charging events [19].

Setting chargepoints to charge smartly by default is to avoid a situation where users that would otherwise be happy to engage in smart charging fail to do so, instead charging their EV from the moment it is plugged in. Drivers returning home during the evening time and charging their vehicle as soon as it is plugged in would exacerbate the evening peak, with all the resulting negative implications.

This recommendation should be applied to the use case of home, off street charging. It is not felt that for destination or rapid charging the dwell times will be long enough to warrant participating in smart charging in all instances, hence the decision should be left to users and / or chargepoint operators.

Low participation in smart charging under an opt-in model could be as a result of low awareness of smart charging, a lack of interest in EV charging, or consumer concern or uncertainty about the benefits of smart charging. Moving to an opt-out model will increase participation in smart charging while ensuring that those who, for whatever reason, do not wish to engage in smart charging can choose not to easily and straightforwardly. Consumers value having an opt-out, as shown in a range of recent studies [15, 19, 32].

Striking a balance between ensuring high participation in smart charging without inhibiting new business models and offerings or limiting consumer choice can be challenging. However, it is felt that setting smart charging as an opt-out functionality, without specifying how providers must set these parameters, strikes an appropriate balance.



Recommendation 7: Require private EV chargepoints to charge smartly by default as part of Government's device-level smart charging standards, making smart charging an opt-out function.

- To ensure that this recommendation supports rather than hinders competition, companies should be given discretion on how to interpret and apply this recommendation. A requirement for users to input their own default settings when they first set up their unit, for instance, could be a consumer-friendly way of determining appropriate defaults. However different providers may have alternative approaches that deliver a better consumer experience;
- An outcome-based approach – of shifting EV charging from peak to off-peak times – should be applied rather than setting a prescriptive default off-peak charging mode, as proposed in Government's recent consultation on smart charging standards. This has the added advantage of increasing diversity, hence reducing the risk creating secondary peaks;
- Consumers must remain in control of their charging preferences, therefore it must remain easy for them to change the settings and opt out of the default should they choose, by inputting their own defaults or choosing a 'charge now' function;
- Further consultation (whether formal or informal) with chargepoint operators, chargepoint manufacturers, energy suppliers and aggregators will be needed to determine detailed recommendations. This should be coordinated with BSI's Energy Smart Appliance Publicly Available Standard work which is underway; and
- The recommendation should be introduced as part of, and within the same timeframe as, Government's device-level smart charging standards, which are expected to be set out in 2020 and enforced from 2021.

In discussions on the topic key challenges in setting smart charging as an opt-out functionality were raised and will need further consideration:

- Without defining what the default is it may be difficult to enforce. Unlike with pensions or organ donation where the default is a clearly defined outcome, a default smart charging setting is much harder to define. This is a clear challenge however, and must be balanced against the risk of creating a secondary peak by prescribing an off-peak default for all chargepoints, for instance. The recommendation in the Government consultation on smart charging standards [20] proposes a default off-peak mode for all chargepoints, however discussions in Work Package 2 suggest this may not be the optimal way to proceed, despite the good intentions. Further engagement with industry will be needed to understand how a default can be set and enforced in practice.
- A default set by the chargepoint manufacturer or operator will not deliver the best outcome for all consumers. This is a valid concern as a default will not be optimal for all consumers in all circumstances. Despite this, if it delivers a better outcome for most consumers without preventing those that want to benefit from inputting their own preferences / settings it should still deliver benefits overall.

It is recommended that an outcome-based approach be chosen over a prescriptive approach to the default settings to ensure that the private sector can continue to test new service propositions and innovate while delivering high participation in smart charging. At the time of writing there are 10 EV energy tariffs on offer in the market [21] many of which have cheaper off-peak rates, the off-peak times vary considerably across the offerings, highlighting that a one size fits all default is unlikely to be the best solution.

Ensuring that consumer protections are fit for purpose (charging)

It is clear that consumer protection is key to a well-functioning market for smart charging. Consumer protection issues are discussed throughout this report – including under section 4.6 – however there are two areas to be addressed specifically here, 1) the issue of emergency charge limitation; and 2) data access and privacy.

Protecting consumers in the event of emergency charge limitation

There is a live debate within and between industries about whether smart charging should ever be mandatory, a process that is sometimes called 'managed charging', in the Taskforce this process – whereby a network operator issues an instruction to a chargepoint to stop or curtail charging – is referred to as 'emergency charge limitation'.

Mirroring the industry-wide debate, contrasting views were expressed as part of the discussion in Work Package 2 on emergency charge limitation, which it is argued may be necessary to protect networks if EV clustering occurs and risks overloading the low voltage distribution network.

It was agreed that taking a customer-centric approach means that EV drivers are entitled to receive the charge they were expecting within the expected time period, something that would oppose emergency charge limitation in principle. However, when there is a binary choice in the very short term between temporarily halting or curtailing EV charging and a network fault that would affect all consumers, there is an argument to be made that the better consumer outcome is to take action to prevent a blackout or brownout.

From a consumer perspective, curtailing EV charging to protect network assets is problematic. Research from Citizens Advice [15] highlights that mandatory managed charging is unfavourable among consumers, with concerns expressed around the risk that it could deter the uptake of EVs, exacerbate range anxiety and was unfair / unacceptable.

