Charge HQ

Energy Security Board
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Re: Energy Security Board: Electric Vehicle Smart Charging Issues Paper Consultation.

Charge HQ thanks the ESB for the opportunity to respond to the questions raised in the Issues Paper on Electric Vehicle Smart Charging.

We're an early-stage company actively enabling smart charging for hundreds of EVs in residential settings in response to rooftop solar output, wholesale prices and the level of renewables on the NEM. We are firmly focused on user-centric solutions which both avoid peak demand problems from EVs but also actively support accelerated adoption of renewables.

Charge HQ currently supports control of charging via OCPP-compliant smart chargers or by connected vehicles.

Question 3: ESB understands that most EVSEs on the market today come with smart charging as a minimum functionality – is this the case or do stakeholder see this as still an emerging functionality?

We believe that the majority of EVSEs being installed today do not have support for remote control, and are thus not "smart" assuming that definition. We are seeing a mix of dumb chargers (without the ability for control by third parties) and solar-aware chargers (also without the ability for third-party control), with limited consumer focus on OCPP-enabled devices.

OCPP chargers currently have limited uptake by residential consumers in Australia. This is likely due to somewhat higher prices than dumb chargers and (until recently) the lack of any residential-focussed OCPP smart charging systems such as Charge HQ. Most consumers are not aware of OCPP as there has been no way for them to benefit from a charger which supports it.

Given the current dominance of Tesla in the local EV market, a significant number of vehicles are capable of smart charging via direct vehicle control.

Question 4: What are stakeholder views regarding the adoption of these standards in the Australian context? Do stakeholders consider the OCCP1.6(J) the most appropriate international standard to adopt? Are there any additional standards or options that should be considered in the short term?

If a standard is to be adopted, Charge HQ supports the adoption of OCPP1.6(J) as the most appropriate standard at this time. It is widely supported by vendors of commercial charging equipment and is making its way into residential chargers.

However, our support comes with some qualifications:

OCPP implementations are not all the same

Our experience with residential chargers that support OCPP shows significant variation in implementation from one vendor to another. There is variation in how much of the standard is implemented and in the accuracy of intended support. In addition, the OCPP1.6 specification leaves a lot of room for interpretation, and different chargers may respond to commands and events in different ways and yet still be considered compliant with the specification.

Differences encountered by our testing include, but it not limited to:

- Variable levels of support for the power control (Smart Charging Profiles) component of OCPP, including no support at all.
- Differences in the status reported by chargers, e.g. when the cable is unplugged from the EV some chargers report a status of Finishing whilst others report Available.
- Differences in the order of messages transmitted by the chargers, or in the sequence of state transitions.
- Variation in the telemetry provided by the charger, e.g. some chargers report voltage whilst others do not. The only telemetry metric mandated by OCPP is charge session energy, although it provides for many other metrics.
- Variation in the frequency of telemetry updates, e.g. some chargers provide updates every 30 seconds, others only every 5 minutes.
- Variation in configuration options. Different chargers may have different names for the same option, or may not support particular options at all.
- Inconsistent behaviour when offline. Some chargers can be configured to allow charging whilst offline, others may not. The OCPP1.6 specification does not go into much detail regarding offline behaviour.

These differences mean that a particular charger model which claims support for OCPP may not actually be compatible with a given CPO system, unless integration work is performed. Material amounts of work are required (by a CPO or similar) to discover, implement and maintain support for a range of such chargers to facilitate smart charging.

The ambiguity in the OCPP specification also means that CPO system developers and OEMs may disagree over what constitutes “correct” behaviour by a charger. OEMs may be reluctant to change their charger’s OCPP behaviour for fear of breaking compatibility with existing partner CPOs. Conversely, CPOs may be unwilling to modify their systems to accommodate the behaviour of a particular charger due to the added complexity and possible conflict with compatibility with other chargers.

Chargers are developed for commercial use

The vast majority of existing OCPP chargers have been developed for commercial use rather than residential. This has guided the development and testing of their OCPP implementation and functionality. The use cases for commercial charging are quite different to those of residential charging. As a notable example, a residential smart charger must support repeatedly stopping and starting charging without unplugging the vehicle. For example, charging may be stopped during the evening peak, started during the off-peak period, then stopped again during the morning peak. Such a use case is not typically encountered in commercial charging, which usually involves drivers plugging in, charging, then unplugging and leaving. The OCPP specification allows for charging to be repeatedly stopped and started but does not mandate support for it.

Charge HQ has tested several OCPP compatible chargers which do not support repeated stopping and starting. This lack of support may be deliberate or simply a bug which has never been discovered in the commercial context. These chargers will require firmware changes by the manufacturer before they can be declared compatible with residential charging systems such as Charge HQ.

Consumers would not accept a charging system which could not restart charging after being stopped by a third party, so chargers which did not support this function would not be suitable for use in a residential smart charging system, despite being technically compliant with the OCPP specification.

Commissioning of chargers

The OCPP specification does not cover how chargers should be configured to connect to a CPO system (managing backend), nor how they can be switched between CPO systems. Charger manufacturers are free to develop their own approaches to configuration.

