Smart Charging Process Evaluation

Process Evaluation of the Electric Vehicles (Smart Charge Points) Regulations 2021

Charge Point Market Review

Report produced by Ricardo and Thinks Insight & Strategy for the Department of Energy Security and Net Zero

Completed by Ricardo and Thinks Insight & Strategy for the Department for Energy Security and Net Zero prior to the recent general election in the United Kingdom in July 2024. As such, any references to government policies, commitments, or initiatives may reflect the stance of the previous administration and were accurate at the time of fieldwork and writing.

Executive Summary

The scope of this review focuses on household and workplace electric vehicle charge points launched in the UK market from the first half of 2020 to the second half of 2022. The objective of this market review is to understand the market response before and after implementation of the Electric Vehicles (Smart Charge Points) Regulations 2021 ("the Regulation").

The information on charge points containing the associated features outlined in the Regulation (see Table 4-1) was collected from desk-based research and specifically from manufacturers' publicly available websites. The information is therefore 'self-reported' by manufacturers, and not necessarily fully compliant with the specifics within the Regulations under each feature. The information is presented based on the release date (to the UK market) of the specific charge point, and aggregated into half year intervals (e.g. with 2021 H1 representing January to June 2021, and 2021 H2 representing July to December 2021). The proportion of new charge points released to the UK market claiming to have all associated features (as self-reported by the manufacturers) has increased from 11% (in 2021 H2) to 28% after the 30th June 2022 enforcement date (in 2022 H2) and then to 94% in early 2023 (in 2023 Q1).

Figure 0-1 Total number and share of new private charge point models released per period into the UK market with all associated features enforceable before and after 30 June 2022 enforcement date, organised by charge point release time periods[1]
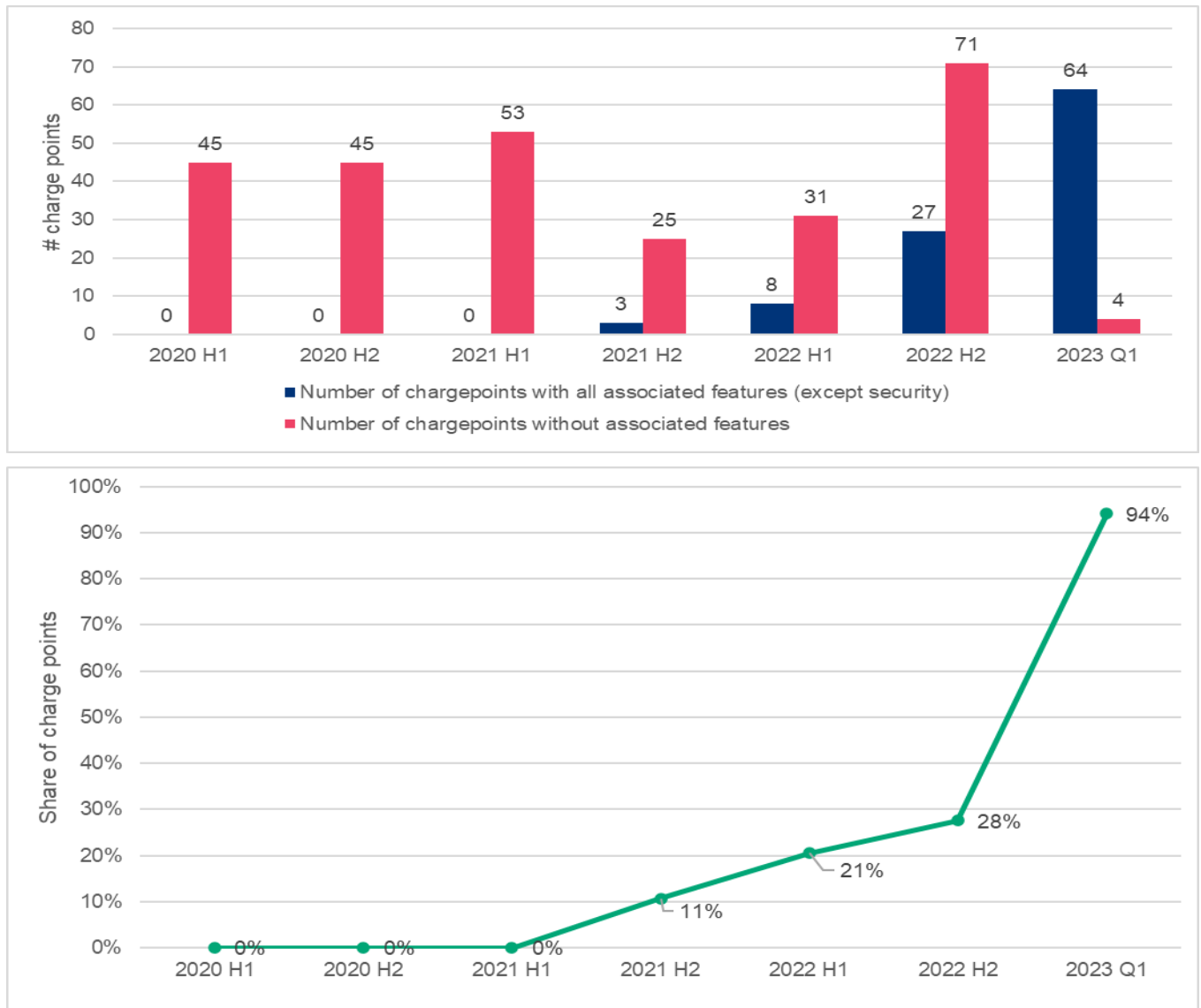

Note: 2023 Q1 covers up to March 2023. 2023 Q1 includes new charge point models released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

Of the self-reported information collected on the associated features in the Regulations, the user interface (100%), pre-set default charging hours (99%) and the measuring / monitoring system (94%) were the most present features (as self-reported) in new charge points released to the UK market in 2022 H2 (after the 30th June enforcement date, Figure 0-2. The randomised delay functionality (54%), safety provisions (52%) and continued charging (when connection drops, 52%) were the least common self-reported features as per the 30th June enforcement date. The security standards (5%) had not been well adopted by the market to 2022 H2, however it is noted that this feature was only mandatory after the 30th December

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[1] Note 1: H1 refers to the months of that year January to June, and H2 refers to the months July to December. 2023 Q1 is up to March 2023.

enforcement date. Further analysis in 2023 Q1 found that of new and updated charge point models released between December 2022 to March 2023, 91% (62 out of 68) self-reported to contain security requirements and all associated features in the Regulations.

Figure 0-2 Proportion of the latest charge point models (2022 H2) self-reporting associated requirements (n=98)
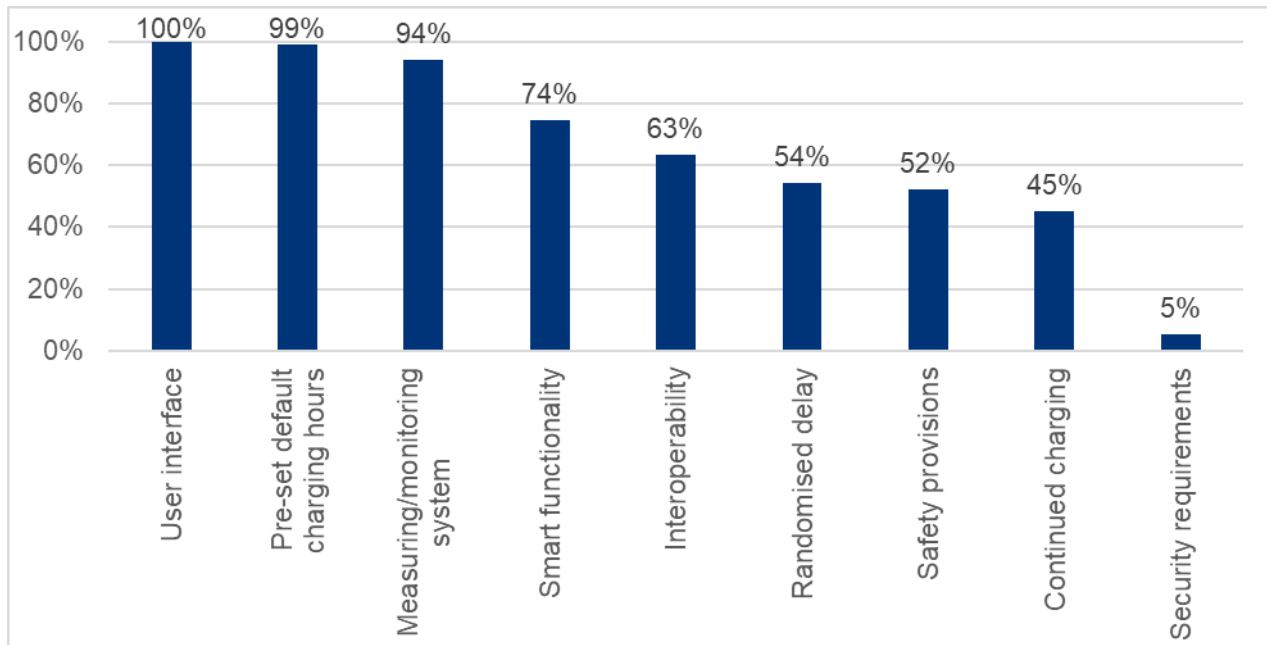
As stated above, the information is correct to March 2023, which comprised of information collected in two stages by desk research. The updated research looks at the features of charge points released from December 2022 to March 2023, specifically self-reporting of the security standards (enforceable from 31 December 2022), and understanding how the market has reacted to this feature. The recent charge points (released to the UK market in 2023) were reviewed to understand if manufacturers have updated their recent products to bring them into compliance with the new security features required.

