Regulating electric vehicle smart charging

Introduction

Thank you for responding to the electric vehicle smart charging consultation. Your responses will help us to determine regulations for smart electric vehicle chargepoints.

Print or save a copy of your response

When you get to the end of this questionnaire, you will be offered the chance to either print or save a copy of your response for your records. This option appears after you press ‘Submit your response’.

Save and continue option

You have an option to ‘save and continue’ your response at any time. If you do that you will be sent a link via email to allow you to continue your response where you left off.

It’s very important that you enter your correct email address if you choose to save and continue. If you make a mistake in the email address you won’t receive the link you need to complete your response.

Confidentiality and data protection

The Office for Low Emission Vehicles (OLEV) are carrying out this consultation to help to determine requirements needed to develop regulations for smart chargepoints used for electric vehicle charging. This consultation and the processing of personal data that it entails is necessary for the exercise of our functions as a government department. If your answers contain any information that allows you to be identified, the Department for Transport (DfT) will, under data protection law, be the controller for this information.

As part of this consultation we’re asking for your name and email address. This is in case we need to ask you follow-up questions about any of your responses. You do not have to give us this personal information. If you do provide it, we will use it only for the purpose of asking follow-up questions.

If responding for an organisation we are asking for the:

- organisation’s name for identification purposes
- the business of the organisation in order to better understand it’s relationship with smart chargepoints

DfT’s privacy policy has more information about your rights in relation to your personal data, how to complain and how to contact the Data Protection Officer.

Your information will be kept securely and destroyed within 12 months after the consultation has been completed. Any information provided through the online questionnaire will be moved to our internal systems within 2 months of the consultation end date.

Personal details
1. Your name and email address (only used if we need to contact you).

Your name: Anna Bonne

Your email: abonne@theiet.org

2. Are you responding as: *

☐ an individual? (Go to question 5)

☒ on behalf of an organisation?

Organisation details

3. Your organisation's name is?

The Institution of Engineering and Technology

4. Your organisation can best be described as:

☐ a transmission system operator?

☐ a distribution network operator?

☐ an energy company?

☐ an aggregator?

☐ a chargepoint operator?

☐ a chargepoint manufacturer?

☐ a consultancy?

☐ a software solution provider?

☐ an academic organisation?

☐ a local government or council organisation?

☒ another type of organisation not listed?

Professional membership organisation
Smart charging: aims and objectives

Smart charging of electric vehicles (EVs) can reduce the demand on the electricity system at peak times.

This means consumers can benefit from cheaper charging of their EVs, as costly electricity network and generation upgrades to increase electrical capacity at peak times can be avoided and the use of clean, renewable electricity increased.

Our aim therefore is to maximise the use of smart charging technologies, to benefit both consumers and the electricity system, whilst supporting the transition to EVs.

Our objectives are:

- grid protection: cyber security and grid stability
- consumer protection: smart interoperability, safety and data privacy
- consumer uptake
- innovation

5. Do you agree with:

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Why?

All elements listed above are crucial to the successful and rapid uptake of EVs in the UK. The market is at an early stage of development and therefore needs to be driven by government policy in order to achieve the demanding and ambitious targets for transport decarbonisation that it would not otherwise achieve organically.

Our comments on the reasons outlined in section 1.1 – 1.23 are as follows:
• There is a strong emphasis on smart charging to avoid times of system peak demand (which generally occur during winter weekday evenings – although generally later in the evening at the local network level (and might be at summer weekday daytime in central business districts). However, an increasing driver for the time of charging will be the (increasingly variable and sometimes volatile) electricity market spot price. Energy Suppliers and Aggregators - with the benefit of smart meters and half-hourly settlement - will seek to exploit flexibility in EV charging for day-ahead and intra-day markets through dynamic time of use tariffs. Aggregators might also seek to aggregate such flexibility for balancing mechanism products.

• It is likely that a DNO (Distribution Network Operators) signal will need to be introduced to ensure the local constraints are factored in. We are seeing evidence of good movement of EV users away from the peak with ToU (Time of Use) tariffs, only to introduce a new peak overnight, exceeding the daytime peak and pushing operation closer to equipment ratings.

• Section 1.19 defines interoperability (or smart interoperability) as meaning a consumer being able to switch chargepoint operator without the chargepoint losing its smart charging functions. Whilst appreciating the value to consumers of the right to switch chargepoint operators (assume a similar model to that for switching of energy suppliers is envisaged) safety and data privacy are matters that require specific focus. Later discussion in the consultation document appears to suggest a light touch consideration of both safety and privacy. Interoperability requirements also should extend to communications protocols such that legitimate chargepoint operators – and/or those that have a valid interest in chargepoint data (for example network operators monitoring local network demand patterns) – are able to meet their requirements. Use of the smart metering system may facilitate access by legitimate parties to data whilst providing cyber security, but this needs to be balanced against speed of deployment / market access.

• The grid needs to be robust for reasonably foreseeable changes in demand whether caused by intentional (consumer choice) or unintended (fault condition) physical change and by cyber initiated events. Section 1.16 notes that if large numbers of EVs start or stop charging simultaneously, this has the potential to create sudden spikes or drops in electricity demand that could cause issues with balancing. Whilst true, a greater concern is that such behaviour could destabilise the national electricity system and potentially lead to an event similar to that on 9 August 2019. Note that if just 250,000 EVs simultaneously began charging from 7kW chargers the shock to the system could be broadly equivalent to that on 9 August 2019 in terms of rate and extent of frequency fall.

• The points raised in the consultation document in respect of consumer uptake objective does not include any acknowledgement that smart charging solutions need to as a minimum offer the services that consumers with EVs require (not always a direct equivalent to services wanted).

• Whilst innovation can be stifled by barriers being put in place, innovation can also be harmed through a lack of certainty about underlying principles and rules.

• We would like to highlight that there are several years of experiential learning with real EV drivers in Britain: My Electric Avenue (2013-2016) and Electric Nation (2015-2019) that should be referred to.

Phased approach
We are proposing to take a phased approach to smart charging regulation.

In phase one, we will require:

1. new chargepoints to be smart
2. that smart chargepoints meet device-level requirements, including on cyber security and interoperability

In phase two, once we have the necessary evidence, we will set requirements for chargepoint operators beyond the device itself, to ensure that interoperability and security objectives are delivered.