Industry and customer feedback highlights that EVs should not be singled out, instead all loads should be treated equally. With the proliferation of domestic battery storage and potential for other large demand appliances/applications such as the electrification of heat in the near future, it is argued that EV drivers must not feel unfairly targeted. Instead it should be up to consumers to choose whether or not they want to participate in providing flexibility to the system, and importantly via what appliance/application, and incentives should be in place to encourage users to act in ways that benefit the system rather than imposing solutions upon customers.

A further concern, expressed by industry stakeholders, includes the fact that emergency charge limitation could hinder the development of local markets for flexibility as it could severely reduce the incentives for network operators to procure flexibility from the market. This would jeopardise longer term aspirations to create local flexibility markets and move to a more decentralised, digitalised and democratic energy system, in which EVs could play an important role.

That being said there is some acceptance among customers in research from Citizens Advice and greater acceptance in the work undertaken as part of the Smart EV project [22], My Electric Avenue project [23] and Electric Nation project [24] that emergency charge limitation would, by and large, help prevent blackouts or brownouts.

The conclusion reached through the discussion within Work Package 2 was that if emergency charge limitation were to be used it must only be as a short-term, last resort in response to a fault or an imminent fault on the network and in the absence of market-based solutions.

While in certain, rare instances it may be necessary to take emergency action to avoid a blackout or brownout, something that consumers can appreciate, this should only ever be used as a last resort in response to an imminent threat to network security. Governance surrounding its use will need to be clearly defined and agreed to give customers and other stakeholders transparency and confidence over its potential use.

A Smart Energy Code modification proposal – SECMP0046 [25] – is currently in progress which, if implemented, would allow DNOs to control chargepoints via the smart metering system. Ofgem will determine whether this proposal is accepted or rejected and the Work Package 2 does not wish to pre-empt that decision. Instead Work Package 2 has sought to lay out key considerations to help inform Ofgem's decision-making process, notably consumer protections that may be necessary which will not inevitably be picked up through the process described above.

Recommendation 8: If emergency charge limitation is deemed permissible by Ofgem, network and system operators must work with Ofgem, industry and consumer representatives to develop governance arrangements for the use of emergency charge limitation

These governance arrangements must set out that:

- Emergency charge limitation must only ever be used to protect the safety and security of the electricity system and in response to an immediate issue on the network (e.g. faults, imminent overloads, disruptive events, etc);
- When emergency charge limitation is used in a certain area, deployment must be time-limited with a requirement to implement a long-term solution (e.g. network reinforcement; procurement of a market-based flexibility solution);
- Limits must also be set on usage over a 24-hour period and a 30-day period with penalties and incentives set under RII0 ED2 to ensure that network operators only use emergency charge limitation as intended;
- Industry must work together to ensure that vulnerable customers are not put in danger and/or other arrangements are put in place when emergency charge limitation is used, including by using the Priorities Services Register; and
- Consumers should be informed about emergency charge limitation events, as soon as possible.

Further areas that will need to be addressed in developing robust governance frameworks include:

- Whether consumers should be compensated for an emergency charge limitation event;
- Whether emergency charge limitation should be delivered by a third party rather than the network operator; and
- Whether the Clean Energy Package limitations on network operators owning and operating EV chargepoints permits emergency charge limitation.

There was support within Work Package 2 for consumers to have access to a temporary override button to get immediate charge in the case of need. This would not only help assuage consumer concerns about emergency charge limitation, but it would also ensure that in emergency scenarios EV users are able to charge their vehicle.

Giving consumers real control of their data

Consumers need confidence on what data is being used for smart charging and EV services. There should be protections in place about how often industry can access this data and what for, and crucially consumers should own data relating to their charging usage and transactions.

Consumers will need to be confident that any data they agree to release relating to their EV or chargepoint will be maintained according to an agreed framework of rules. General Data Protection Regulation (GDPR) sets out rules on the retention, deletion, processing and transfer of data. However, discussions in Work Package 2 identified the need for further protections that will be important to provide consumers with the confidence that their data is protected:

- To provide added reassurance and clarity to consumers on how data for smart charging and EV services can be used, what it can be used for and by whom;
- To clearly set out what data is owned by consumers and what is owned by other parties;
- To set out the rights and controls that consumers have over their data;
- To support industry in interpreting GDPR, for example on issues like data portability;

The Work Package 2 therefore proposes that a Data Access and Privacy Framework be set out by Government and Ofgem to deliver on the above. The framework must:

- Have provisions for removing historic data if a consumer moves away from the property;
- Ensure that consumers are clear about who has access to their data and whether it is being shared with other organisations (car manufacturers, EV retailers, CPOs, DNOs and energy suppliers) and if so, for what purposes;
- Incorporate learnings from relevant sources including the MiData project, Smart Metering Data Access and Privacy Framework and Ofgem's Half Hourly Settlement Code Review; and
- Take a global view, to ensure alignment with other jurisdictions where relevant.

Recommendation 9: Work Package 2 proposes that by 2021 Ofgem and Government introduce a data access and privacy framework for the EV sector to ensure that consumers have full control over their data. Consumers should be made aware of all data access issues at the point of sale of all EV products and services. They should also be told of their powers to control and delete this data.