The additional research on security requirements found that 58 out of 68 charge points models released in 2023 Q1 were mostly updated versions of existing products, which had undergone either software updates or hardware updates or a combination of the two. Most charge point manufacturers did not report on specific security requirement features; however, based on the limited information that was available, it was found that passwords, software, sensitive security parameters, and secure communications features were the more common features self-declared by manufacturers in over 30 charge point models. Security log and provision of information features were one of the least common features based on self-declaration.

The analysis has found that the mean average price of charge points for end-users has decreased by around 31% from 2020 up until the 30th June 2022 enforcement date. However, during the period of implementation of the Regulations, the average cost of single-phase charge points is observed to have increased by around 7.8% compared to 2022 H1. For three-phase charge points there was an increase of 35% compared to the costs in 2022 H1. Overall, there was a fall in prices of newly release charge point models in 2023 Q1 associated with

manufacturers becoming familiar with the Regulations. However, there is some evidence to suggest that updates to existing charge point models to comply with the security requirements in the Regulations have increased the price of these to consumers. Nonetheless, these charge point models still have a comparable price point with new charge point models which are collectively still below prices in 2020. It is also worth noting that the implementation of the Regulations commenced at a time of supply chain issues following COVID-19, and high inflation associated with the Ukraine-Russia war which could have also influenced product prices.

Lastly, a comparison was conducted on a small sample of 12 charge point manufacturers grouped evenly by business size (small, mid and large), to look for any differences in their responses to the Regulations. The sample suggested that large size manufacturers could be more likely to discontinue their products, compared to medium and small size manufacturers that are more likely to update and release new products in light of the Regulations. Additionally, small size manufacturers generally transferred the additional development and product costs to consumers by increasing their charge point selling price while fewer large and medium size manufacturers did so.

Contents

1 Introduction

This smart charging market review was completed as part of a Process Evaluation covering the implementation of the Electric Vehicles (Smart Charge Points) Regulations 2021. The scope of this review focuses on household and workplace electric vehicle charge point models launched in the UK market from the first half of 2020 to the first quarter of 2023. Charging cables that draw power from standard 3-pin electric sockets, and smart cables which connect charge points with vehicles capable of transmitting power and information are not included in the scope (although smart charging cables are included in the Electric Vehicles (Smart Charge Points) Regulations).

All charge points models in the scope can be purchased either directly from manufacturers or via approved distributors, installers, or retailers in the UK. The objective of this market review is to understand the market response before and after implementation of the Electric Vehicles (Smart Charge Points) Regulations 2021 ("the Regulation"). The Regulation mandates all new charge point models sold in the UK after the implementation date to be compliant with the requirements listed in the regulation. The Regulation is implemented in two stages with most requirements coming into effect for the second half of 2022 (stage 1), and the security requirements coming into effect at the later date of 30th December 2022 (stage 2). Key metrics such as charge point price and requirements stipulated in the Regulation are analysed in time series with half-year intervals.

2 Data collection methodology

The database of household and workplace charge point models currently being sold in the UK was collected from desk-based research of publicly available information. The list of manufacturers was compiled using the list of manufacturers from the Delta-EE's EV Charging Player Database[2] in combination with the approved residential charge point model list[3] to create a referencing database (cross-checked with OPSS list of manufacturers) . Therefore, the majority of charge point manufacturers operating in the UK market are thought to have been captured in this review. In some instances, charge points and manufacturers appearing in the referencing database are excluded where the manufacturers were found to have discontinued and terminated the product sale.

The information was in the first instance collected from the manufacturer's websites (correct from November 2022). Where not stated on the manufacturer's website, the cost information was collected from third-party websites[4]. The release date was in most cases taken from the date specified on the technical specifications, and the majority of the features were also taken from the technical specifications. Some manufacturers also provide regulation compliant

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[2] EV Charging Research (delta-ee.com)
[3] Residential authorised charge point model list - GOV.UK (www.gov.uk)
[4] The third-party sellers for charge points where some prices were obtained include cef, voltaev, RS components, electrical2go

statements to declare their charge point models have the associated features in the Regulations, these compliant statements were also reviewed in the process.

2.1 Limitations of the methodology

The methodology described above provides a rapid review of publicly available information and provides a snapshot of the UK charge point market covering a wide range of manufacturers and their associated products. This review is based on the information provided publicly by the manufacturers, and therefore is only as reliable as this public information. The consultation phase of the Process Evaluation cross-checked some of the details of this market review with manufacturers directly, although this was only conducted on a small sample size as discussed in the main report.

Self-reporting of functionality: The key limitation of the methodology used is the reliance on information made public by the manufacturer. Manufacturers may be less likely to announce certain aspects to the public if consumers are unlikely to be interested. For example, some consumers might not perceive the randomised delay function in the Regulations as a value-adding feature, and therefore manufacturers would not prioritise mentioning such feature on their product. On the other hand, manufacturers may report the presence of some functionality which may not be fully compliant with the Regulations. This review has not taken steps to verify all self-reported functionality and therefore there may be cases of over and under reporting of certain charge point model functionalities. This report therefore provides an overview of self-reported charge point model functionality, but readers should keep in mind this limitation. There will be some opportunity to verify charge point information with manufacturers in the stakeholder engagement part of the project commencing in January 2023, however this will only include a limited sample of manufacturers.

Missing price information: Another limitation from this analysis is missing price information. Most manufacturers do not sell their charge points directly to consumers as the charge points need to be installed by a certified electrician, as stipulated in the Building Regulation in England for the installation of electric vehicle charge points or cable routes[5]. Manufacturers can also reach a wider proportion of the market by selling through retailers or distributors. The charge point unit plus installation costs also depends on the complexity of the installation and whether additional work is required to install the charge point. Thus, most manufacturers supply charge point units to distributors and electricians without publicly disclosing the unit price, with very few manufacturers publishing the recommended retail price of their products or selling their products online with unit and installation cost as a bundle. Therefore, the cost information provided in this analysis should be taken as an indicative price only, and not represent the true cost of purchasing and installing a charge point. Averages in costs for charge point models have been taken across a wide time period (i.e. half year) to allow for limitations in cost information to be (potentially) averaged out.

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[5] Infrastructure for charging electric vehicles: Approved Document S - GOV.UK (www.gov.uk)

Reliability of e-commerce data: This research has not included charge point models sold on e-commerce platforms (i.e. Amazon, eBay) as it is not always clear whether these charge points have already been used and are being resold as second-hand. Second-hand and used charge points are in scope of the Regulations, however if the seller does not sell charge points as a business, then the seller does not fall under the Regulations.

> The data presented in this market review does not relate to compliance of the charge points and associated features, but only indicates whether the manufacturers have publicly stated that the product contains a particular feature. For example, a product may have a user interface, but this may not be compliant with the Regulations. In this case, the charge point model is deemed to have the particular feature (user interface), and the details of the features have not been checked against the details for the given feature as per the Regulations.

3 Available Private Charge Points

The Ricardo market database (Appendix 1) included 308 charge point models produced by 66 manufacturers, as collected through desk-based research mainly from manufacturers publicly available websites. The Ricardo market database is comprised of 190 single-phase charge point models (61.6%) supplying households and 118 three-phase charge point models (38.3%) supplying workplace and depots.

> Most UK households and end-user infrastructure can support single phase charge point installation without substantial modification to their existing power infrastructure as the maximum charge point output is the same as the electricity mains supply at 230V. Three-phase charge points have a higher output of up to 415V and require additional electrical modifications when installing to existing power infrastructure. Consequently, three-phase charge points have a higher maximum output of 22kW while single-phase has 7.4kW. Three-phase connections are more common in industrial and commercial buildings due to the higher load requirements, which three-phase charging can support.
>
> For charge point connector types, Type 2 connectors are commonly used in electric vehicles in the UK and Europe and recommended by the EU, while Type 1 connectors are the common connection type in North America. Both Type 1 and 2 connectors support alternating current (AC) charging. CHAdeMO connectors are commonly found in direct current (DC) charge points with the ability to support bi-directional charging where energy stored in the electrical vehicle batteries can be delivered to the electricity grid, and vice versa. Type 1 connectors are 5-pin, whilst Type 2 are 7-pin.

94% of the charge point models in this analysis have Type 2 connectors and the rest are Type 1 and CHAdeMO connectors. Both Type 1 and 2 connectors can come in a socketed or tethered cable version but not all manufacturers produce both connection types or

tethered/socketed cable versions (as shown in Figure 3-1). A number of manufacturers offer Type 2 to Type 1 adapters if they only offer charge points with Type 2 connectors.

Figure 3-1 Number of charge point models available (from desk-based research) with different cable options (2020 H1-2022 H2)
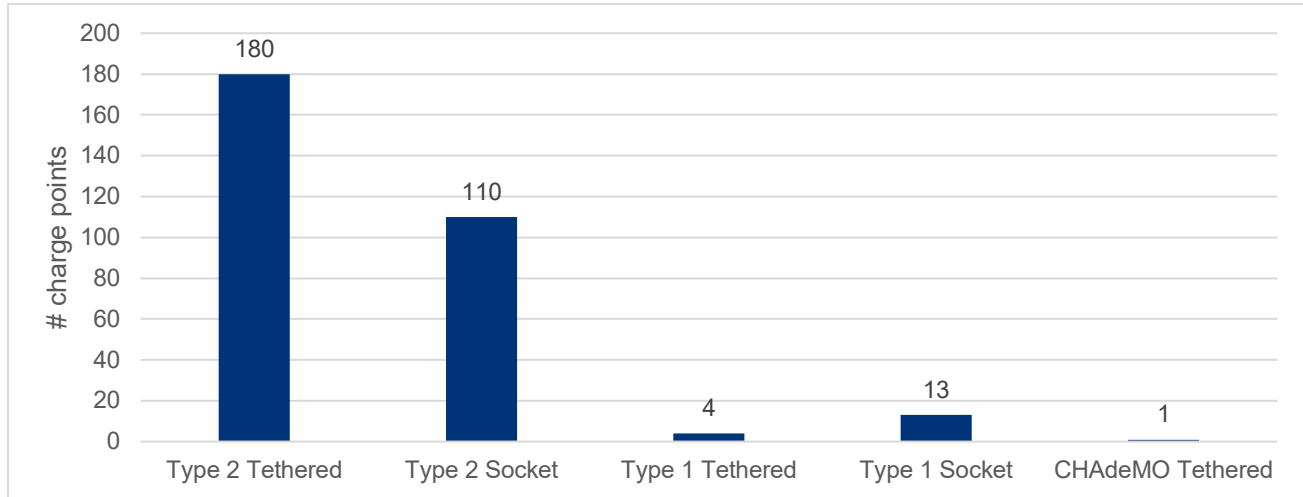

Figure 3-2 shows the variations in charge point models release timeline by every half-year. This is expected as different charge point manufacturers have their own product launch and update timelines, resulting in differences in charge point models numbers across time periods. The fall in number of new charge point models released in the second half (H2) of 2021 (July-December) may be related to the publication of the Regulations consultation response and draft legislation in the first half (H1) of 2021 (January-June) with manufacturers postponing launches to enable reworking of their products. The latest charge point models released in 2022 H2 would have to comply with the Regulations, which came into effect from 30th June 2022 for all new charge point models sold in the UK, with the security requirements of the Regulations coming into effect in 30th December 2022.