6. **Do you agree with having a phased approach?**

- [ ] Agree (Go to question 9)
- [x] Neither agree nor disagree
- [ ] Disagree
- [ ] Don't know? (Go to question 9)

**Why?**

The market needs clear signals to move to smart charging as soon as possible. Device level requirements and cyber security need to be in place at the start for all new charge points. Consumers need to have the confidence in charging. We believe that issues with not having the charge when they want it will put off many new adopters and damage the idea of electric vehicles long term.

Defining device-level requirements will take some time and while this should proceed as quickly as possible, an early indication (as proposed in Phase 1) to ensure the market switches to smart charging is needed. The visibility of phase 2 will also likely encourage the market to be proactive in developing cybersecurity and interoperability solutions in anticipation of new requirements.

The current Phase 1 is difficult support - to mandate 'smart' without clarity on what 'smart' specification is - and whether that works in the future may be counter productive. The aim of delivering 'smart' to the market quickly is a good one - but legislation that does not adequately describe what is required may lead to an unlevel playing field and significant upgrade costs later, which are trying to be avoided. A minimum cyber standard should be developed, a communication protocol/spec should be developed and minimum functionality - the ability/cost of upgrading should form part of the standard - the paper sates that this is being developed by BSI - this needs thorough industry alignment and the timing to achieve this needs to be reviewed - it may all take too long for a phased approach - phase 1 to be valid.

There must be no unnecessary delay in moving to phase 2 given the importance of the objective. What would be unfortunate is a scenario similar to that with smart metering whereby a relatively large number of installed smart meters are to SMETS1 spec with limited interoperability and with potentially significant upgrading costs to achieve interoperability retrospectively.

We believe that 2025 seems way too long given: (1) the pace at which the OEMs are moving – price parity of new BEV’s to ICE between 2022-2024 and (2) the changes in BIK by HMT from 2020-22 effectively creating a buoyant second-hand BEV market from 2022. 2022-23 is likely to be a major tipping point.
Phased approach: your reasons

7. What alternative approaches to our phased approach would you suggest?

In reality we believe that it should be a continuum (i.e. overlapping phases) and 'Longer Term' (undefined) for phase 2 should be changed to 'as soon as reasonably practicable' but ideally couched in a numerical value (for example before 1 million smart chargepoints are installed) by which time any disadvantages from premature intervention in terms of detrimental impact on innovation should be negligible.

However a phased approach can be an effective approach to inform proposals for a long-term approach provided that sufficient time is allowed for evidence collected in the initial phase to be properly considered for decisions required in subsequent phases.

An alternative phased approach would be to continue with many more non-smart charging points to increase consumer confidence that they can charge their vehicles but then in the second phase update these charging points to smart with the added security features.

There is a need for clear objectives in respect of evidence gathering and how that information is proposed to be used to inform subsequent decisions.

8. What supporting evidence or analysis do you have?

The criticality of grid stability (not just the increasing challenge of real-time system balancing) needs to be given a high priority well before EV annual sales reach a level consistent with the Road to Zero objectives – and certainly before 1m BEVs have been acquired by users with home chargers (in light of comments under question 5 above).

Clustering effects will also be showing parts of the distribution network starting to suffer by (or way before) this volume – we’ve modelled all of WPD’s network as part of Electric Nation and might be able to define the scale of the challenge (I will need to check what is going into the public domain)

Definition of a chargepoint

The Automated and Electric Vehicles (AEV) Act defines a chargepoint (or "charge point", which is how it is set out in the Act) as a device intended for charging a vehicle that is capable of being propelled by electrical power derived from a storage battery (or for discharging electricity stored in such a vehicle).

We have seen examples of charging cables entering the market which include a built-in device that enables smart charging. We propose that the smart regulations should also apply to charging cables which contain a smart charging-enabling device.

9. Do you agree that the smart regulations should apply to charging cables containing a smart charging-enabling device?
Smart charging cables include many of the same software and hardware components as a dedicated charging point. To an end user, they are synonymous in their functionality and therefore, should be treated the same.

A public chargepoint is defined in the AEV Act 2018 as a chargepoint: "provided for use by members of the general public"

and this aligns with the definition used in the Alternative Fuels and Infrastructure Act 2017.

Our proposal would effectively mean that all private chargepoints would be within scope of the regulations. ‘Private’ is therefore likely to encompass:

• home chargepoints (in off-street and some on-street parking locations)
• the majority of workplace chargepoints

12. Do you agree with the proposal that all new chargepoints, except for public chargepoints, are smart?

X Disagree
It is essential that all public charging points eventually comply with the same requirements (at least AC chargers). Especially with regards to communication, cybersecurity and eventually smart charging functionality (for example, public on-street domestic chargers could represent a large proportion of overnight charging demand in some areas in the future and it is important that they can be controlled and managed in the same way as domestic chargers to ensure minimum adverse impact on the grid).

We would propose that Phase 2 should expand the requirement to all charging points, including public. Public charge points should not be exempt. While they need to charge instantaneously they also need to collect and manage data (remote start of charging/payment etc) and these should comply also so that the data set is complete. When a consumer connects to a public charging point they should specify their stay and charge required so the charging point can achieve this in the smartest way.

We agree that home and (some) at work chargepoints should be covered. However, if ‘at work’ chargepoints offer (say) a 7-hour day-time charge (e.g. 0900 – 1600 at 3.5kW) then it is questionable what a ‘smart’ function would achieve.

A similar argument would apply to transport transition hubs - e.g. park and ride sites, railway station car parks and airport medium and long-stay car parks - where ‘slow’ charging might be sufficient to meet the user’s requirements and with the charging generally occurring at times of day away from system peak.

An ideal mode of ‘smart charging’ at such locations might be to modulate the overall charging load so as to create a constant overall level of charging over the day. A more sophisticated form of smart charging at such locations might be to assess state of charge of each vehicle and duration of stay (i.e. if pre-booked) and apply a dynamic optimising algorithm to apply an optimum (i.e. as ‘flat’ as possible) overall charging demand profile.

For a new connection (e.g. in car parks, shopping centres, railway stations, work places, etc), there is an application [to the DNO] for new (or additional) demand, which could allow a range of options to be put forward to the connectee. This could range from a big fat cable, to a smart EV charging system and a smaller cable. This should be priced accordingly for the connectee, giving them the option to choose cost Vs capacity. It’s therefore a real market choice, with reflective costs for the party making the application.

