SEC Modification Proposal Form – SECMP0046

Mod Title

Allow DNOs to control Electric Vehicle chargers connected to Smart Meter infrastructure.

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Details of Proposer	
Name:	RICHARD HARTSHORN
Organisation:	Scottish and Southern Electricity Networks
Contact Number:	01189 534163
Email Address:	Richard.hartshorn@sse.com
Details of Representative (if applicable)	
Name:	BOB HOPKINS
Organisation:	Scottish and Southern Electricity Networks
Contact Number:	01738 512930
Email Address:	Bob.hopkins@sse.com

1. What issue are you looking to address?

The forthcoming predicted increase in the uptake of Electric Vehicles (EVs) will bring an accompanying increase both in quantity and rating of domestic chargers.

This risks overloading the “last mile” low voltage circuits (known as feeders) from secondary substations to the individual properties.

Some method of controlling this load is necessary to alleviate the potential overload of these circuits.

2. Why does this issue need to be addressed? *(i.e. Why is doing nothing not an option?)*

It is likely that clusters of domestic EVs will begin to appear in the next few years, increasing the demand on low voltage networks. This has the potential to lead to the fuse blowing and/or overheating of the cables supplying these areas, leading to power outages for all households connected to those feeders. Typically, a single feeder could serve up to 100 properties. Supply restoration may take from around an hour (to attend site and replace the fuse) but may require extensive work to provide a long-term capacity increase which could take several weeks.

The conventional method of dealing with this problem is to reinforce the DNO networks by installing new fuses, entire transformers and/or replacing the underground cables supplying entire streets – all with the associated cost and high level of disruption.

Previous work has estimated that the potential savings from having smarter solutions to this problem is £2.2 billion. A number of studies have shown that managing the charging of EVs at times of network stress can defer or negate this cost, including the My Electric Avenue project, which reported extensively on the potential benefits of smart charging. Since then, many studies have highlighted the benefits, and even necessity, of smart charging as the UK decarbonises transport (e.g. Electric Nation interim results, Aurora Energy Research, National Grid Future Energy Scenarios).

Due to the localised nature of the problem that DNOs face at a street level, it is considered essential that this action is taken by the DNO rather than other parties (e.g. supplier or aggregator) in order to be able to respond quickly and minimise the complexity of the process.

3. What is your Proposed Solution?

The Automated and Electric Vehicles Bill currently going through Parliament mandates that charge points shall have the capability to respond to external signals i.e. be ‘’smart’. The project work undertaken behind this modification proposes options for the definition of that smart functionality. The solution may ultimately be incorporated as an ENA Engineering Recommendation or secondary legislation.

There are a number of potential solutions involving Smart Meter infrastructure that may achieve the desired outcome of the ability to modify EV charging load within a household. We envisage that the specifics of the solution will be worked up during the modification process, however, at this stage we have briefly assessed the feasibility of two main options:

1. Use of Home Area Network (HAN) Connected Auxiliary Load Control Switches (HCALCS) to temporarily disconnect EV chargers from supply or use of HCALCS to provide a binary "signal" to inform a smart charger to reduce the charging rate.

2. Pass signals to a HAN-Connected Smart Charger which has the ability to vary the rate of charging in response to a parameter passed to it.

This modification seeks to permit DNOs, through the DCC, to issue a command to an EV charger via the HAN.

DNOs are best placed to take this action as, at a street level, customers are likely to be supplied by multiple Import Suppliers, which would make it technically and commercially cumbersome if DNOs could not take action directly. DNOs having direct control will also improve speed of response.

It is proposed that the DNOs would monitor the load flowing through the low voltage feeders at substations previously identified as "high risk", and a signal would be raised when this load approaches an ''at risk level''.

This signal would be translated into an instruction to curtail EV charging on the chargers connected to the feeder. This instruction would be transmitted through the DCC Systems to the SMETS2 communication hubs on the feeders. The signal would change the status of the HCALCS or the HAN-Connected Smart Charger to reduce the charge rate – thereby protecting the feeder and ensuring all customers on the feeder have their electricity supplies maintained.

An impact assessment has been carried out to establish the likely frequency and timescale of any curtailment applied to domestic EV chargers and the impact is expected to be negligible. A typical example is extending the charging duration by ten minutes on four occasions annually led to a 20% increase of EVs that could safely charge from the local network. Due to the expected rarity of event, we consider the best approach is for DNOs to take real-time control of HCALCS/HAN-Connected Smart Charger when necessary rather than using, for example, scheduled commands.