Figure 3-2 Number of charge point models released to the UK market over time 2020 H1 – 2022 H2
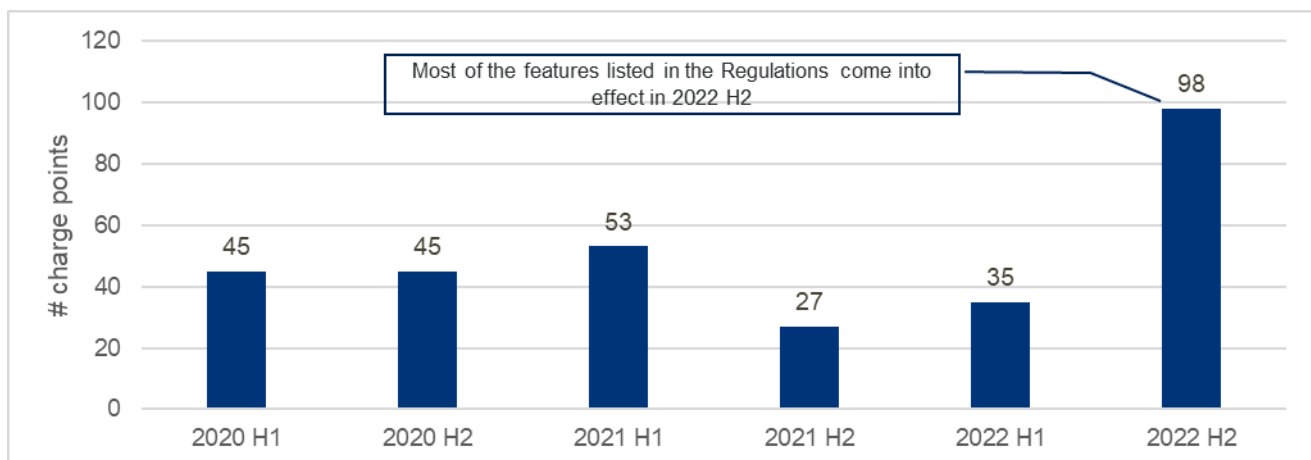
Note 1: H1 refers to the months of that year January to June, and H2 refers to the months July to December.

Note 2: 2022 H2 only covers charge points release between July 2022 to November 2022

Regarding charge point model connectivity features, Wi-Fi is the most common connectivity mode with 200 charge point models (64%) offering such mode (for charge point models released between 2020 H1 and 2022 H2), followed by Ethernet with 180 charge point models (58%). 113 charge point models (37%) support one or more cellular connection standards (e.g. 4G, 3G, GSM) and 104 charge point models (34%) support Bluetooth connection. In terms of multiple connectivity, 101 charge point models (33%) only offer a single connectivity option while the remainder support more than one connectivity options.

4 Analysis of Market Trends

4.1 Smart charging features

This section analyses the share of new charge point models with the specific features outlined in the Regulations. This provides a market snapshot of the levels of charge points which have the associated features (Table 4-1) and how the features of new charge point models have changed over time with a time-series analysis. The data was split into six categories based on release date.

Table 4-1 Specific charge point model features and requirements under the Regulations

Feature	Compliance description
Smart functionality	Charge point model is able to send information via a communications network Charge point model is able to respond to signals or other information received by it by: (i) Increasing or decreasing the rate of electricity flowing through the charge point (ii) Changing the time at which electricity flows through the charge point The ability for charge points to use functionality stated above to provide demand side response services including response demand side response services
User interface	Charge point model point has at least one user interface, incorporated in the charge point or otherwise made available to the owner
Energy supplier interoperability	Charge point model is configured such that is will not cease to have smart functionality if the owner changes their electricity supplier

Continued charging if comms network drops	Charge point model is configured such that, in the event it ceases to be connected to a communications network, it will remain capable of charging an electric vehicle
Safety provisions	Charge point model is configured such that it will not allow a relevant person to carry out a specified operation where to do so would or may result in a risk to the health or safety of persons.
Measuring /monitoring system	On each occasion it is used, the charge point model measures or calculates: (i) The electricity it has imported or exported (ii) The amount of time for which it is importing or exporting electricity
Pre-set off peak/ default charging hours with options to change	The charge point model: (i) Has pre-set default charging hours which are outside of peak hours (ii) Offers the owner the opportunity to accept, remove, or change the default charging hours on first use (iii) Offers the owner the ability to change, remove, or set default charging hours any time after first use
Randomised delay functionality	The charge point model is configured such that it must operate, at each relevant time, with a delay of random duration up to 600 seconds, determined to the nearest second each time
Security standards	Security requirements consistent with certain requirements extracted from partials of multiple industry standards including cyber security standard ETSI EN 303 645 and also the standard for energy smart appliances PAS 1878. For example, charge points must incorporate a security log to record security-related events such as attempts to tamper with the charge point, which is derived from PAS 1878 and not ETSI

Source: [Complying with the Electric Vehicles (Smart Charge Points) Regulations 2021 (publishing.service.gov.uk)](publishing.service.gov.uk)

The analysis presented in this document only addresses the associated features (as self-reported by the manufacturers) within the Regulations and does not aim to understand if the presented features are compliant with the Regulations. The information provided in this review is based on publicly available information only. (See Data Collection Methodology section above for further details)

4.1.1 Charge point models with all associated requirements (except security requirements)

The Regulations came into effect following a two-step approach, with the majority of requirements coming into effect in 30th June 2022 and the security requirements enforced from 30th December 2022. The enforcement date for the security requirements was put six months after the smart functionality requirements after industry feedback at the consultation stage requested a longer period to develop and incorporate necessary hardware changes.

There were 25 charge point models released after the Regulations were first announced (i.e. from 2021 H2), and only three models (12%) self-reported including all of the associated features outlined in the Regulations. The share of charge point models which have the 30th June 2022 requirements has risen steadily since the Legislation laying date. However, since the Regulations came into effect from 30th June 2022, only 28% of new charge point models were self-reported to contain all smart functionality requirements (Figure 4-1). In the analysis of charge point models released in 2023 Q1, this value rose to 94% (excluding the security feature).

Figure 4-1 - Total number and share of new private charge point models released per period into the UK market with all associated features enforceable before and after 30 June 2022 enforcement date, organised by charge point release time periods[6]
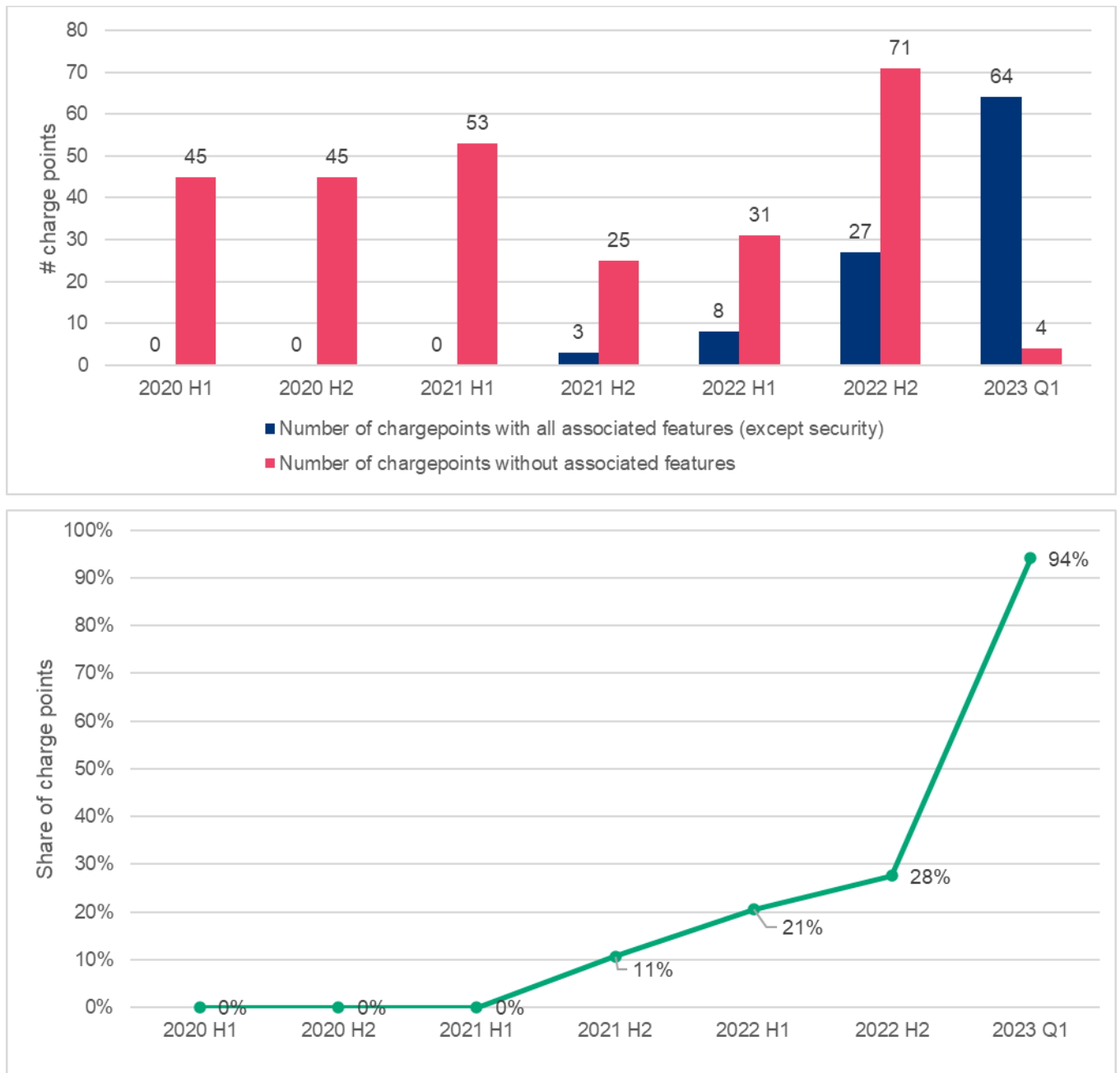
Note: 2023 Q1 covers up to March 2023. 2023 Q1 includes new charge point models released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