There is a differentiation between ‘new connection’ load Vs ‘creeping’ load. For the creeping demand (like a residential property with a driveway), individuals can choose to install a charger, so long as it’s within their cutout rating and the installer makes the necessary notifications after the event. The After Diversity Maximum Demand (ADMD) of networks with EVs has been shown to double, which jeopardises the supply quality to other users, not just the party with the EV connection. It is therefore appropriate that these chargers are smart, as it protects the broader customer base, with an appropriate, targeted solution.

The definition of new chargepoints by exclusion of other types of chargepoints is not clear. The consultation appears to assume that all new chargepoints that are not available to the general public will be provided on a per dwelling basis. This would appear to preclude possible community based chargepoint solution options and multi-user facilities.

Regardless of the content of the final proposal, this should be clearly communicated to the industry ahead of time, ideally in Phase 1.
Types of chargepoint: your reasons

13. Do you think the proposal is:

☐ too restrictive?
☐ not restrictive enough?

14. What would you change in the proposal?

We believe that the proposal is neither too restrictive or not restrictive enough. It is about right in terms of overall degree of restriction, but should also consider the potentially useful role of smart charging at other charging hubs (see comments under 12).

15. What supporting evidence or analysis do you have?

40%-50% of households don’t have access to any off-street parking: https://www.racfoundation.org/assets/rac_foundation/content/downloadables/spaced_out-bates_leibling-jul12.pdf

Types of chargepoint: public chargepoint

Our proposed regulations would cover other important requirements for smart chargepoints, such as cyber security.

We therefore propose that, although we do not require public chargepoints to be smart, if a public chargepoint does have smart functionality then it must comply with the rest of the proposed regulations.

16. Should public chargepoints that are smart comply also with the regulations?

[X] Agree
17. Do you think there are elements:

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Why?

Public charging points should have the exact same requirements as private charging points. Creating different requirements will lead to confusion and fragmentation in the market. It may also lead to unintended consequences in how charging infrastructure is deployed or managed. The requirements should not apply to rapid chargers (DC) other than cybersecurity and data communication requirements.

Please also see comments under 12 above.

**Definition of a smart chargepoint**

Our proposed regulations would define the term 'smart chargepoint' as a chargepoint that must be:

1. communications enabled (able to send and receive messages)
2. able to respond automatically to a remote signal by adjusting the electricity consumption flowing through the chargepoint

18. Do you agree with our proposed smart chargepoint definition?

- [ ] Agree (Go to question 20)
- [X] Neither agree nor disagree
19. How do you think it should be defined instead?

The charging point needs to be able to manage its energy delivery for the consumer. So in addition to 1 and 2, the charging point needs to be able to accept requests from the consumer as to how much energy they require and the time over which it needs to be done by.

There is a need to clarify that a ‘remote signal’ might simply be a change of tariff rate. However, for system protection purposes such change of price signals must be subject to a random offset (which is already a requirement for the smart metering system). The necessary breadth of the random offset should be periodically reviewed to ensure it remains sufficient to protect the power system from shocks which could threaten stability.

More clarity is also needed around which parties permitted to send/receive messages.

Cyber security and data privacy

We propose a combination of:

1. outcome-based security requirements with an independent security testing assurance scheme

2. mandatory security characteristics and will reference the British Standards Institute (BSI) standards, these requirements would be mandatory, except where proven equivalent or higher security standards exist.

20. Do you agree with having outcome-based security requirements alongside technical security characteristics from the BSI standard (or a proven equivalent)?

- Agree
- Neither agree nor disagree
- Disagree
- Don't know? (Go to question 22)
Cyber security and data privacy: your reasons

21. Why?

Given the potential impact on electricity system stability of just a small fraction of the number of BEVs (Battery Electric Vehicle) ultimately anticipated to use home charging, cyber security is critical to prevent malicious or accidental interference with smart charging signals.

In addition, we would urge caution in separating out charging point requirements from the rest of the “system”. It is essential that cybersecurity and data privacy is guaranteed across the entire system, that could encompass: The vehicle, mobile phone applications, the charging point, charging point operator back office systems, any other systems such as those providing smart grid or energy market signals (e.g. aggregators).

Cyber security and data privacy: outcome based security requirements

We propose the outcome-based security requirements in the regulations are to:

1. protect the integrity of chargepoints through physical protections

2. protect operational interfaces of chargepoints and prevent use of non-operational interfaces

3. protect communications and messages sent from and received by chargepoints

4. protect firmware on chargepoints, and enable secure updates of firmware

5. protect electric charging, metering, payment charging and other functions of chargepoints (where applicable)

6. protect data held by chargepoints

7. ensure that messages sent to chargepoints are sent from a certified and trusted source

22. Do you agree with the outcome-based security requirements of:

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Why and what other requirements do you think are necessary?

Please see comments made in question 21 above. There is a need to make sure the whole system is considered not just the charging point.

23. Do you agree that chargepoints should undergo mandated security testing and assurance?

☒ Agree
☐ Neither agree nor disagree
☐ Disagree
Don't know?

Why?
We do agree with testing as it will help to protect the public and provide confidence. However if the testing is very onerous it could bias the solution to larger incumbent players who can afford to put their product through what would expect to be a rigorous security standard. We suggest a de-minimis level, say >5k units, where a lower security test may suffice.

24. Do you think any other data privacy requirements are needed from these regulations or through other methods?
Yes. See answer to Question 21 above. A whole system approach is required.

25. [For organisations that manufacture chargepoints only] Which of these outcome-based security requirements do you already comply with?

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Interoperability

We propose to require that the chargepoint is capable of retaining smart functionality if the chargepoint operator is changed without the need for a visit to the premises.

It is proposed that requirements around interoperability will form part of the BSI technical standard for chargepoints or that compliance with an equivalent standard could be accepted if it can be proved that it achieves the same outcomes.

In order to ensure that the interoperability outcome and compliance has been met, we propose to establish a certification and assurance regime.

26. Do you agree with the proposed requirement that the chargepoint must be capable of retaining smart functionality if the operator is changed without the need for a visit to the premises?

X Agree

☐ Neither agree nor disagree

☐ Disagree

☐ Don’t know? (Go to question 28)

Interoperability: your reasons

27. Why?

In principle we do agree, but there needs to be much more clarity about the commercial arrangements that would apply in respect of transfer of responsibilities between chargepoint operators.
It is not clear whether the proposed requirement assumes that the customer would have ownership (and therefore ongoing responsibilities) for the chargepoint installed at their premises. If this is the assumed position then this would need to be more clearly explained not least as part of the work to meet the Consumer Uptake objective. It is noted that previously the take-up rates for a customer energy meter ownership model was not strong and that ownership of the meter is most commonly by a third party.