4. What SEC objectives does this Modification better facilitate?

This modification facilitates SEC Objective 5:

- the fifth General SEC Objective is to facilitate such innovation in the design and operation of Energy Networks (as defined in the DCC Licence) as will best contribute to the delivery of a secure and sustainable Supply of Energy.

5. What is the requested Path type?

Path [2]-Authority Determined

The SMART EV project led by SSEN on behalf of all UK DNOs is examining options to manage the anticipated large increase in network load brought about increased ownership of electric vehicles.

The project seeks to examine a number of options exploring their technical and commercial viability.

The proposal satisfies one or more of the criteria for a Path 2 Modification and Path 2 is therefore requested.

The changes are likely to have a material impact on DNOs and their ability to manage load on their networks.

6. Are you requesting that the Modification Proposal be treated as Urgent?	[No]

EV uptake is increasing rapidly and DNOs are concerned that without timely intervention, clusters of EVs will lead to localised power outages. This could occur in the next few years.

7. What is your desired implementation date?

Studies have estimated that around a third of low voltage circuits will need intervention by 2030, which equates to over 300,000 individual network reinforcement projects. However, it is difficult to estimate when the first issues will be seen due to the effect of clustering.

There is concern that should a solution not be available within the next 2-3 years, DNOs may need to resort to unpopular measures to maintain supplies (e.g. use of Diesel generators or asking customers not to charge their vehicles).

It would be beneficial if the timing of this modification coincided with the mass rollout of SMETS2 infrastructure.

8. Which SEC Parties are expected to be impacted? (Please mark with an X)

Large Supplier Parties	x	Small Supplier Parties	x
Electricity Network Parties	x	Gas Network Parties	
Other SEC Parties	x		

This Modification Proposal is complemented by the availability of EV chargers designed to a specification which is yet to be fully determined. This would form part of wider effort, under the powers granted by the Automated and Electric Vehicles Bill, to define and implement this specification. EV charger manufacturers will therefore be affected by this proposal as it will directly determine product features.

As specifically relates to the potential option to use HCALCS to modify EV charging rate - at present HCALCS are a Supplier-controlled function and support only activating or deactivating a switch (rather than varying consumption through the switch). This proposal may involve the use of HCALCS but does not seek to change their specification.

Adding the capability of DNO control for low voltage network protection purposes would only have an impact when this network protection facility has been activated.

This network protection facility will likely impact on suppliers' commercial arrangements with the consumers, and so whilst Energy UK have been involved in all aspects of this project it is anticipated further discussion will be required.

9. Which parts of the SEC will be impacted?

- Schedule 8: Great Britain Companion Specification (GBCS) – New Use Case would need to be added for DNOs' access to HCALCS and to control output value;
- Appendix AD: DCC User Interface Specification (DUIS) – New Service Request Variant required to configure the electric vehicle charger output value and DNOs' access control;
- Appendix AF: Message Mapping Catalogue (MMC) – New response notifications will need to be created;
- Schedule 9 : Smart Metering Equipment Technical Specifications (SMETS) – New command required to configure or reduce HCALCS output;
- Appendix R: Common Test Scenarios;
- Appendix E: DCC User Interface Services Schedule

10. Will there be an impact on Central Systems? (Please mark with an X)

DCC Systems	x	Party interfacing systems	x
Smart Metering Systems	x	Communication Hubs	
Other systems			

We anticipate dialogue with the various parties within the SEC would be necessary to fully establish the central system impacts.

The main impact it is envisaged will be on the use of the DCC infrastructure to both receive and transmit signals from and to the appropriate equipment.

11. Will there be any testing required?

DCC will be required to conduct DCC Systems testing to ensure that the Access Control for DNOs to new or amended Service Requests works and that any revisions to the Service Requests and GBCS Commands are implemented to specification.

Given that there are no SMETS HCALCS currently available, and that this Modification Proposal changes the design of HCALCS (to regulate output), it is likely that emulators will be required if implemented in the near future.

It is anticipated that there would be User Systems testing required if DNOs were granted access to new or amended Service Requests.

12. Will this Modification impact other Energy Codes?	[Yes]

Further discussion would be required to fully clarify the impact of this modification on other codes.

There may be some impact on DCUSA due to charging being constrained and displaced to an alternative time.

BSC possibly impacted as Supplier Balancing and Settlement is impacted. Supplier's imbalance positions under the BSC may well be affected.

13. Will this Modification impact Greenhouse Gas Emissions?	[No]

While this proposal would limit peak electricity flow on low voltage feeders to protect the network, once the constraint is released the vehicle would continue to complete its charging cycle hence there would be no overall impact on greenhouse gas emissions.