4.1.2 Associated charge point price

The price data for charge points in the Ricardo database includes the charge point unit and installation cost where these are provided by the charge point manufacturers. In some cases when manufacturers do not disclose their recommended retail price in the public domain, the

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[6] Note 1: H1 refers to the months of that year January to June, and H2 refers to the months July to December. 2023 Q1 is up to March 2023.

price information was obtained from charge point retailers instead. Manufacturers have not been approached to obtain the charge point price and features information at this stage of the analysis.

Whilst the mean average cost of charge point models for end-users has decreased over time by around 31% from 2020 up until the 30th June enforcement date. The mean average cost for single-phase charge point model has increased by about 7.8% after the Regulations came into effect compared to the 2022 H1 period. The mean average cost for three-phase charger models increased by 35% after the 30th June enforcement date compared to the 2022 H1 period (Figure 4-2).

It should be noted that both single and three-phase charge point models have shown price volatility over time, which might be a result of more upper-end, expensive charge point models being released in one time period, rising inflation and supply chain constraints[7] from the pandemic and the Russia-Ukraine war. The increase in prices from 2022 could be a result of additional feature requirements as per the Regulations, or a natural result of increased prices from high inflation. UK inflation change over 12 months was 9.3%[8] , and the change in price from 2022 H1 to 2022 H2 was 7.8% (single phase) and 35% (three-phase). Cost trends of charge point models have been investigated in the field research aspect of the project.

Prices of newly released charge point models in 2023 Q1 appear to have fallen when compared to 2022 H2. This may be the result of manufacturers understanding and adopting the necessary measures to comply with the regulations and thus a stabilisation in prices.

Figure 4-2 Average price to end-users of charge point models released to the UK market during 2020 and 2023. Errors bars represent the maximum and minimum costs for the charge point in the given period


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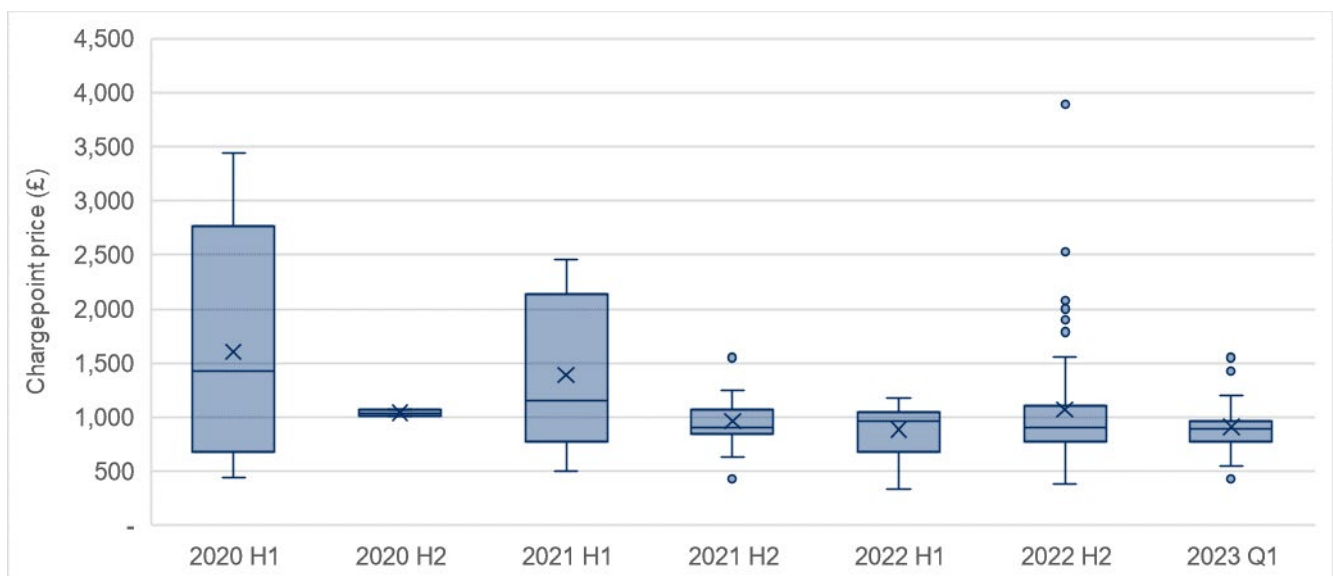
[7] Nine in 10 electronics manufacturers reported rising materials costs at the end of 2021, and 40% of manufacturers reported a decline in profit margins. Source: Current Conditions for the Electronics Supply Chain Remain Challenging | IPC International, Inc.
[8] Inflation and price indices - Office for National Statistics (ons.gov.uk)

4.1.3 Latest charge points - associated features

A total of 98 household and workplace charge point models were released in 2022 H2 (July 2022 – November 2022). An analysis of these charge point models found that all charge point models were self-reported as having at least one user interface made available to the owner, and over 90% self-reported to having a built-in monitoring system to measure energy flow and pre-set default charging hours with options to change (Figure 4-3). Features like continued charging when communication connection drops and randomised delay appears to have been less adopted with only 45% and 54% of the charge point models self-reporting such features respectively. The security requirements which did not come into effect until the end of December 2022 saw the least adoption, with only 5% of the charge points self-reported by manufacturers as meeting the Regulations requirement.

Figure 4-3 Proportion of the latest charge point models (2022 H2) self-reporting associated requirements (n=98)
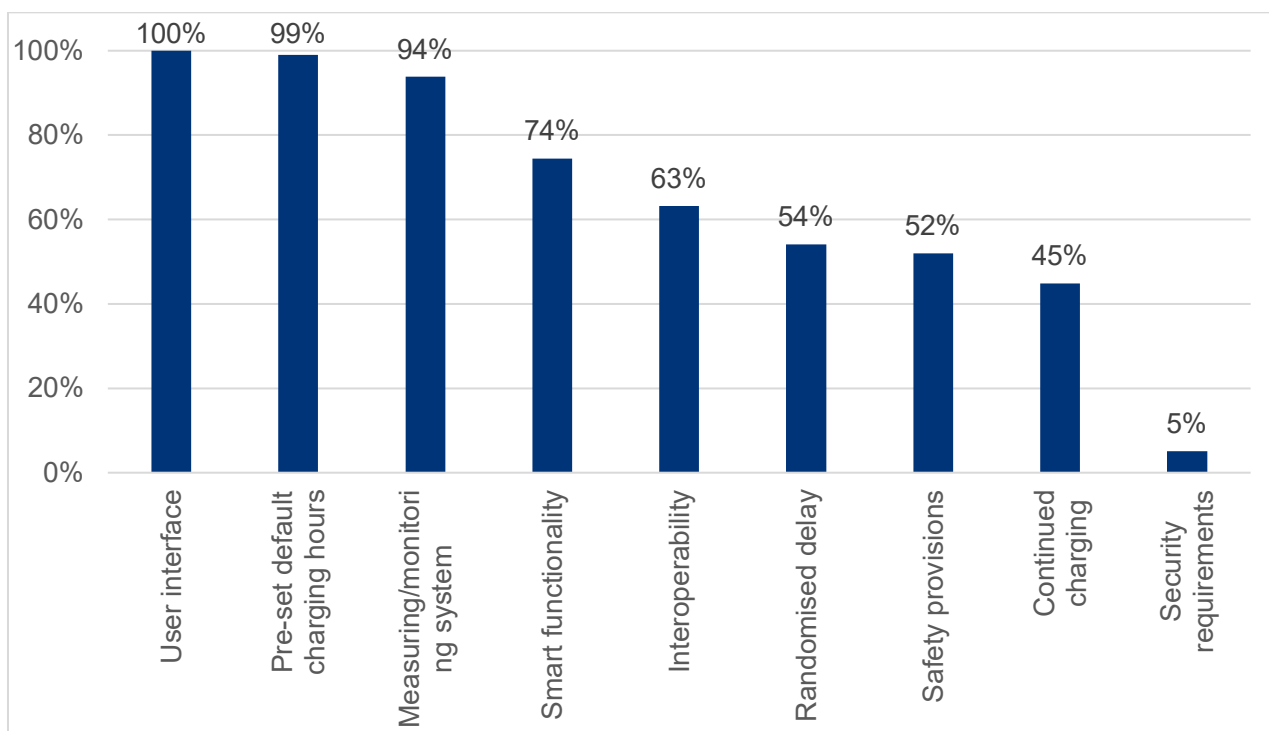

4.1.4 Feature-specific analysis

The analysis presented in this Section relates to self-reported features (as per the manufacturers websites or other publicly available announcements) up to November 2022. The charts presented represent charge point models released into the UK market in the given time period (e.g. 2022 H1), and do not represent a cumulative count of charge point models released with associated features.