5 – Switching providers

A user-centric approach to smart charging should also consider how readily users will be able to switch between product, services and networks, as well as managing issues such as a change of tenancy. The recommendations described above were set out to support consumer decision making.

For this to be successful, industry and government should work towards a system-wide solution that ensures competition for users. Whether referring to national infrastructure or goods and services bought for personal use, making sure they all work together is fundamental to a good user experience. More work needs to be done to deliver this in practice, and Government has a key role to play given its privileged position to discuss financial and operational details with businesses.

To understand better what outcomes users should have, a range of stakeholders were surveyed as part of Work Package 2, including chargepoint operators, regulators and trade bodies. This was followed by phone-based interviews with technical experts to understand the capital and operational costs involved. While there was no consensus across stakeholders on all topics, aspirational user outcomes were agreed by the majority of respondents in relation to EV charging and services:

- Users should be able to charge at any charging location, for any EV within Great Britain. This relates to the connector specifically.
- Users should be able to access any public chargepoint without having to become a member of a scheme. Some stakeholders further suggested that this requirement should extend to not having to download an app, however there was no consensus on this aspect.
- Users should be able to pay with a range of payment methods at chargers. For example, pay-as-you-go as well as direct debit.
- Users should be able to update their car or their charger, without affecting their ability to charge.

A further outcome that was discussed was that “Users should be able to participate in EV services and switch, without being locked into a service provider”. This outcome is also included in the Government consultation on smart charging standards [20] and is termed “smart interoperability”. Differing views were expressed on the desirability of this outcome, with stakeholders highlighting that it may cause a range of unintended consequences that could ultimately harm consumers.

Charger compatibility/ongoing compatibility

Stakeholders agreed ensuring chargers worked with a range of EVs is needed for convenience, cost savings and efficiency. Many stakeholders agreed that ongoing charger/car compatibility should be available for users. However, some noted in circumstances where it could not be avoided there should be adequate support and information for users on their next steps.

Using a public chargepoint without having to become a member/download an app

This topic is addressed under ‘Making public chargepoints easy to use’ as part of the discussion for Work Package 2 Recommendation 5 above.

Offering payment with a range of payment methods

In principle, stakeholders agreed with this outcome to enable access for all types of users. However, there was some concern regarding how industry could implement measures to meet the outcome, without incurring high costs. Stakeholders suggested methods such as offering cash payments via cards similar to ‘oyster cards’; selectively offering a range of payment methods in areas of most concern

(i.e. rural areas where communication problems could occur); or extending existing cash payment infrastructure to capture charging payments – for example, parking payments.

While contactless and cash payments offer less value to the electricity system than RFID cards or apps, stakeholders suggested users should be able to choose freely from options and that industry should make preferred methods attractive to users.

Accessing information about charging / discharging events on one platform

During the course of the day, a user could engage in multiple charging and discharging events using public chargers. Understanding the overall impact of engaging would require accessing information about charging or discharging events, potentially on one platform. Stakeholders had mixed opinions on whether this would be valuable to users and thus, worth the cost of creating the platform.

As this value had not been ascertained, this outcome was not included within the above list. However, as products and services progress, the usefulness of such a platform could increase and warrant further consideration.

Not being locked-in with providers when engaging in EV services

In the Government's "Electric vehicle smart charging" consultation [20], proposals for 'smart interoperability' were outlined, whereby Government proposed that users should be able to switch the operator of their private chargepoint without a site visit.

There was no clear consensus reached in the Work Package on whether 'smart interoperability' – as defined in Government's consultation document – should be a requirement. Stakeholders highlighted examples from other industries where users had been temporarily locked into a provider as agreed via a contract without consumer detriment. Concerns were also raised about the impact smart interoperability would have on the chargepoint market, as a high degree of technical specification would be necessary to meet the requirement, which could impact innovation and choice in the marketplace, and ultimately lead to consumer detriment.

The counterargument is that users should not be limited to which providers or enabling platforms they could use. This is particularly the case for home chargers, whereby the technology and service could remain on the property, despite changing tenancies or ownership. The reality of the consumer experience of home charging is that they will not own a home charger and an electric vehicle for corresponding amounts of time. They may rent a property short term, may move into a property which already has an electric vehicle charger, may acquire several electric vehicles over a short space of time if they are take-home fleet drivers, or may wish to change their electricity supplier whilst retaining the charging hardware they have already bought or been given through a previous supplier.

6 – Obtaining redress

Ensuring that market boundaries do not constrain effective complaint handling

The bundling of home energy, public charging and vehicle services as well as the range of actors involved in the customer journey creates complex interdependencies within service provision. In such circumstances, users need to be confident that any problems will be resolved quickly and fairly, with clear boundaries for who is responsible and how the process will work.

There does not appear to be comprehensive data on consumer complaints in the EV sector however data across the financial services and utilities sectors [26] highlights a mismatch between consumer expectations for complaint handling and what they experience in practice. With smart charging and EV services potentially involving multiple different parties, the number of points of failure increases as does the risk of consumers' problems falling between the cracks.

Consumers must not be forced to navigate between different companies and agencies to resolve a problem. To prevent this, clear responsibilities for resolving consumer complaints must be defined and allocated between different market participants. Industry will need to agree to co-operate and work closely together, jointly establishing processes to diagnose problems and assign them to relevant parties to ensure consumers can be confident that their problems will be resolved speedily and effectively.