**Interoperability**

28. Do you agree that compliance with a BSI standard combined with a certification and assurance regime could help ensure interoperability?

- [x] Agree
- [ ] Neither agree nor disagree
- [ ] Disagree
- [ ] Don't know? (Go to question 30)

**Interoperability compliance: your reasons**

29. Why?

We agree insofar as the provision goes (but see comments under Q5 above). As well as meaning a consumer being able to switch chargepoint operator without the chargepoint losing its smart charging functions, interoperability requirements should also extend to communications protocols such that legitimate chargepoint operators – and/or those that have a valid interest in chargepoint data (for example network operators monitoring local network demand patterns) – are able to meet their requirements. Use of the smart metering system would facilitate access by legitimate parties to data whilst providing cyber security.

However, we think that this approach could potentially lock out smaller players. Neither of the companies used on Electric Nation for smart charging have access to the smart meter system (as this was not deemed a necessary requirement).

There is a need to ensure that UK approach does not lead to UK only solutions; they need to line up with international standards too. It should be noted that the market players are responding to a global market, not the oddity of the GB smart meter deployment.

**Randomised delay function**

We propose including a requirement that all chargepoints have a function that randomly delays how quickly it responds to a signal over a period of time, in order to assist the electricity system with stability issues.

The randomised delay function should have a maximum delay of 10 minutes. This could be
overridden only if the chargepoint is responding to particular services that need very fast responses, such as frequency response services.

There may also be exemptions for any public chargepoints that are smart.

30. Do you agree that with the proposal that chargepoints should have a randomised delay function?

- Agree
- Neither agree nor disagree (Go to question 34)
- Disagree (Go to question 34)
- Don't know? (Go to question 34)

Why?

We agree however please see comment under Q19 above. The necessary breadth of the random offset should be periodically reviewed to ensure it remains sufficient to protect the power system from shocks which could threaten stability.

It should also be randomised throughout the country, not geographically allocated. The latter would cause voltage step change issues for customers connected to the distribution network between initiation of the smart charging signal and the transformer tapping up/down.

It is not clear from the consultation whether this proposal is supported by analysis of possible aggregated impacts on electricity distribution networks.

Randomised delay function: implementation

31. Do you agree that a randomised delay function for smart EV chargepoints should have a maximum delay of 10 minutes?

- Agree (Go to question 34)
- Disagree
- Don't know?

Why?

10 mins is acceptable from consumer point of view however the delay needs to be sufficient to prevent a risk to system stability (noting that just 250,000 EVs charging at 7kW could initiate a rapid fall in system frequency if they began charging simultaneously). Hence the potential effect
of several million (indeed potentially tens of millions) of EVs beginning to charge (or ceasing to charge) within a short interval of each other needs to be assessed. The potential fall and rate of fall (or rise) of system frequency is a function of system inertia and the speed and quantum of frequency response (noting that EVs themselves might be a future source of dynamic and/or static frequency response).

Again, it needs to be randomised across the country, not set in geographic blocks, which would cause local voltage issues.

Randomised delay function: maximum delay timings

32. What time period would you prefer?

☐ Below a minute
☐ Between 1 and up to 5 minutes
☐ Between 5 and 10 minutes
☐ Between 10 and up to 15 minutes
☐ 15 minutes and above

33. What supporting evidence or analysis do you have?

It is inappropriate to select an arbitrary value at this time. To determine the randomised offset requirement the required offset should be assessed from an in-depth study taking into account the future nature of the electricity system in terms of mix of generation under different conditions, times of day, times of year; the impact on system inertia, and the availability of frequency response and balancing services at such times.

Whilst it is recognised that an excessive offset might affect the accuracy of (say) an Energy Supplier’s trading position and its physical notifications to the ESO (and might also delay the speed of response for ancillary services unless the smart charging capability permits such ‘dispatch’ signals to bypass any random offset) the need to protect an increasingly unstable power system (due to a declining proportion of synchronous generation) is of paramount importance.

Any learning points from the 9 August incident should be carefully considered – as should ongoing evidence from ESO’s regular System Operability Framework reports.

Randomised delay function: alternatives

34. What alternative approaches do you believe could achieve the same outcome as the randomised delay function?
The randomised function is probably the most straightforward and reliable method for avoiding system shocks due to tariff period / price changes. However, smart charging might also embrace the exploitation of home EV charging flexibility for system balancing and static frequency response services (perhaps coordinated through an Aggregator). In such cases an offset would be inappropriate since an immediate response (especially for fast frequency response) is required. It follows that a dispatch (or stand down) signal to deliver a system service such as short-term operating reserve should be controlled and ramped if necessary through a control function.

For dynamic frequency response, control would ideally be through a frequency transponder built into the smart charger – in which case it would be necessary to prevent ‘hunting’ – i.e. chargers continuously switching between normal charging and reduced charging (or discharging if V2G enabled) with frequency rapidly oscillating either side of the target 50Hz. This might be achieved, for example, by having randomised frequency set points such that some smart chargers would initially respond, with further chargers responding only if the first (or second etc.) response failed to correct the frequency. Armed with this capability, smart chargers could also provide static fast frequency response – the randomised frequency set points then being broadly analogous to the differentiated frequency set points of low frequency demand disconnection relays – dependency on which might be beneficially reduced with such smart charging functionality.

The AC charging standard needs to be changed to allow the charging point to control the charge current of the vehicle. This will enable the charging point to control when and how much energy the vehicle is taking.

**Minimum charging current or power**

There are reported problems in some vehicles that if the chargepoint switches off completely, before the vehicle has finished charging, this could mean the vehicle doesn’t then restart charging.

In order to avoid this problem, we propose introducing a requirement that chargepoints should not reduce the rate of charge below a minimum amount of current or power when connected to the vehicle.

This requirement wouldn’t apply when the vehicle is discharging energy back to the grid through the chargepoint.

35. Do you agree that the regulations should include a requirement for a minimum charging rate?

- [ ] Agree (Go to question 37)
- [ ] Neither agree nor disagree
- [x] Disagree
- [ ] Don’t know? (Go to question 37)

**Against minimum**
36. Why?

It would be highly desirable to resolve the issue of some chargers failing to recommence charging once switched off before the EV has finished charging. It would seem counter-intuitive that a technical solution to this anomaly could not be found. Moreover, an EV charger might become de-energised due to other causes – for example a network fault (or perhaps a severe voltage dip). It follows that rather than compromise the protection of the grid and possibly cause significant inconvenience to EV users (who might not realise that the smart charger had stopped charging prematurely) a technical solution to the issue should be sought.