It is noted that the Regulations may have influenced the publicly available information presented by charge point manufacturers, and that before the 30th June 2022 enforcement date manufacturers may have not publicly displayed technical features which are included in the Regulations.

Smart functionality

A charge point model must meet the smart functionality and user interface criteria to be considered a smart charge point as per the Regulations, defined in Table 4-1. This includes the ability to provide demand side response (DSR) services by sending and receiving information via communications network such that a third party (i.e. a Demand Side Response service provider) is able to regulate the demand onto the grid by changing the charge point charging power (rate or timing). Prior to the Regulations announcement in July 2021[9], very few charge point models reported having smart functionality with capability to offer DSR services. Just over half of the charge point manufacturers self-reported that their product had smart functionality[10] just before the Regulations came into force, and this increased to 74% after the 30th June 2022 enforcement date (Figure 4-4).

Figure 4-4 Share of new charge point models released to the UK market self-report smart functionality over time
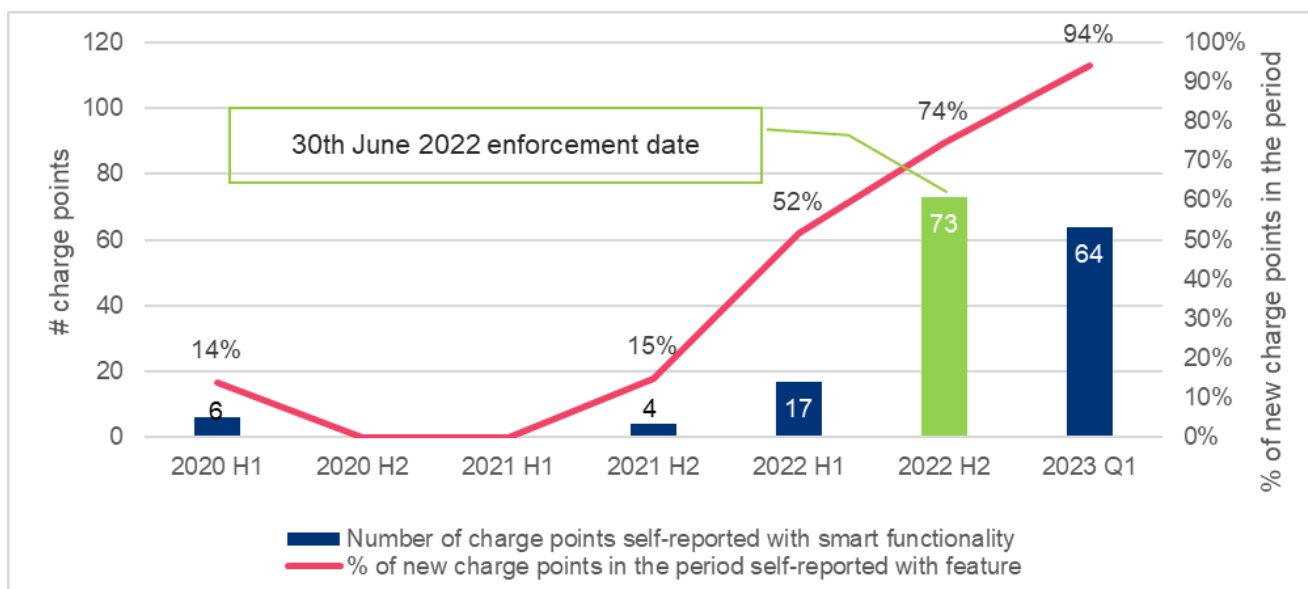
Note: 2023 Q1 covers up to March 2023. 2023 Q1 includes new charge point models released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

User Interface

The Regulations state that charge point models must have at least one user interface to allow end-users to operate the charge points. Prior to the implementation of the Regulations, most charge point models already offered a user interface for end-users (Figure 4-5). Charge point models designed for workplaces typically offer an online portal, while charge point models designed for home use typically offer a mobile app to view charging information and control the charge points.

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[9] The Electric Vehicles (Smart Charge Points) Regulations 2021 (legislation.gov.uk)
[10] We note that the 'smart functionality' definition in the Regulations may be different to the way the manufacturers have defined 'smart functionality' in their products, and therefore it is likely that the share of charge points with smart functionality as defined in the Regulations is lower than the values present in this chart.

Figure 4-5 Share of new charge point models released to the UK market self-reported with user interface
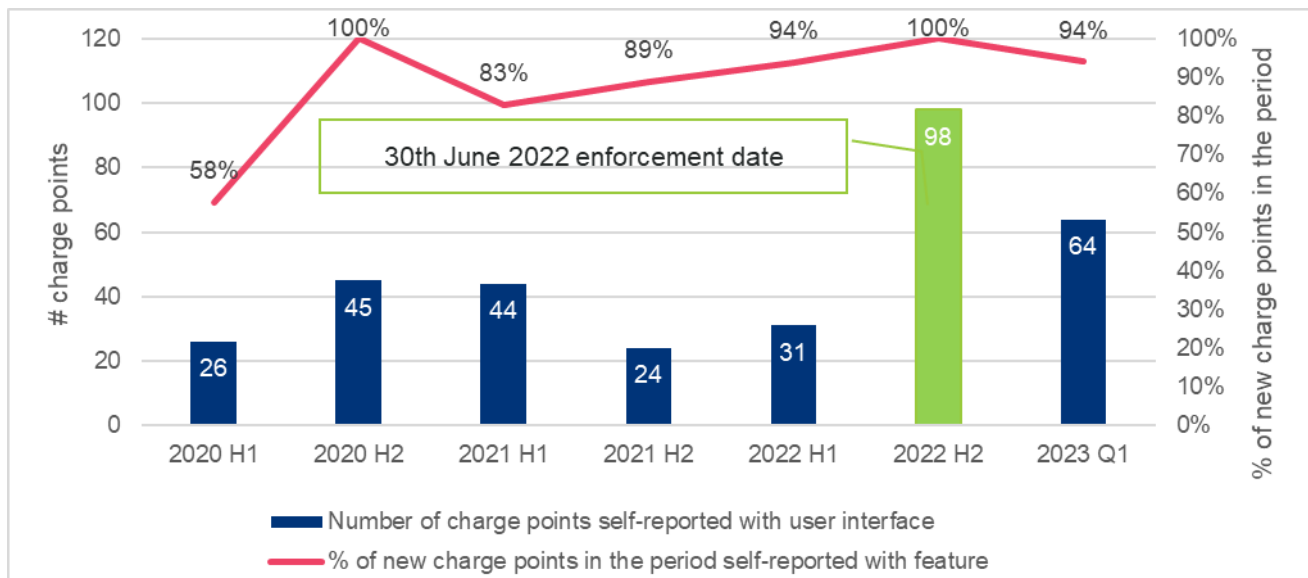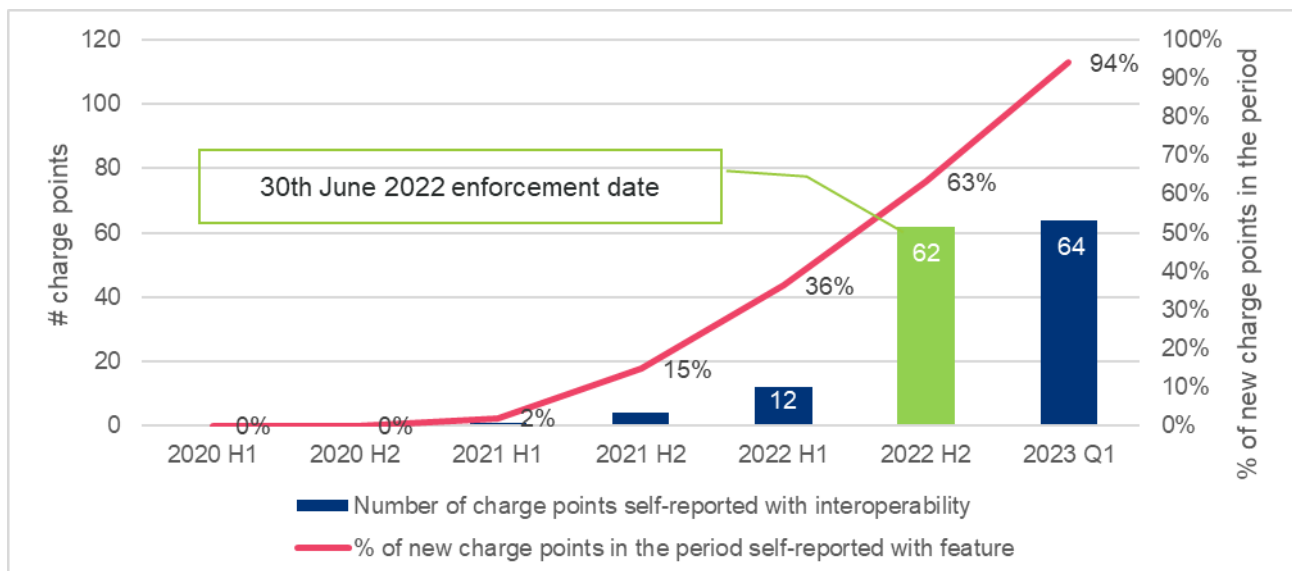

Note: 2023 Q1 covers up to March 2023. 2023 Q1 includes new charge point models released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

Interoperability

The interoperability feature ensures the charge point model can retain their smart charging capabilities when end users or the operators change their energy provider. There were difficulties capturing interoperability information as some manufacturers have partnered with energy suppliers to provide green tariff integration services, but do not state whether end-users can retain the smart functionality if charge point owners switch suppliers in the future. The share of the self-reported interoperability feature included within new charge point models increased from 36% prior to the 30th June enforcement date to 63% in 2022 H2 (Figure 4-6)