In stakeholder interviews, having a single point of contact for public charging queries was suggested as a means to remedy a failure in service. An appropriate alternative dispute resolution scheme was also seen as an important protection for users, whether they were charging at home or elsewhere, which would include the vast majority of user facing organisations.

It is proposed that common complaint handling standards be developed by industry to ensure that consumers are afforded the same level of service regardless of their initial point of contact and that their problem is resolved in a timely and effective manner.

Complaints handling standards already exist in the energy sector and are defined in legislation [27]. Due to the diversity of actors in the EV sector, and the rapid pace of change, less prescriptive standards should be taken forward for smart charging and EV services. Standards must, however, deliver a high level of service, with access to an Alternative Dispute Resolution service identified by Work Package 2 as a key component.

Recommendation 10: Industry to develop and adopt common, principle-based complaint handling standards by the end of 2021 to ensure that consumers are transferred seamlessly (between market boundaries if necessary) to resolve their problem(s), regardless of who they have initial contact with.

- Complaint handling standards must be developed and implemented by all service providers involved in smart charging activities (including but not limited to energy suppliers, aggregators, chargepoint operators and installers, vehicle manufacturers);
- As the standards will cut across many different industries and organisation types, the standards should be principle-based, however access to an independent Alternative Dispute Resolution (ADR) is essential;
- The standards must be aimed at delivering a high level of service to the consumer;
- Establishing complaint handling standards should be industry-led in the first instance, to reflect the fast-changing nature of the EV sector; and
- Government must closely monitor implementation of the standards and if insufficient progress is made, keep open the option of intervening. Work Package 2 proposes the following timeline:
 - Work on setting standards should start in 2020, with a view of publishing them in 2021;
 - The standards should then be rolled out across industry in 2021 and 2022 so that they are implemented by the end of 2022.

Ensuring that consumer protections are fit for purpose

A further risk identified by Work Package 2 relates to the new roles and interactions inherent in smart charging. Consumer interactions with EVs and smart charging cuts across a range of sectors, from tightly regulated, established sectors to new, largely unregulated ones. This means that many EV services are currently only covered by general consumer law, which brings a risk of consumer detriment as the roles and responsibilities in the sector evolve.

EV tariffs and smart charging offerings have so far come from, or in conjunction with, energy suppliers on which extensive regulations apply through the electricity supply licence. However as highlighted in Ofgem's Innovation Link paper [28], "EVs do not fit neatly into the conventional rules and obligations". This brings a risk that providers may not be aware of all the applicable obligations, responsibilities and protections or that new services fall between the cracks, leaving consumers unprotected. There is also a risk that consumers are not aware of the recourse that is available should they have a problem. Similar gaps in protection have recently been identified with regards to third party intermediaries (TPIs), where research highlighted differences in protection for consumers when there's sectoral regulation vs. general consumer law [33].

A voluntary demand side response (DSR) Code of Conduct for aggregators was introduced in 2019 by the Association for Decentralised Energy (ADE) through the Flex Assure scheme [29]. Flex Assure helps give DSR customers assurance that they will receive good quality service and sets minimum standards across five areas: sales and marketing; technical due diligence and site visits; proposals and pre-contractual information; and customer contracts and complaints. The scheme has been well received by industry and Government, however it only applies to aggregators in the non-domestic sector meaning that it does not offer protections to householders for smart charging and EV services. Discussions are ongoing within industry on whether a similar scheme is necessary for domestic DSR and if so, whether it would be effective and viable.

Regardless of the outcome of this work it will be important that Government and Ofgem take the lead on this important issue. To deliver good outcomes, industry and government should seek to educate, inform and advise at the point of enquiry, guarantee safety, provide a quality service, be inclusive by considering vulnerability and access and provide confidence over charging levels. The role and responsibilities to deliver each of these 'outcomes' can be vague, leaving gaps in provision. As such, it is proposed that a full review be undertaken to develop a comprehensive picture of consumer protections relating to smart charging and EV services.

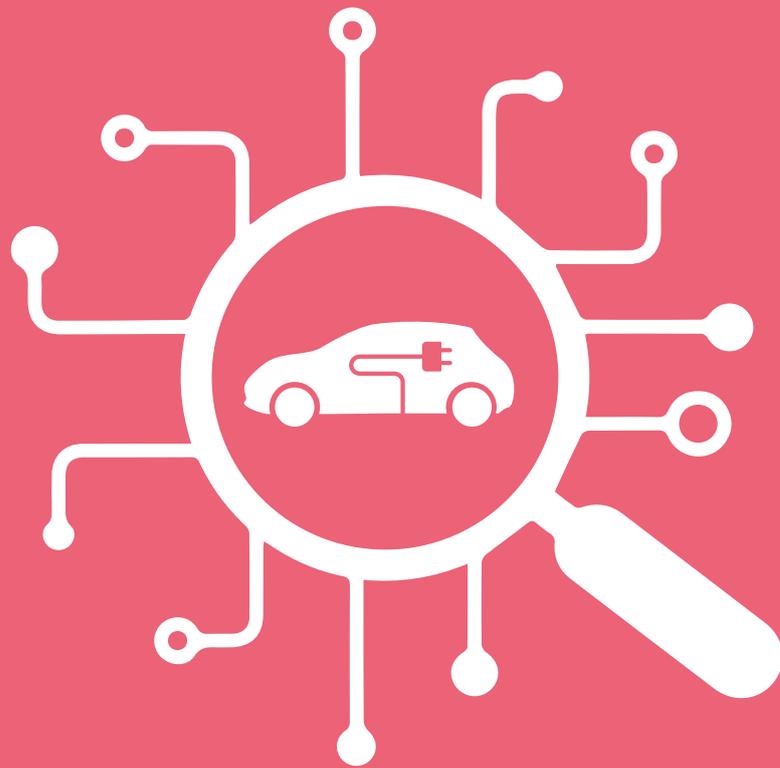
Recommendation 11: Work Package 2 proposes that Government or Ofgem undertake a full review of protections for EV users by the end of 2021. This should build on and be coordinated with ongoing work (such as Ofgem's Future Energy Retail Market Review).