Note that we have evidence in Electric Nation of some makes/models of EV really struggling operating at low rates of charge – this would suggest a min threshold to ensure the smart charging solution continues to operate.

We believe that this needs further exploration with vehicle OEMs. The exact level of minimum charge rate should be carefully considered.

Minimum rate

37. What do you think is an appropriate minimum charging rate?

See 36 above. This should be discussed with vehicle OEMs.

38. How else do you think this issue could be addressed?

See 36 above. This issue may disappear as now generations of EVs enter the market. Better Battery Management Systems (BMS) in vehicles may be able to cope with charging starting and stopping with no issues in the future.

Default off-peak charging mode

We propose that domestic (home) chargepoints should be installed with off-peak charging as the default mode and that there would be a manual override of this default function.

This would not apply to non-domestic chargepoints.

Alternatively the chargepoint could reduce on-peak charging by default, so the EV would still charge but at a slower rate during peak times.

39. Do you think that chargepoints should:

☐ include a default off-peak charging mode?
include a default reduced on-peak charging mode?

X not include a either a default off-peak charging mode or on-peak charging mode? (Go to question 41)

☐ another option of your choice?

Why?

Most if not all electric vehicles incorporate charging timers that are specifically designed to allow off-peak charging (In addition, most if not all EVs have timers that allow the vehicle to be heated and cooled or remotely via an App for example, allowing the vehicle to be heated/cooled before the driver gets in). Whilst default settings can be an effective tool to encourage behavioural changes, it should be noted that “off-peak” is not a fixed period of time. Off-peak time periods vary not just from BST to GMT but also from 4 hours to 10 hours and we would expect there might be many other regimes in the future.

The approach should be to educate, incentivise and encourage EV users to adopt charging behaviours that both meet their needs and protect the efficiency and integrity of the electricity system based on strong marginal cost reflective tariff rates (embracing both energy production and use of system marginal costs) and system service revenue opportunities coupled with AI.

Moreover, it should be recognised that for many EV users, the most convenient (and beneficial from a power system perspective) time to charge might be during the daytime if the EV is at home (for example a family ‘second’ car) when real-time electricity prices are lower, networks are generally more lightly loaded and any home microgeneration might otherwise be exporting.

**Default off-peak charging modes: timings**

40. What time should be the specified off-peak or on-peak period?

N/A

**Safety**

We propose that chargepoints and their installation should be required to be safe.

To meet this outcome, chargepoint sellers and installers should have due regard, where relevant, to the safety framework of:

1. Electricity Safety, Quality and Continuity Regulations
2. IET Wiring Regulations (BS 7671)
3. IET Code of Practice for Electric Vehicle Charging Equipment Installations
4. Electric Vehicle Conductive Charging System standard (BS EN 61851)
5. Highways and Electrical Registration Scheme (for installations on a public highway)
6. the Low Voltage Directive and Electrical Equipment (Safety) Regulations
7. the Electromagnetic Compatibility Regulations the Health and Safety at Work Act
8. Building Regulations

41. Do you agree that regulated chargepoints should be required to be safe by having due regard to the safety framework?

[X] Agree
☐ Neither agree nor disagree
☐ Disagree
☐ Don't know? (Go to question 43)

Safety: your reasons

42. Why?

It is clearly inappropriate to expose residents to unnecessary risk, therefore chargepoints should not be outside of existing safety frameworks. A lot of energy flows when charging a vehicle and there is much opportunity for hazards and safety issues. Moreover, incidents related to ‘unsafe’ practices would create adverse publicity which might well have the effect of delaying the transition.

Safety

43. What other safety requirements do you think should be included in the regulations including why?

There should be readily available (or even unavoidable) publicity material guiding EV users as to safe EV charging practices - for any form of private or public charging. This would logically include safe deployment of charging leads (e.g. avoiding creating trip hazards) and regular maintenance of customers’ charging leads and plugs.

For example, one unsafe practice that might arise for homes without off-street parking is that of draping charging leads across house frontages and footpaths.

Consideration is also required for wireless charging safety standards.
44. Beyond existing regulations, do you think there are safety factors that are not being sufficiently considered in relation to EV charging?

- [x] Yes
- [ ] No
- [ ] Don't know?

What and why?
See 43 above

Vehicle to grid (V2G) and other advanced smart charging

Vehicle to grid (V2G) solutions could provide significant benefits for the electricity system, as well as potential revenue streams for consumers and service providers, in a world where EVs are widespread.

Making smart charging the norm for EVs can help to facilitate the notion of V2G as a consumer option, but equally, a prescriptive approach could hamper its development.

We are keen to ensure that any smart charging regulations provide adequate space for vehicle to grid solutions to continue to develop or restrict other types of advanced smart charging.

45. Do you agree the regulations should provide adequate space for V2G and other advanced smart charging solutions to develop?

- [x] Agree
- [ ] Neither agree nor disagree
- [ ] Disagree
- [ ] Don't know?

Why?
To support the increased demand (not only EVs) on the electricity supply grid V2G opportunities should be made available.

We agree that providing space to develop is correct but a prescriptive requirement is not. System service revenue opportunities (for example see Q34 above) can be secured by exploiting flexibility in terms of time and/or rate of charging. V2G merely extends the potential quantum of the service offered but does so at the expense of a more expensive charger (i.e. it needs to incorporate an inverter). V2G also has the disadvantage of potentially shortening battery life (due to repeated cycling) and may also require network protection measures (e.g. loss of mains protection).

V2H (i.e. discharging but not exporting to the grid) might be a more practical development.

<table>
<thead>
<tr>
<th>46. Do you believe that there should be specific requirements in the smart charging regulations for:</th>
<th>Agree</th>
<th>Neither agree nor disagree</th>
<th>Disagree</th>
<th>Don't know?</th>
</tr>
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<tbody>
<tr>
<td>V2G solutions?</td>
<td>❌</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>other advanced smart charging?</td>
<td>❌</td>
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Why?

See 34 and 45 above.

We agree however regulations should not inadvertently prevent innovations in this space by introducing too stringent requirements at this early stage of development. The market / providers should have some freedom to experiment with options. There is a need to understand the electricity licensing arrangements that may apply to large V2G service providers before any regulations are put in place. We do not believe that there is sufficient evidence at this moment in time to inform introduction of specific V2G requirements.