Figure 4-6 Share of new charge point models released to the UK market self-reported with energy supplier interoperability
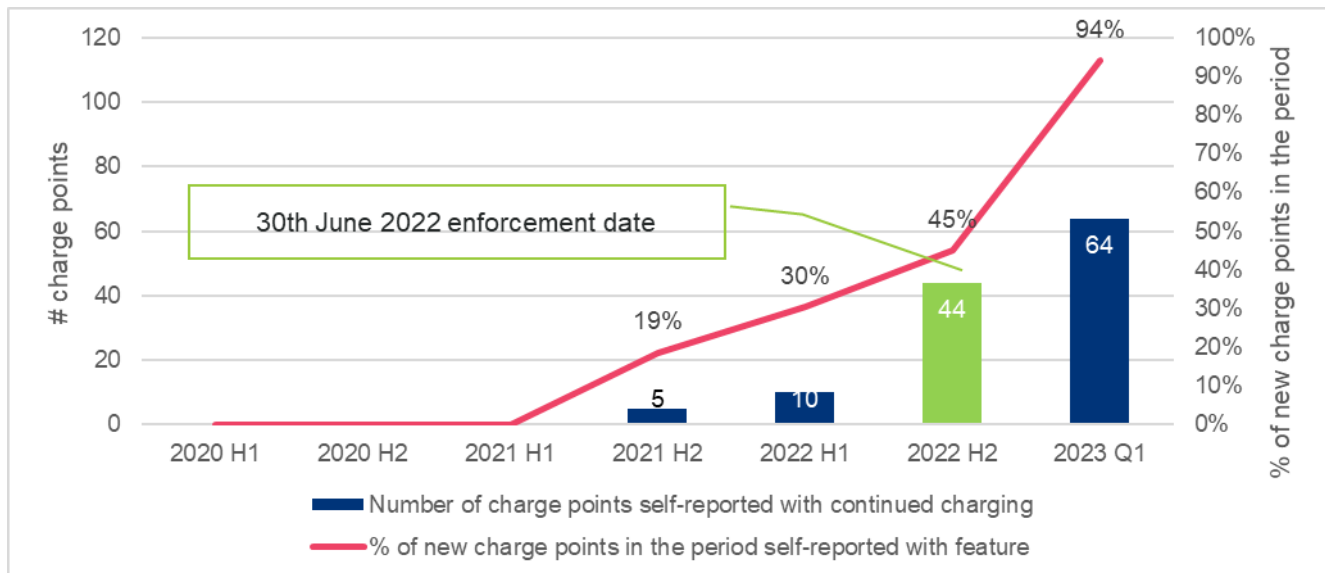
Note: 2023 Q1 covers up to March 2023. 2023 Q1 includes new charge point models released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

Continued charging when communication connection drops

Prior to the implementation of the Regulations, charge points did not need to have the capability to communicate, hence charging is independent of communication connections for all charge points before the Regulations was announced. Following the Legislation laying at the end of 2021 H1, the self-reported share of charge points with continued charging function has picked up slowly, however, still less than half of the charge point models released in 2022 H2 had such function (Figure 4-7).

Figure 4-7 Share of new charge point models released to the UK market self-reported with continued charging when communication drops

Note: 2023 Q1 covers up to March 2023. 2023 Q1 includes new charge point models released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

Safety provisions

The safety provisions in the Regulations are intended to ensure end-users' and operators' safety following the inclusion of other features in the Regulations such as off-peak charging, smart functionality, and randomised delay, to avoid any compromise in device safety. There are also additional requirements related to safety in the Regulations which come under the security requirements (effective from 30th December 2022).

The analysis presented in Figure 4-8 below is on the basis that the charge point manufacturer has self-reported that the product has some degree of safety features, which are mostly related to the physical and electrical safety of their products. This includes features such as built-in RCD protector, waterproof and hard-wearing outer case. However, it is noted that the safety provisions as outlined in the Regulations are more a provision to ensure that the other features (e.g. smart functionality) do not compromise the wider safety of the device.

It appears only four manufacturers have addressed the Regulations' definition of active safety provisions to adopt tamper-proof measures under the security requirements in the Regulations, although charge points models did not have to be compliant with the security requirements until after 30th December 2022. More detail on these elements is provided in the Security Requirements section below.

Figure 4-8 Share of new charge point models released to the UK market self-reported with safety provisions
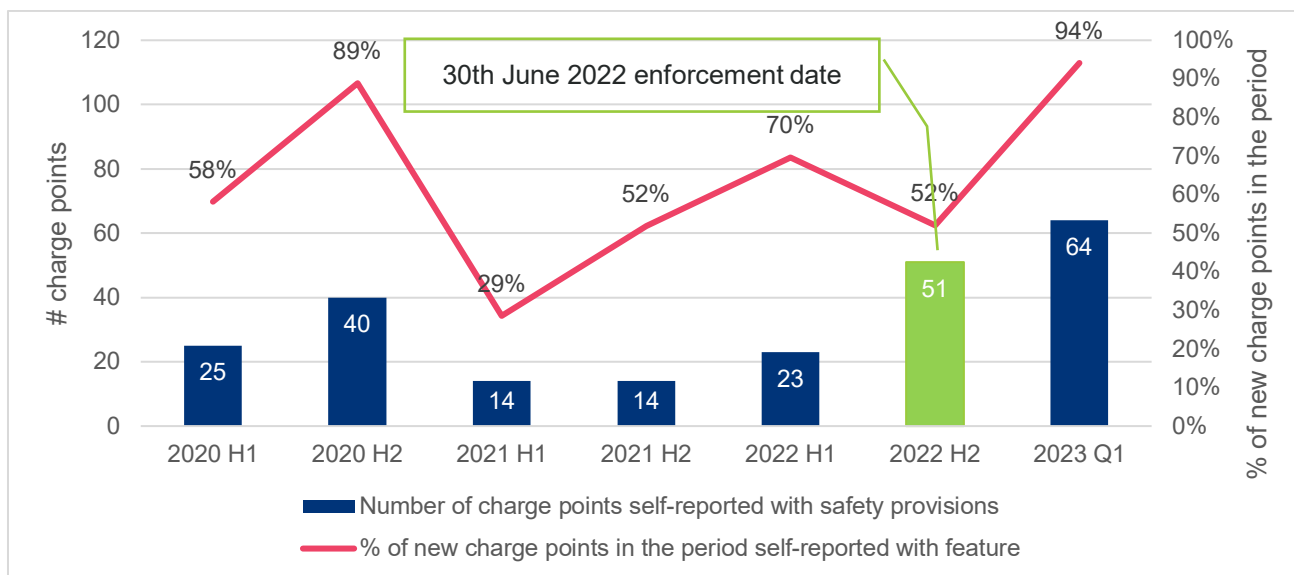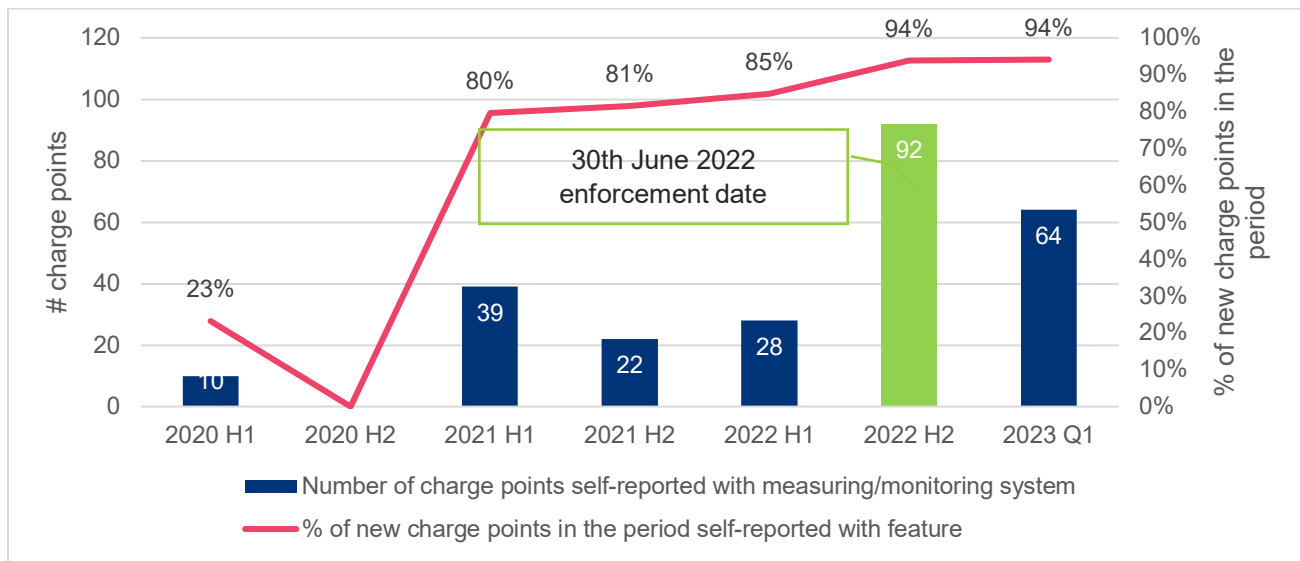

Note: 2023 Q1 covers up to March 2023. 2023 Q1 includes new charge point models released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

Measuring and monitoring system

More than 80% of the charge point models released after 2021 were self-reported to have a monitoring system feature to display energy consumption. Older model charge points typically require additional accessories (i.e. external sensors) to measure and monitor energy consumption. Newer models have built-in monitoring system and this is included in the charge point price. After the enforcement date of 30th December 2022, the self-reported share of charge point models released into the UK market with a monitoring system rose from 85% in 2022 H1 to 94% in 2023 Q1 (Figure 4-9).