- The review should include a function mapping exercise, charting the roles and functions of each type of company involved in the EV customer journey, in order to identify whether consumers require further protection;
- The review will need to consider future roles that companies may play, alongside current roles;
- Particular consideration needs to be given to consumers in vulnerable circumstances;
- Existing work programmes that are looking at consumer protections (such as the Future Energy Retail Market Review which is looking at aspects of home charging) will need to be integrated; and
- The review should be launched in 2020 and be finalised by the end of 2021 at the latest, allowing enough time to undertake a detailed, in-depth review while ensuring that it is done in a timely manner.



5

Further Considerations



Further considerations

Using the smart meter infrastructure as the communications system for smart chargers

Work Package 2 was asked to consider the benefits and disadvantages to the user of using the smart meter infrastructure as the communications system for smart charging. The key arguments that were raised in discussions are outlined below.

While Work Package 2 was not specifically asked to provide a recommendation on whether smart charging should be undertaken through the smart metering system, the critics of doing so far outnumbered the proponents – something that may not be immediately apparent when presented with the arguments below.

Government should therefore proceed with caution if it seeks to take forward smart charging through the smart metering system – a proposal which does not appear to have industry backing.

The potential benefits

Compatibility with other smart devices in the home: The smart meter infrastructure will offer the potential to allow customers to choose which smart connected devices to manage. In an idealised system all loads would be treated equally and the system would allow consumers to choose whether or not they want to participate in providing flexibility to the system, and importantly via which appliances/applications. The smart metering infrastructure's Home Area Network (HAN) could allow consumers to choose which networked smart devices they want to manage, potentially removing the need for additional technology/hardware outside of the smart metering infrastructure.

Accessibility: High future smart meter uptake will result in the associated technologies becoming relatively accessible. BEIS have advised that 99.3% of premises will be able to have a smart meter installed, which will create a significant market for technology which can interoperate with/be embedded as part of the infrastructure. For example, being part of the consumer's HAN and offering the capability for a smart connected home.

Consumer confidence and trust: The Data Communications Company (DCC) has a proven, established and reliable two-way communications system as the backbone of the smart metering infrastructure. Consumers would benefit from the reassurance that there would be consistent and reliable communications coming via the infrastructure.

The smart meter infrastructure allows the ability to retain and use the existing governance framework which has been subject to multiple reviews and approvals across government bodies, and so can be trusted to provide security and reliability to consumers.

The smart metering infrastructure has a high level of security due to the specification designed by the government agencies such as the National Cyber Security Centre (NCSC). This is crucial for future scenarios in which mass uptake result in EV chargepoints becoming Critical National Infrastructure (CNI) due to the risk of large numbers of chargers with a large aggregate load being disconnected simultaneously, in turn affecting local and national electricity network and system stability. There are some views, however, that a single system at risk of being hacked presents a greater risk than having multiple systems.

Familiarity and comfort with smart meters could ease concerns and/or engagement issues.

Education and awareness campaigns could provide a foundation removing initial barriers to engagement over smart charging; however, there are concerns over existing negativity around smart meters which may reduce this benefit.

The potential disadvantages

Key potential disadvantages to the EV user utilising the smart meter infrastructure as the communications system for smart charging remain. These are outlined in the following paragraphs.

Universality: Not everyone will be able to have a smart meter installed; there are likely to be customers who refuse to have one installed; and the smart meter infrastructure does not completely remove the communications challenges. This raises questions about which smart charging solutions would be available to the consumers who cannot (physically) have a smart meter installed. Furthermore, reliance on GPRS means some properties in remote areas will be unable to communicate effectively - using internet is likely to be a more reliable communications medium and give customers access to those systems. These concerns need to be addressed should smart metering be considered as the communications system for smart charging.

Reduced functionality relative to alternatives: In order for consumers to benefit from solutions which offer an EV chargepoint with the ability to vary consumption on a more granular, dynamic and rapid basis and participate in markets such as frequency response, there is a need for low-latency and dynamic controls (such as commercial broadband) which is more than the DCC is able to provide.

Cost and functionality: System changes and security requirements could lead to delays and costs. Designing a system which requires any significant DCC change will likely delay and extend the design, provision, and deployment of UK standards-based smart chargers. This will impact the ability of customers to benefit from the smart metering infrastructure. Government and industry should use the pre-existing DCC functionality when creating standards for UK EV chargers. In addition, chargepoint manufacturers would need to be given time to make sure the smart charger architecture is able to accommodate any uplift required to meet DCC security requirements. This could lead to an increase in costs for consumers as the resource required is passed through to end product pricing.