**Monitoring and recording EV electricity consumption**

We propose that the chargepoint must:

1. monitor and record the electricity consumed and exported
2. monitor and record the time the charging event lasts
3. provide a method for the consumer to view this information
47. Do you agree the regulations should include a requirement to:

<table>
<thead>
<tr>
<th>Agree</th>
<th>Neither agree nor disagree</th>
<th>Disagree</th>
<th>Don't know?</th>
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<tbody>
<tr>
<td>✔️</td>
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<tr>
<td>✔️</td>
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**Why?**

Whilst these are important parameters to monitor and measure, it is important not to incur unnecessary expense in duplicating the inherent functionality of a smart meter (from which aggregated half-hourly time-series import and export volumes can be readily derived). A smart meter will summate all imports and exports (but not the charger alone) and this summatated demand profile is what is most needed by network operators. Identifying the power flows to (or from) a charger might be necessary for some system services functions – e.g. to be able to monitor response to a dispatch signal and for revenue settlement purposes – for example in respect of flexibility-based network congestion management services for DNOs or short-term operating reserve for ESO.

All records should be based on individual charge events. Each event should be defined by a continues signal / command. i.e. if a charge event is continued but power has been reduced due to a signal, this should be recorded as a sperate event. This will result in a very detailed bill (similar to the half-hourly energy tariffs at present) that will enable scrutiny.

The data should be available via a mobile App.

48. Do you agree the chargepoint must provide a method for the consumer to view information related to monitoring and recording?

- [ ] Agree
- [ ] Neither agree nor disagree
- [ ] Disagree (Go to question 50)
- [ ] Don't know? (Go to question 50)

**Why?**

As with other types of fuel purchase transaction (e.g. traditional fuelling station), it is reasonable to assume that the consumer would expect to be able to view the electricity consumed/exported data. Additional information should be provided through a smarty meter or indirectly from the Charge Point Operator or via their mobile App.
Monitoring and recording EV electricity consumption: format

49. What format do you think should be required for the consumer to view the information?

We would suggest the following methods in this order of priority:

1. Mobile App (more useful, with the user, cheaper, more configurable to a wider audience (e.g. Accessibility modes, etc, etc), more future-proofed)
2. Wireless connected meter / in-home device (gets lost / thrown in a drawer, not easy / cheap to change)
3. Website – however we believe there will be a lack of appetite to view data through this method.

The information should be displayed should include time in hr:mm:sec and energy in kWhrs. A per transaction total figure would also be needed. With electronic facilities, historical trend information (price, usage) is also value to consumers.

Enforcement authority and penalties

50. Do you agree that the Office for Product Safety and Standards should be the enforcement authority for the regulations?

[X] Yes

☐ No

☐ Don't know?

Why?
We agree in respect of the chargepoint itself and we are not aware of other bodies that could take on this role. However, the relevant authority would be responsible for other safety standards and regulations – e.g. the examples prior to Q41 above.

51. Do you agree that the penalty for non-compliance should be a fine for each chargepoint sold and installed?

[X] Agree
Neither agree nor disagree

Disagree

Don't know?

Why?

A fine is appropriate approach to help compliance, however the level should also reflect the standard or regulation breached (ref. e.g. the examples prior to Q41 above).

Time for compliance

It is anticipated that chargepoint sellers or installers will need time to adapt their stock of chargepoints to comply with these requirements.

We are minded to bring the regulations into force 12 months after they are laid in Parliament.

52. How long in your opinion should sellers and installers have to comply with the requirements once the final version has been published?

☐ Up to 6 months

☒ Up to 12 months

☐ Up to 18 months

☐ Up to 24 months

☐ More than 24 months

53. [For chargepoint companies only] What do you think would be the impact on your business of a 12 month time for compliance?

N/A

54. [For organisations only] What modifications to your existing products would you need to make in order to comply with these requirements including testing for security and interoperability?
Other considerations

55. Will any of the suggested proposals in your opinion:

- disadvantage people with protected characteristics, as defined by the Equality Act 2010?
  - Yes
  - No
  - Don't know? ❌

- cause other equality issues?
  - Yes
  - No
  - Don't know? ❌

Explain any issues and potential solutions you may have.

The AEV act provides us with the powers to ensure that chargepoints ‘achieve energy efficiency’.

56. Do you think we should include specific energy efficiency requirements for chargepoints?

- Yes ❌
- No (Go to question 58)
- Don't know? (Go to question 59)

Specific requirement: your view

57. What specific requirements and why?

It is important that customers understand energy efficiency ratings of home chargepoints – particularly for V2G or V2H types (where inverter losses might be a factor). The requirement should be to provide a clear label (similar to white goods energy efficiency) that states the efficiency as % and a rating, e.g. A+++.
Prescribed limits for harmonic (and DC) injection should also be adhered to – including such that network companies are able to ensure the planning limits prescribed by ENA ER G5/4-1 (and any subsequent revisions) can be maintained at an economically viable cost.

**Against specific energy efficiency requirements**

58. Why not?

N/A

**Other considerations**

59. How do you think our proposals will affect:

<table>
<thead>
<tr>
<th>consumers?</th>
<th>Consumers need to understand the way they refuel their vehicles needs to change and this proposal will help them understand they need to cooperate with the electricity supply. Smart charging will enable customers to secure lower energy and use of system charges – and also create the potential for revenues (or offsetting allowances against energy charges) for providing system services. Overall, smart charging should help secure lower electricity bills for all consumers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>chargepoint manufacturers?</td>
<td>Setting out common and minimum requirements should help create a level playing field (and help prevent loss of market share to chargepoint providers offering cheaper but unsatisfactory alternatives). It will increase the technology in chargepoints but all the technology is currently available.</td>
</tr>
<tr>
<td>distribution network operators?</td>
<td>Help encourage EV users to avoid local network peak demand periods and also provide a basis for DNOs to secure network congestion management services from EV chargers.</td>
</tr>
<tr>
<td>energy suppliers (and wholesalers)?</td>
<td>Provides functionality that could help Suppliers to more accurately balance their positions at gate closure and provide opportunities for day-ahead and intra-day trading.</td>
</tr>
<tr>
<td>chargepoint operators?</td>
<td>Helps provide for the functionality that will enable access to a range of markets – including energy, system balancing and other system ancillary services.</td>
</tr>
<tr>
<td>local government?</td>
<td>Provides an opportunity to support economic local energy planning by enabling exploitation of inherent flexibility in EV charging.</td>
</tr>
<tr>
<td>national government?</td>
<td>Will help achieve Road to Zero and Net Zero objectives – e.g. by better temporal alignment between EV charging with low carbon generation production.</td>
</tr>
<tr>
<td>other, in your opinion, relevant parties?</td>
<td>An obvious omission is ESO who might be able to secure additional and more effective system services (e.g. through Aggregators) at a time of increasing challenges in terms of system balancing and maintaining system stability.</td>
</tr>
</tbody>
</table>
60. What supporting evidence or analysis do you have?