Figure 4-9 Share of new charge point models released to the UK market self-reported with measuring/monitoring system

Note: 2023 Q1 covers up to March 2023. 2023 Q1 includes new charge point models released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

Pre-set off-peak charging

Pre-set off-peak charging features are mostly found in single-phase charge point models and less common for three-phase charge point models prior to the Regulations implementation in 2022 H2. An explanation for the lack of this feature in three-phase charge point models might be the intended usage of such charge points for top-up and fast-charging between journeys over the course of a day.

Just under half of the new charge point models on the market in 2021 H1 had pre-set off-peak charging with this figure rising to 99% after the 30th June enforcement date[11] (Figure 4-10), as self-reported by manufacturers. Some manufacturers suggested the pre-set feature can be included via software updates, which could explain the higher percentage of new charge point models containing this feature after the 30th June enforcement date.

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[11] We note that the 99% of charge points released in 2022 H2 is high, and not in-line with the randomised delay feature (which is closely aligned with the pre-set off-peak charging feature). This (and other feature availability) will be checked during the industry field research.

Figure 4-10 Share of new charge point models released to the UK market self-reported with pre-set off-peak charging
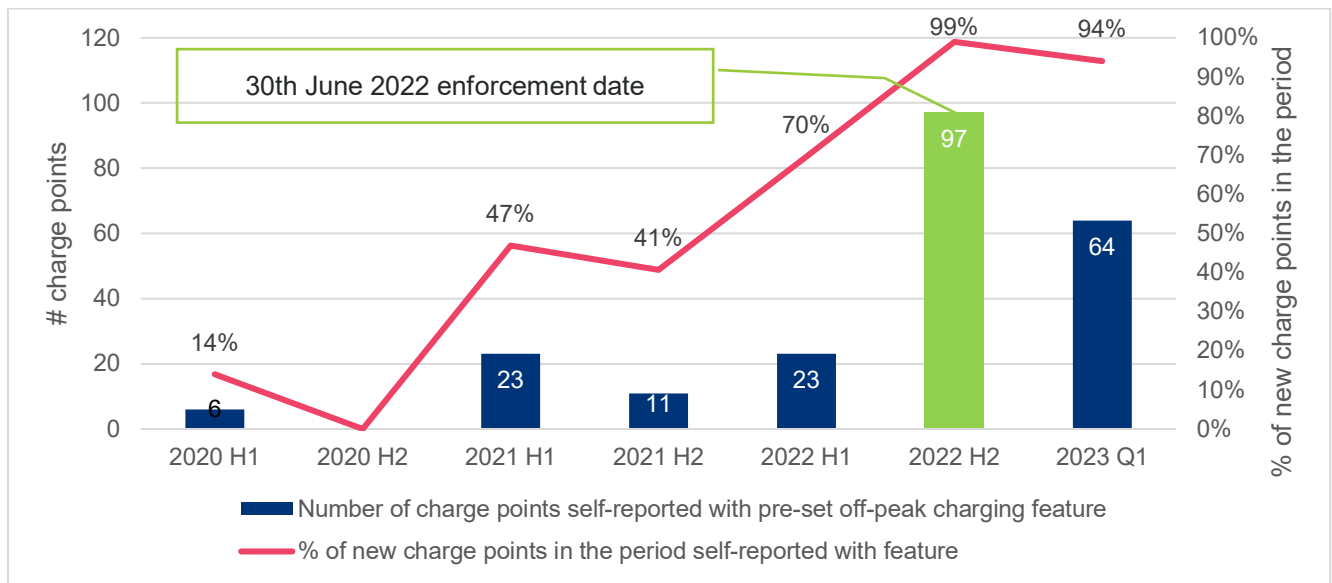
Note: 2023 Q1 covers up to March 2023. 2023 Q1 includes new charge point models released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

Randomised delay function

Randomised delay was not a feature included (or stated as included) in any charge point models before 2021 H1 (Figure 4-11). Only 24% of the new charge point models had this feature in 2022 H1, and that rose to just over half (54%) after the Regulations came into effect in H2 as self-reported by the manufacturers.

Figure 4-11 Share of new charge point models released to the UK market with randomised delay functions
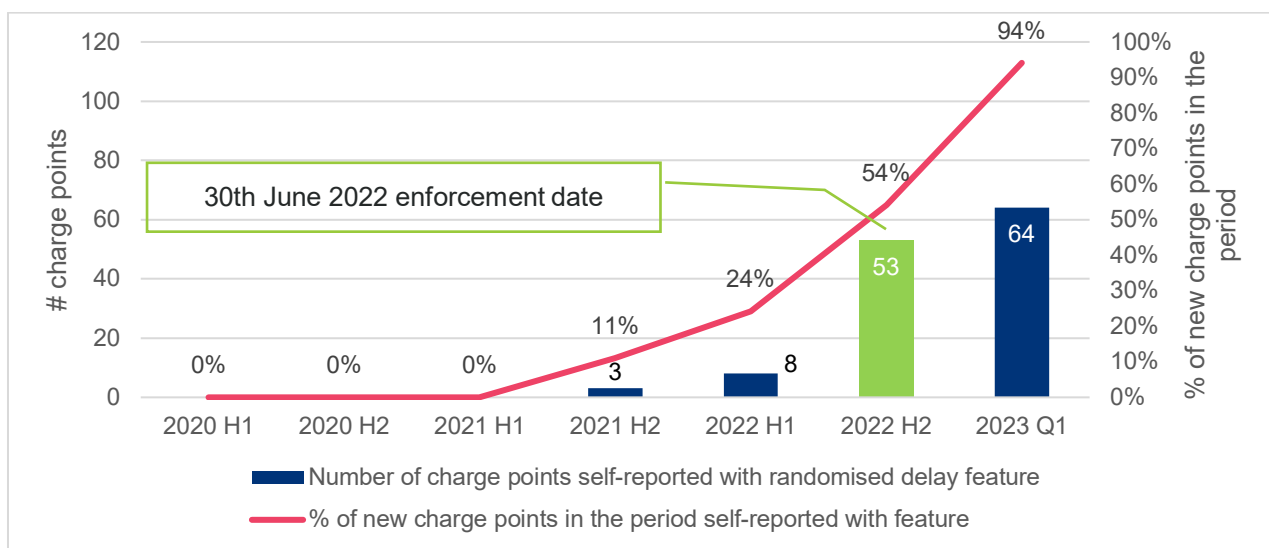
Note: 2023 Q1 covers up to March 2023. 2023 Q1 includes new charge point models released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

Security Requirements

The security requirements came into effect at the end of December 2022, six months after the first phase of the Regulations became enforceable at the end of June 2022. As part of this, charge points are required to meet security requirements outlined in the Regulations based on industry standards including ETSI EN 303 645 and PAS 1878. Some manufacturers stated on their websites in 2022 H2, before the security requirement came into effect, that the necessary security features would be added to their products in-use and in retail stocks via a software update, without the need for physical alteration to the charge point. However, there is limited information available on how these manufacturers were planning to do this.

Further analysis into the security requirement was conducted at the end of March 2023, looking specifically at new products released after the security requirements of the Regulations came into effect and self-reported changes (to old models) announced by charge point manufacturers publicly. Based on publicly available information from charge point manufacturers, 33 charge point models received new software updates associated with the related features in the Regulations, 13 models received hardware updates and 12 models received both hardware and software updates between December 2022 to March 2023 (see Figure 4-12). In addition to this, 10 new charge point models entered and 13 discontinued from the GB market. Of the discontinued models, the majority of these were older models (released in 2020 H1) and therefore did not have many of the features required in the June 30 Regulations. It has been deduced that the other 241 charge points in the database had not been updated since H2 2022.

Figure 4-12 New or updated charge point models released in December 2022 - March 2023
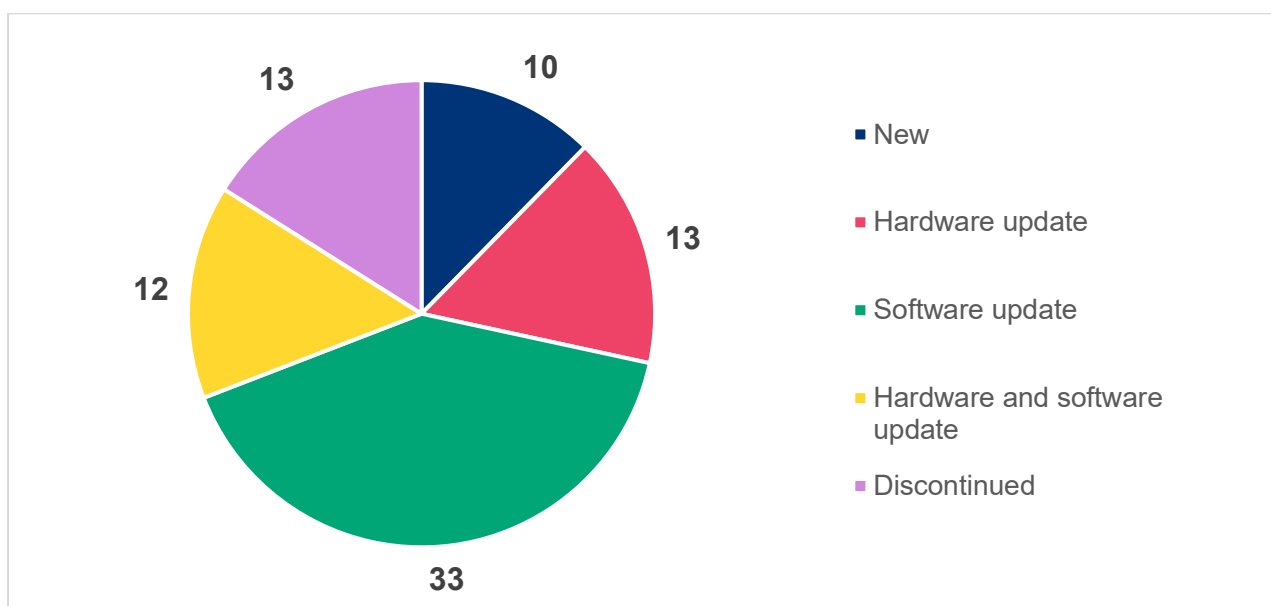

Figure 4-13 compares charge point model prices for existing products which have been updated to conform with the Regulations security requirements. The charge point models

included in the comparison are sold directly by manufacturers and have both March 2023 and November 2022 price information available, capturing prices before and after the adoption of security requirements.