Reputational risks: While consumers may be reassured about the security of the smart metering system, concerns were raised about the public perception and negative media coverage that the smart metering programme has encountered at times.

Reduced competition and choice: Undertaking smart charging through the smart meter would create a UK specific solution, thus risking limiting the attractiveness of the UK market to global EVSE manufacturers and resulting in reduced choice for UK consumers. Among those currently active in the smart charging space in Work Package 2, there was no appetite for the smart charging to be undertaken through the smart metering system.

Engaging with depot-based fleets, dispersed fleets and owner operators

Work Package 2 was unable to go into the same depth when it came to how to engage fleets with smart charging as for private users, however the findings will hopefully be of use to inform other industry discussions and work programmes.

Smart charging is essential to enable fleets to manage their rather diverse charging requirements which is markedly different from domestic needs. While financial drivers are important they may not be sufficient alone and engagement, combined with forward looking regulation, will be essential to deliver participation in smart charging. This could be carried out by the government, industry groups, as well as by commercial operators.

For some fleets, depending on their size and the location of charging, there may be few financial incentives today to move to smart charging. Not all fleets have half-hourly settlement, and some locations have ample grid capacity, allowing for many charge posts to be installed. To encourage these fleets to adopt smart charging, engagement, but also forward-looking regulation, is key to stimulating adoption. For example, a future requirement of charge posts to be smart, or some future guidance on half-hourly settlement, can help fleets understand the need to future-proof their operations.

Charging solutions appropriate for a set of fleet vehicles, and the likely engagement with smart charging will be driven by the range of business sectors and activities, including:

- Range – expected daily range for typical business or other given purposes;
- Length of duration i.e. expected daily working hours and adherence to driving regulations, or if the vehicle contains internal electrical powered equipment which makes demands on the internal energy;
- Route planning considerations – routes may be largely pre-planned (e.g. delivery or service schedules) or unplanned (in the case of rapid responders such as ambulances, repair fleets); and
- Location of vehicles, whether they be at home or at a depot location.

Fleet adoption of electric vehicles is hampered by infrastructure constraints (see diagram below), and smart charging can help alleviate some of these constraints.

 Vehicles	 Employees	 Cost	 Infrastructure
<p>Very limited vehicle choice up to 2020</p>	<p>Access to home charging is limited by housing – private parking, owned home</p>	<p>Uncertain tax landscape beyond 2020/21 post WLTP, RDE2</p>	<p>Unclear on responsibilities for managing local grid and fear of costs</p>
<p>Long range BEV predominantly in premium and premium SUV sector and so expensive</p>	<p>Limited business infrastructure</p>	<p>Grant removal</p>	<p>No ROI case studies on infrastructure investment</p>
<p>Business mileage reimbursement rates only announced Oct 2018</p>	<p>Significant product misconceptions (fire risk, battery degradation etc)</p>	<p>Lack of clarity on clean air zones and impact on long term planning</p>	<p>Require guidance – how many charge points and what types?</p>
<p>Resale market unproven (cliff edge RVs in redundant technology)</p>	<p>Growing cash alternative (High BIK environment) limiting affordability and take up</p>		<p>Lack of clarity on interoperability and reliability of network</p>
<p>LCV range prohibitive</p>			

A variety of different products will be required by fleets, in contrast to domestic users:

- Load balancing – maintains multiple charge point efficiency at peak demand
- Peak shaving – prevents overcapacity through (de)activation, variable kWh or varying charge out rates
- Hub/Satellite connection – link multiple charging stations within a single management plan
- Real-time user updates and charging status
- Real-time usage
- Driver charging for energy
- Benefit-in-Kind reporting
- Mileage reconciliation (online and mobile app)

Unlike domestic customers, many commercial customers are exposed to half-hourly variations in the electricity price. The prevalence of ‘time-of-use’ charging in commercial customers creates an opportunity for these customers to realise substantial value from smart charging, benefiting from the technology’s ability to ‘peak shift’ – shifting a large proportion of their demand to off-peak periods. Peak shifting allows commercial users to benefit from three main sources of savings:

- Avoidance of Transmission Network Use of System (TNUoS) charges (Triads)
- Avoidance of Distribution Use of System (DUoS) charges
- Purchasing electricity at a cheaper wholesale price

There are a wide variety of different types of fleet customers, from company car fleets with mainly domestic users, to fleets of vans. Different demand profiles will be associated with each different type of fleet vehicle.

Besides merchant benefits on the power markets, there are a number of other opportunities that businesses could realise through smart charging with fleets of EVs. Smart chargers will ultimately be able to provide grid services such as frequency response. There has also been substantial development in local network flexibility markets (such as the WPD Flex Zone), which could provide an additional revenue stream. This will assist with the payback on investment in charging hardware.