Comments:

Most of the above are self-evident benefits but well publicised examples include: DNO flexibility platforms; Innovative customer service options (such as Octopus Agile); The London Mayor’s ‘London EV Infrastructure Delivery Plan’; National Grid (ESO) Future Energy Scenarios; System Operability Framework; and System Needs and Product Strategy. All of these challenges are beneficially influenced by smart EV charging.

Call for evidence: smart charging long-term approach

61. Do you agree that, to implement a long-term approach to smart charging by 2025, we need to make a decision between 2020 and 2022?

- [ ] Yes
- [ ] No (Go to question 63)
- [ ] Don’t know? (Go to question 64)

Why?

A decision needs to be made as soon as possible, by end of 2020. However even 2025 is potentially too late – there is a risk of stranded investment in first generation EV infrastructure which might compromise interoperability and overall functionality - a potential situation analogous in some respect to SMETS 1 smart meters. A longer-Term plan should be in plan as soon as is reasonably practicable.

The recommendations from the Electric Vehicle Energy and Energy Data Task Forces should be carefully considered in terms of critical timescales.

The proposed timeline should allow time for evidence from the Phase One implementation period to be fully considered in order to inform Government decisions in respect of the long-term approach.

Call for evidence: preferred timeline agreement

62. What is your preferred timeframe for a decision?
Call for evidence: preferred timeline disagreement

63. What is your preferred timeframe for a decision?

- 2020
- □ 2021
- □ 2022

Call for evidence: preferred timeline evidence

64. Supply any evidence of the impact that an earlier or later decision could have?

ADD

Comments:

Clearly to some extent the critical timing will depend on how quickly EV transition begins to take off. However ideally this should be sooner than 2023. As stated in Q61 above, the decision should be informed by the recommendations (and MoSCoW analysis) from the EV Energy Task Force’s final report.

Call for evidence: preferred timeline factors

We propose to use the objectives of:

- grid protection: cyber security and grid stability
- consumer protection: smart interoperability, safety and data privacy
- consumer uptake
- innovation

as factors to determine the preferred timeline.

65. Do you agree that these factors are the correct criteria to consider in determining a decision point?
Agree

Neither agree nor disagree

Disagree

Don't know?

Why?

These are critical success factors. Note however that innovation will be continuous: it would be a mistake to wait for a given level of innovation to have occurred; rather future-proofing (avoiding lock-in) to allow for innovation should be the objective - in other words an agile methodology to enable continuous improvement.

Call for evidence: using smart meters for EV charging

66. Do you believe that the smart metering system, with appropriate modifications and improvements, could offer a viable solution for the smart charging of EVs?

Yes

No

Don't know?

Why?

Smart meters are not a great example of an effective smart technology. There still many issues with reliability and communication. In our opinion there are issues with the smart meter approach:

1. Impact on competition. The smart meter infrastructure plays into the hands of incum-bent energy suppliers and is difficult to access by other market players. There is a huge amount of customer focused innovation happening in the industry (Ohme, Kaluza, EV.Energy, PodPoint…). None of the infrastructure (i.e. EV chargers, back end systems) to support this innovation integrates with smart meters for many good technical reasons; BEIS would effectively be stifling these efforts.

2. Lack of demand from industry.

3. There is concern over handing over the role of EV load control to a centralised monopoly interest, the Data and Communications Company (DCC). This seems an unnecessary incursion of Government into a space which is currently rife with investment and customers are already reaping the rewards through better services and lower bills.

4. The overall message about centralised government plans to restrict charging through smart meters could undermine OLEV's efforts to promote EVs for the good of the
public’s health and the climate. Some smart charging providers are already launching their products on a message of putting customers in control.

5. There are already significant difficulties being faced by the DCC to implement existing SMETS technical functionality. Until the core functionalities are delivered upon, it seems inappropriate to extend the scope of the DCC’s role further.

6. We understand that the security arrangements of smart meters are considered robust. However rather than let this sole benefit dictate a favoured technical solution, perhaps it would be better to specify or recommend security arrangements, practices or standards to guide the industry. Conforming to these standards, if deemed necessary, could be mandatory.

67. In your opinion how do you think would the smart meter system needs to be improved in order to meet customer expectation of smart charging and what would be required to do this?

From a customer view point, the system is essentially sound as a foundation for some aspects of smart charging but there might need to be enhancements in terms of latency and volumes of data communication.

68. In your opinion what would be the implications of the UK not considering relevant international standards by requiring the GB smart meter system for smart EV charging?

In practical terms the risk is that manufacturers will not want to build to a UK specification when there is a much larger international market adopting common standards.

Call for evidence: alternative options

We want to collect evidence on what other options could also be viable, with the aim of meeting the objectives of:

- grid protection: cyber security and grid stability
- consumer protection: smart interoperability, safety and data privacy
- consumer uptake
- innovation

69. Do you think that the alternative approach described in the consultation could deliver our objectives on smart charging by 2025 with similar outcomes to the smart meter system regarding:
70. Do you think there are other approaches that could deliver our objectives on smart charging by 2025 with similar outcomes to the smart meter system on:

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Don't know?</th>
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</thead>
<tbody>
<tr>
<td>cyber security?</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>interoperability?</td>
<td>X</td>
<td></td>
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</table>

Which approaches?

Alternative options could be to have a chargepoint interface point that is more aligned with an energy metering interface point. For example, this could include:

- Viewing the chargepoint unit at the premises as an “appliance”
- Treating the connection infrastructure between the energy supply and the chargepoint as a “network”
- Treating the connection infrastructure within the premises as a “customer”

Also see Q69 above.

71. Supply any evidence you have on these approaches including how much time you think developing the approach would take and what costs may be incurred?

ADD

Comments:
72. What are your views on smart charging via the vehicle rather than the chargepoint and how do you think government should approach regulating this area?