The process of connecting a smart charger to a CPO system varies significantly: some are quick and user-friendly whilst others require advanced technical knowledge and more time. Some chargers can be configured or switched between CPO systems remotely however most can only be configured by someone physically close to the charger. Some even require a licensed electrician during the commissioning process.

The issue of switching between CPO systems is somewhat analogous to the issue of porting mobile phone SIMs between networks and is a critical consideration in the development of any standard or regulation.

Security

OCPP1.6 has a basic and fairly weak security provision. In a commercial context this is often not a problem because communication occurs over a secure network connection, eg private SIM card. In the residential context communication is most likely to be over the household WiFi internet connection, which is less secure and must be considered an untrusted network.

OCPP1.6 has been extended with additional security mechanisms, eg Client Side Certificates, however these are optional and not supported by some charger models.

Suggestions

Despite the above constraints, if a standard is to be adopted, we maintain support for OCPP due to its existing widespread support by OEMs and offer the following suggestions for consideration:

- An extension or amendment to the OCPP1.6 specification could be developed for the Australian residential context which clarifies various points and resolves ambiguities that are significant for residential smart charging. This could include specifying minimum security provisions. This extension would remain compliant with OCPP1.6 whilst narrowing the scope of “correct” behaviour. OEMs could then ensure that their chargers are compatible with this extended specification, CPO developers would have less variability to deal with, and consumers could have more confidence that the hardware they are buying is fit for purpose.
- OCPP2 should be investigated to learn if it addresses some of the ambiguities in the OCPP1.6 specification. Charge HQ has not performed an in-depth analysis of OCPP2 for this purpose and does not necessarily recommend adopting OCPP2 in preference to OCPP1.6 at this time; instead we recommend further investigation. We also note that many OEMs have been slow to adopt OCPP2 in their products.
- The issue of commissioning chargers and switching between CPOs should be discussed with industry and possible improvements explored.

As outlined in our response to Question 9, we suggest a focus on supporting innovative commercial approaches to maximise the deployment of smart chargers which engage in smart charging activities on an ongoing basis.

Question 5: Is there a need for EV to EVSE communications (such as ISO 15118) to be minimum functionality, alongside the communications protocol from the Charge Point Operator to the EVSE (such as OCPP)? The ESB welcomes stakeholder views on why this might be necessary.

EV to EVSE communications (such as ISO 15118) may add support for various features, including:

- Ability for the charger (and thus CPO system) to know the vehicle state-of-charge (SoC).
- Ability for the charger to securely identify the vehicle, and vice versa.

The ability to access the vehicle SoC is useful in the context of charging orchestration as it allows for features such as the user setting a minimum SoC required by the morning. This can provide more flexibility in shifting the charging load whilst ensuring the user's charging needs are met as the CPO system has more information.

In the context of residential charging the ability to identify the vehicle is of fairly limited use, since the identity of the vehicle is generally not important in terms of managing the charging load at the household. However as more charging occurs outside of the household, for example at the workplace, there may be more utility in being able to identify the vehicle which is plugged in.

At this stage, although it may be useful and Charge HQ would take advantage of it, we do not consider ISO 15118 (or similar) to be required functionality for a residential smart charging system.

Question 9: What are stakeholder views in regard to the use of CPOs for residential charging? What are stakeholder views on which parties (Traders (retailers, aggregators), DNSPs, OEMs, and other parties) should be able to take on the function of CPO? Should the requirement for a CPO be mandatory?

We don't believe a CPO should be mandatory nor that material restriction should be placed on who can take on the role of a CPO.

Smart Charging of EVs is a global problem which we believe will attract innovative solutions from private enterprises which succeed because they're embraced by consumers.

Charge HQ's position is that the most effective means of achieving high penetration of smart charging is to focus policy on measures which make it easy to access value from control for all participants (consumers, networks, generators, retailers and OEMs).

This may include - ongoing adoption of Time of Use tariffs, ease of access to remuneration for network augmentation services, and the ability to participate in demand response programs at the residential level.

Question 17: The ESB welcomes stakeholder views on the issues raised in respect of residential charging, including whether there are further issues that should be considered?

With the very high levels of rooftop solar found in Australia, our observation is that the local market for smart charging focuses much more on solar charging than has been seen overseas.

The ability to utilise excess solar energy efficiently will in most cases require charging speeds of 3.6 kW or higher, so that the maximum amount of solar can be consumed when it is abundant. Avoiding a situation where large numbers of EV owners charge from regular 10 Amp outlets over extended charging periods will greatly improve the utilisation of renewable energy for EV charging.

EV charging appears to most household batteries like any other household load, causing the undesired effect of one battery (the household battery) being used to charge another (the EV). This also limits the availability of home batteries to reduce grid demand during peak periods. EV charging systems with household battery awareness can help mitigate this problem.

Centralised control of charging purely through the lens of minimising peak demand on the grid may miss a larger opportunity of behind-the-meter optimisation which improves the grid's hosting capacity of renewables by maximising the self-utilisation of rooftop solar, home battery systems and EV charging flexibility.

Ongoing engagement

Charge HQ would welcome any opportunity to continue to support this process and share insights from our involvement with end users and industry participants.

Regards,

Andrew Rogers
Co-Founder