The largest benefit may in many cases be mitigating grid upgrade costs that would otherwise be incurred to enable the switch to electric fleets. These can be substantial; the power draw of a fleet of 50 EVs charging simultaneously would be up to 0.3MW. Whilst grid upgrade costs of this magnitude vary widely, a typical small fleet owner switching to EVs might expect this cost to be in the region of hundreds of thousands, or even millions of pounds. Partially or fully avoiding these costs represents the quickest way to justify investment in smart charging infrastructure for commercial fleets.

Vehicle to grid and other EV services

Vehicle to grid (V2G), vehicle to home, peer-to-peer trading and ensuring that smart charging solutions are able to interact as required with other smart home devices / appliances were identified as the key benefits relating to smart charging that have not been otherwise covered in this report.

As argued throughout this paper, delivering a good user experience and enabling informed customer choice must be a key objective and outcome as we transition from internal combustion engine (ICE) vehicles to EVs. V2G, vehicle to home and peer-to-peer energy trading and additional service options attached to smart charging are seen as highly challenging to explain to consumers. There is a concern that consumers would struggle to understand the costs and implications for their energy and mobility.

With these services it was seen by some as important that they offer meaningful projections to consumers about the potential benefits and cost. It was also suggested that consumers should have the option to switch without penalty to another tariff option at any time.

A common thread throughout this report has been that smart charging is currently innovation-led with solutions being continuously shaped by changes in technology, business models and customer preferences. This is even more true for vehicle to grid and other consumer benefits. Whether or not there is sufficient added value or perceived utility for users to engage in other EV services is to be determined.

Savings estimates for V2G vary and are subject to considerable uncertainty; one recent study [30] estimates that a 7kW V2G charger could capture annual revenues of around £436 a year, primarily from providing services to the System Operator. Further potential value of up to £250 per year is identified for DNO congestion management, although this would be highly location dependent. One V2G trial [31] is deploying a bundled package, including the vehicle lease, a control app, a free V2G charger and £30 monthly cashback in exchange for plugging in for 12 cycles (between 6pm and 5am) a month. Other bundles and customer propositions are expected as part of the Innovate UK funded trials.

In light of the uncertainty surrounding the viability and attractiveness of V2G, Work Package 2 has not made any specific recommendations however recommendations 1, 2, 3, 9, 10 and 11 would apply just as much to V2G as smart charging, if needed. If and when propositions are brought forward, Government and industry should revisit the recommendations within this report, notably Recommendation 11.



6

Conclusion



Conclusion

This shift brings significant consumer benefits and underlying it all should be a positive user experience. Smart charging offers customers new tariff propositions and control and can support the energy system in avoiding instances where grid connection capacity is exceeded. It can deliver grid flexibility, reduced renewables curtailment, energy trading benefits and reduced network costs. Smart charging will be key to unlocking the full potential of EVs and keep energy system costs down, it is therefore of paramount importance that as many EV users as possible participate in smart charging.

The work undertaken in Work Package 2 as part of the Electric Vehicle Energy Taskforce has sought to provide new insights into delivering a positive user experience for smart charging. The strength of the findings lies in the stakeholders that have been brought together and the iterative process that has been used to develop a strong level of consensus on the way forward.

The recommendations do not attempt to address all of the current or potential challenges of engaging users with smart charging, as that is an impossible task. Instead they represent a set of concrete and ambitious recommendations, with wide backing from industry, to kick-start the journey.

More work is now needed to implement the recommendations. Industry and Government will need to act swiftly to deliver these recommendations over the coming years. Beyond that, the Work Package has identified areas where more thinking and work is needed. Fundamentally, the onus should be on policy-makers and industry to ensure the electricity system meets users' travel and service needs – consumers must have confidence in this from the outset to deliver the transition at pace.

Reaching net zero emissions by 2050 will require transformative change across the UK economy. A switch from ICE vehicles to EVs will form a key part of decarbonising transport, currently the largest emitting sector.