From an electricity system (and especially network) perspective there are benefits in retaining the smart functionality within the chargepoint as this forms a fixed-point interface with the electricity network. There are also some smart cables with a GPS location built in. Applying smart charging via the vehicle might have some advantages in terms of simplified billing for the customer if 'roaming' electricity billing facilities are developed – but having no fixed location would make it impracticable to include smart charging as part of (say) an Aggregator’s portfolio serving a network congestion management contract.

Alternatively there might be ‘smart’ functionality built into the vehicle that would complement smart charging at chargepoints – for example based on state of charge and anticipated mileage before next charging opportunity.

If smart charging was via the vehicle the relevant standards would need to be in place. The vehicles have all the hardware and software to manage this at the moment, they just need the communications protocol. Smart charging via the vehicle could reduce the cost of the charging points.

Call for evidence: smart meters the current lead option for a long-term solution

73. Do you agree that the use of the smart meter system for smart charging should be the preferred option for Phase Two?

[X] Agree

☐ Neither agree nor disagree

☐ Disagree

☐ Don't know?

Why?

Smart metering system is a credible option provided the necessary upgrading for data capacity (communications and storage) is undertaken and provided legitimate parties are not excluded from access to the system (though access for control purposes would need to be very carefully coordinated through a systematic approach). We do not agree that such a proposal should be progressed until smart metering system issues are more fully resolved.
This approach should not preclude other communications and data handling solutions provided the necessary standards and protections are demonstrated as sufficient.

Also see comments for Q66.

**Call for evidence: using the powers in section 14 of the AEV act for transmission of data relating to chargepoints**

We believe having access to accurate chargepoint data, such as geographical and live consumption data, could help ensure better electricity network planning, resulting in a fairer deal for energy consumers.

This data, combined with information on network capacity availability, could help to plan strategic chargepoint infrastructure deployment to encourage uptake of EVs.

We would use the powers in section 14 of the AEV Act to create regulation which ensure the relevant parties have access to the information needed.

**74. What do you think could be the:**

- **benefits of introducing regulations under section 14 of the AEV act?**
  
  This may provide powers specific to EV charging (but might also duplicate some powers already available through Electricity Act Instruments and Industry Governance Codes)

  Companies hold and curate data, which they attach great importance/value to - this should be made available to third party information providers so they are able to help the consumer with free charging point locations and state of operation (working/none working) this information also needs to be in a standard form so the EVs themselves can access it.

- **disadvantages of introducing regulations under section 14 of the AEV act?**

  Creates a second source of legislative powers which might lead to confusion.

**75. Do you agree with our views of the minimum data to be made available?**

- [x] Yes
- [ ] No
- [ ] Don't know?
What do you think should be added or removed?

We generally agree, but this needs further justification through CBA and risk analysis. The need for ‘real-time’ data will not be universal: it might be required as part of a system service provision contract (to measure volumes delivered – e.g. DSR) but granular time-series data might be sufficient for some purposes – including network planning.

---

76. What do you think should be the criteria used to determine when the regulations relating to section 14 of the AEV act should be introduced?

We can see no reason to delay the introduction the regulations albeit the regulations might need to be reviewed and amended from time to time in light of experience and the impact of innovation (which the regulations must not be a barrier to). A further factor is to ensure the regulations are not inconsistent with existing licence obligations (e.g. on ESO, Energy Suppliers and DNOs).

---

77. How do you think we should implement the regulations relating to section 14 of the AEV act?

Implementation needs to be in conjunction with existing Industry Governance framework (code review bodies).

---

78. What, in your opinion, data privacy considerations will be affected and how do you think they could be resolved?

Data can be made anonymous as only the charging point would know the consumer from the RFID or app connection. Reference to the work undertaken for the smart meter programme is relevant in terms of data protection (privacy and anonymity). There may also be issues of commercial confidentiality and care will need to be taken that an over-zealous approach to data privacy doesn’t disadvantage consumers by precluding better tariff products informed by monitored energy usage patterns (including EV charging patterns) and that over-protection for commercial confidentiality / IPP doesn’t act as a barrier to effective competition.

---

79. Who, in your opinion, should have access to this data?

The following are examples rather than an exhaustive listing. In all cases need and benefit should be demonstrated as a prerequisite for access:
• CPOs (which might include Energy Suppliers, Aggregators, or other licensed entities such as on-traditional business companies and service (rather than energy per se) companies.

• DNOs (including IDNOs) for network monitoring purposes and possibly active constraint management – also for monitoring service performance where a flexibility contract has been agreed.

• ESO (and parties acting on their behalf) for monitoring charging patterns / ramp rates and ancillary service performance.

• Other entities such as OEMs or infrastructure providers for diagnostic information and possibly firmware upgrades.

This data should be anonymised and made open source for all to accelerate and further innovation.

80. What processes should be in place to safeguard data access?

Data should be encrypted, with companies applying for a certificate to read it.

81. Do you have any other comments about using section 14 of AEV Act to create regulations?

No

Final comments

82. Any other comments?

Reference has been made in this response to other potentially beneficial roles for smart charging (see 12 above) and consideration should be given to extending the scope accordingly (or to implementing a parallel initiative in respect of smart public charging).

There is a need for many, many more charging points, and the consumer needs to know they will be able to charge their vehicles when they need to. This knowledge will overcome range anxiety. Smart charging to some extent is opposite to this knowledge but smart charging is required to enable the grid to support the number of charging points. Smart charging needs to be carefully sold to the consumer so they see the benefit as being reliable charging for their vehicle. Consumers will then adopt and embrace the new technology and the infrastructure and UK will benefit in the background.
Government needs to be aware that provision of charging systems is an international market, and we must make sure that as the UK we test our approach on things like security and interoperability against approaches being taken in other fast growing markets, and only diverge our standards and regulatory model where there is a very clear justification.

Our national temptation to specify everything ourselves needs to be weighed against the risk that diverging could ultimately cost the UK consumer more money and put our supply chain at a disadvantage.

If more ambitious targets for EV uptake are not set there is a danger that other countries will quickly overtake us in terms of pace of deployment, which means our scope to influence globally will be further reduced.

We would also like to note that this consultation document doesn’t include any reference to smart charging technologies and interactions with local solar PV production. For the owners of a solar PV installation it is significantly economically beneficial to minimise solar PV export. This can be difficult to do as solar production can be highly volatile. There are a number of commercially available devices that “divert” excess solar production for water heating. They do this by converting ac to dc and varying the output from ~0W to 3000W. Solaredge operates globally and is launching a product very soon that will introduce the same concept to vehicle charging. We also understand that Marlec Engineering is developing such a product.