This analysis suggests that software and hardware updates have contributed to a small price increase, with 15 out of 39 charge point models increasing their recommended retail price of the same product by a mean average of 11% (inflation not adjusted) in the period December 2022 to March 2023; the remaining 24 charge point model retail prices remain unchanged.

When comparing the average prices of newly released models in 2023 Q1, the prices of these modified models still fall within the average registered prices of three phase and single-phase charge point models and suggest that these are therefore equally competitive.

Figure 4-13 Price changes of updated charge point models from November 2022 to March 2023
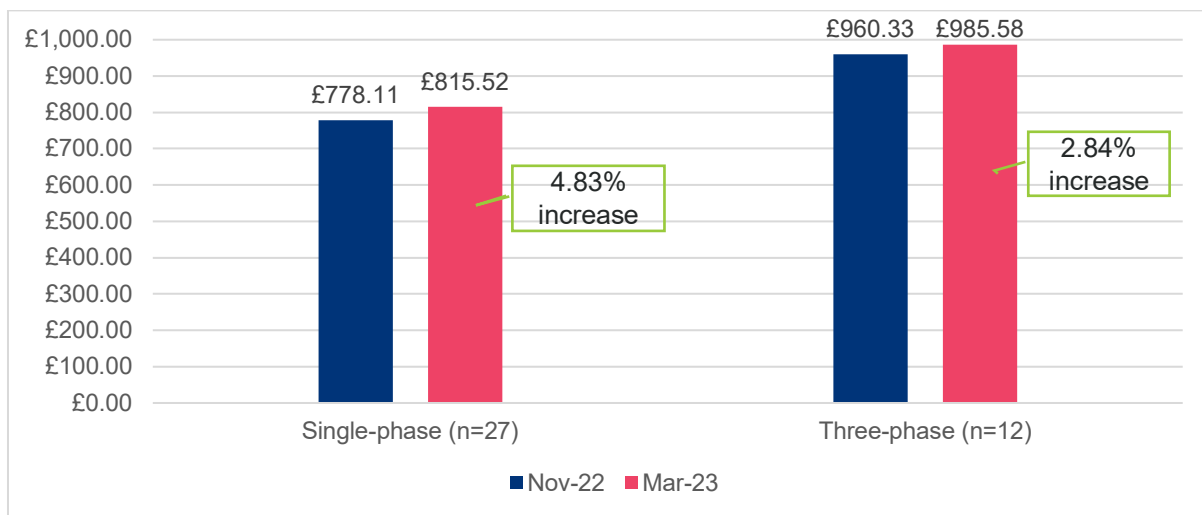

For the new and updated charge point models released between December 2022 to March 2023, 91% (62 out of 68) self-reported to contain security requirements and all associated features in the Regulations. Similarly, 94% (64 out of 68) of the new and updated charge point models self-reported with the associated features stipulated in the first phase of enforcement at the end of June 2022.

In terms of individual security requirement features, most charge point manufacturers simply stated "full compliance" with their products and did not elaborate further in their statements. Nevertheless, the research has accounted for individual security requirements self-declared by charge point manufacturers that elaborated on their features. Figure 4-14 summarises the full list of individual security requirements observed in 2023 Q1 charge points. Some security requirement features are more frequently mentioned, such as passwords, software, and sensitive security parameters. For some less frequently mentioned features including ease of use and provision of information, it could be the case that they are viewed as less relevant to the charge point purchasing decisions of an average consumer compared to more frequently mentioned features. Additionally, some manufacturers claim that their products have encryption or other security-related features, but did not provide further details of these

features. It is also noted that not all charge point models can include security features via software updates alone, some charge points will also require hardware changes.

Figure 4-14 2023 Q1 number of charge point models with associated security requirement features
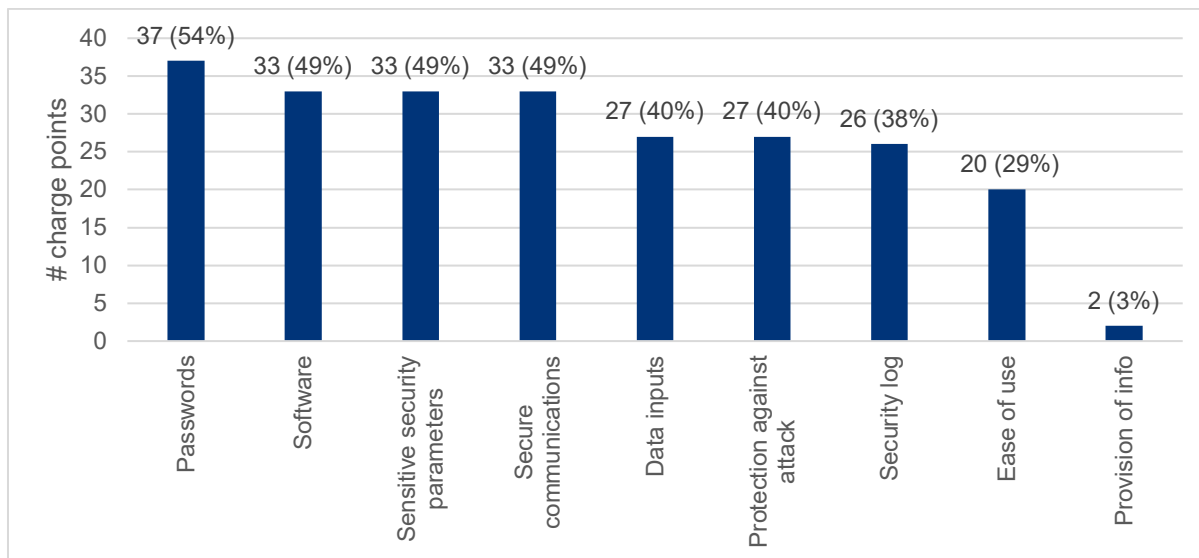
Note: Percentage in parentheses shows the share of charge point models out of a total of 68 released in 2023 Q1. 2023 Q1 covers December 2022 up to March 2023

4.2 Further analysis by the size of charge point manufacturers

The size of an organisation could dictate the resource availability and flexibility that would determine its capability to respond to regulatory changes and the actions it took. Smaller charge point manufacturers might have greater flexibility to adapt to the new Regulations because of their less complex supply chains, but they may not have the resources to meet the new requirements. Conversely, larger manufacturers might have more resources to dispense but less flexibility due to their size and structure of their supply chains. To observe how manufacturers take different approaches and methods to align with the security requirements in the Regulations, 12 manufacturers were selected and equally distributed into three groups organised by the size of manufacturers.

4.2.1 Large size manufacturers

Starting with the sample of large-size charge point manufacturers that operate in multiple markets and business sectors, and also provide other EV charging-related value-add products such as fleet management, two of the four have updated three charge point models in total via either hardware or software changes. Another has not updated or confirmed whether its products contain the related features in the security requirements while the fourth has removed all its eight products from the UK online product catalogue. It is not clear what their GB charge point market share relative to their charge point manufacturing business is, however the four manufacturers in this group have offered 3 new and updated charge points to the market for the first three months in 2023.

4.2.2 Mid size manufacturers

With respect to the sample of mid-size charge point manufacturers operating in fewer markets and business sectors, with charge point manufacturing as their primary activity, three out of the four have collectively launched five new products in total and made hardware changes to their existing product lines affected by the security requirements. Some charge points designed for the workplace produced by two of these manufacturers have not publicly announced product updates at the time of writing. A fourth manufacturer has made software updates to their existing product and is one of the few manufacturers on the database which did not require any hardware changes for the related features in their existing product line. Although this group of manufacturers sell their products to multiple markets outside GB, their GB market share relative to their business might be larger than large-size manufacturers. The four manufacturers in this group have offered 23 new (5) and updated (18) charge point models to the market for the first three months in 2023.

4.2.3 Small size manufacturers

When looking at the sample of small-size charge point manufacturers, these were solely operating in the UK market and only manufacture charge points as their primary business activity. Three of the four manufacturers have updated their existing product lines via software update to add related features, with two of these also phasing out some of their older models and replacing them with new models. Meanwhile, the fourth manufacturer in the sample has made hardware and software changes to its existing products, and has increased one of the product prices significantly by almost 25% since November 2022. The other three manufacturers in the group have also increased their product price by 2% - 21% with an average of 7.5% (inflation not accounted for). Some of the charge point models provided by this group have less common features than other charge point models available in the market such as novel designs, compact sizes, and solar integration. The four manufacturers in this group have offered 27 new and updated charge point models to the market for the first three months in 2023.

Table 4-2 Summary of characteristics and changes made by the three sub-groups of manufacturers sampled

	Large-size manufacturers	Mid-size manufacturers	Small-size manufacturers
Definition	Operates in multiple markets and business sectors, with other EV charging-related businesses	Operates in multiple markets and business sectors, with charge point manufacturing as primary activity	Only operates in the UK, with charge point manufacturing as primary activity
Number of charge point	13	23	27

models in the group			
Average (mean) price increase November 2022 – March 2023	0%	0%	7.5%
Summary	Had the most product discontinuations compared to the other groups and no new models in this group of manufacturers	Product lines not covered by the regulation not updated Most updates require hardware changes with the exception of one	Some product discontinuations Most updates conducted via software updates Increased product cost transferred to customers

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