References

- 1 Electric Vehicle Energy Taskforce. [Online]. Available: <http://www.evenergytaskforce.com/>.
- 2 Future cities Catapult. "Electric Vehicles Report: Towards an Excellent User Experience". [Online]. Available: https://futurecities.catapult.org.uk/wp-content/uploads/2019/01/Electric_Vehicles-Report1.pdf
- 3 Citizens Advice. "True cost of electric vehicle tariffs unclear to consumers" [Online]. Available: <https://www.citizensadvice.org.uk/about-us/how-citizens-advice-works/media/press-releases/true-cost-of-electric-vehicle-tariffs-unclear-to-consumers/>
- 4 RightCharge. "Compare electric car chargers and connect with the right installer" [Online]. Available: <https://www.rightcharge.co.uk/electric-car-charger/>
- 5 National Franchised Dealers Association (NFDA). "Electric Vehicle Approved (EVA) scheme". [Online]. Available: <https://www.evapproved.co.uk/>
- 6 ZapMap. [Online]. Available: <https://www.zap-map.com/live/>
- 7 ZapMap. "ZapMap user survey". [Online]. Available: <https://www.zap-map.com/zap-map-user-survey-reveals-top-10-ev-charging-networks/>
- 8 National Rail. "Open Data Feeds". [Online]. Available: <https://www.networkrail.co.uk/who-we-are/transparency-and-ethics/transparency/open-data-feeds/>
- 9 Energy Data Taskforce Report 2019. [Online]. Available: <http://www.evenergytaskforce.com/>.
- 10 Netherlands. National agreements on interoperability. [Online]. Available: <https://nederlandelektrisch.nl/charging-infrastructure>
- 11 RAC Foundation. "Development of the UK Public Chargepoint Network" 2018. [Online]. Available: https://www.racfoundation.org/wp-content/uploads/Development_of_the_UK_CPN_Harold_Dermott_December_2018.pdf
- 12 PWC. "Powering ahead! Making sense of business models in electric vehicle charging" [Online]. Available: <https://www.pwc.co.uk/industries/power-utilities/insights/electric-vehicle-infrastructure-report.html>
- 13 Energy Saving Trust. "Developing an electric vehicle charging infrastructure" [Online]. Available: <https://www.energysavingtrust.org.uk/transport/local-authorities/developing-electric-vehicle-charging-infrastructure>
- 14 IET. "Checklists and Risk Assessments for the Code of Practice for Electric Vehicle Charging Equipment Installation". [Online]. Available: <https://shop.theiet.org/code-of-practice-for-electric-vehicle-charging-equipment-installation>
- 15 Citizens Advice. "Smart EV charging - What do drivers and businesses find acceptable?" [Online]. Available: <https://www.citizensadvice.org.uk/about-us/policy/policy-research-topics/energy-policy-research-and-consultation-responses/energy-policy-research/smart-ev-charging-what-do-drivers-and-businesses-find-acceptable/>
- 16 Cabinet Office: Behavioural Insights Team. "Behaviour Change and Energy Use". [Online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/60536/behaviour-change-and-energy-use.pdf
- 17 The Pensions Advisory Service. "Automatic Enrolment". [Online]. Available: <https://www.pensionsadvisoryservice.org.uk/about-pensions/pensions-basics/automatic-enrolment>
- 18 Organ Donation, NHS. "What is the opt out system in England?" [Online]. Available: <https://www.organdonation.nhs.uk/helping-you-to-decide/about-organ-donation/faq/what-is-the-opt-out-system/#i>
- 19 ETI. "CVEI Project D5.3 Consumer Charging Trials: Mainstream consumers' attitudes and behaviours under Managed Charging schemes". [Online]. Available: https://www.eti.co.uk/programmes/transport-ldv/consumers-vehicles-and-energy-integration-cvei?size=10&from=10&_type=eti-document&publicOnly=false&query=&programmeName%5B0%5D=Transport++LDV&projectName%5B0%5D=Consumers%2C+Vehicles+and+Energy+Integration
- 20 GOV.UK. "Electric vehicle smart charging". [Online]. Available: <https://www.gov.uk/government/consultations/electric-vehicle-smart-charging>
- 21 ZapMap. "EV Energy Tariffs". [Online]. Available: <https://www.zap-map.com/charge-points/ev-energy-tariffs/>
- 22 EA Technology. "Smart EV". [Online]. Available: <https://www.eatechnology.com/engineering-projects/smart-ev/>

- 23 My Electric Avenue. [Online]. Available: <http://myelectricavenue.info/>
- 24 Electric Nation. [Online]. Available: <http://www.electricnation.org.uk/>
- 25 Smart Energy Code. [Online]. Available: <https://smartenergycodecompany.co.uk/modifications/allow-dnos-to-control-electric-vehicle-chargers-connected-to-smart-meter-infrastructure/>
- 26 Huntswood. "Complaints Outlook 2019". [Online]. Available: <https://www.huntswood.com/company/media-centre/complaints-outlook-2019>
- 27 LEGISLATION.GOV.UK. "The Gas and Electricity (Consumer Complaints Handling Standards) Regulations 2008". [Online]. Available: <http://www.legislation.gov.uk/uksi/2008/1898/contents/made>
- 28 Ofgem. "What you need to know about selling electricity to electric vehicles users". [Online]. Available: https://www.ofgem.gov.uk/system/files/docs/2019/10/what_you_need_to_know_about_selling_electricity_to_ev_users.pdf
- 29 Flex Assure. "DSR Code of Conduct". [Online]. Available: <https://www.flexassure.org>
- 30 Energy Systems Catapult. "Vehicle-to-Grid Britain" 2019. [Online]. Available: <https://es.catapult.org.uk/case-studies/vehicle-to-grid-britain/>
- 31 Octopus Electric Vehicles. "Powerloop" [Online]. Available: https://www.octopusev.com/powerloop?gclid=EAlaIQobChMIwdLVtrSJ4wIVgp3VCh2x3gcTEAAYASAAEgKSi_D_BwE
- 32 Citizens Advice. "Clear and in Control" 2019, [Online]. Available: HYPERLINK " <https://www.citizensadvice.org.uk/about-us/policy/policy-research-topics/energy-policy-research-and-consultation-responses/energy-policy-research/clear-and-in-control/>" <https://www.citizensadvice.org.uk/about-us/policy/policy-research-topics/energy-policy-research-and-consultation-responses/energy-policy-research/clear-and-in-control/>
- 33 Citizens Advice. "Stuck in the middle" 2020, [Online]. Available: <https://www.citizensadvice.org.uk/about-us/policy/policy-research-topics/energy-policy-research-and-consultation-responses/energy-policy-research/stuck-in-the-middle/>



Low Carbon Vehicle Partnership
3 Birdcage Walk,
Westminster,
London SW1H 9JJ