Department for Energy Security & Net Zero

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Thinks Insight & Strategy

Smart Charging Process Evaluation

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

Research and Evaluation Findings Report

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

Research paper series number 2024/004

August 2023

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.

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Executive Summary

Introduction

The Department for Energy Security and Net Zero (DESNZ), formerly part of the Department for Business, Energy & Industrial Strategy (BEIS), commissioned Ricardo[1] and Thinks Insight and Strategy[2] to undertake the Process Evaluation of the Electric Vehicle (EV) 'Smart Charge points' Regulations (2021) (the 'Regulations') following their phased introduction in June and December 2022. The Regulations are intended to increase the smart charging capabilities of private charge points on the market in Great Britain (GB).

> The Regulations implemented in June 2022 state that EV private charge points sold for use in a domestic or workplace environment in GB with smart cables[3] must have **smart functionality and meet certain device-level requirements**.

The Process Evaluation began in November 2022 and was completed in September 2023. The primary objective was to provide an understanding of how the Regulations have been implemented and how industry and consumers have responded to this. Data collection methods and approaches for this evaluation included a charge point market review; interviews with different charge point industry stakeholders; and interviews and focus groups with domestic and non-domestic consumers across various stages of the charge point consumer journey.

Were the Regulations delivered as intended?

Whilst activities and outputs pertaining to the Regulations have been delivered, the transition period continues and there remains a gap in compliance and understanding. In 2023 Q1, over 90% of the charge point models available in the market self-reported to have the required features (except security features); which came into force later.

Nevertheless, at this early stage it appears that the expected outcomes and impacts have not yet fully materialised. For example:

- Not all charge point installations are likely to be compliant with the Regulations on the basis that some charge point sellers still have enforcement undertakings in effect enabling them to continue selling non-compliant charge points until the enforcement undertaking period expires.
- Use of smart functionalities, such as pre-set off-peak default charging setting and randomised delay functions appear to be immature. Consumers are more likely to not engage with the functionalities at all rather than overriding them. Several non-domestic consumers suggested that smart charging isn't viable for their business operations.

[1] More information at https://www.ricardo.com/en
[2] More information at https://thinksinsight.com/
[3] Smart cables are defined as an electrical cable which is a charge point and can send and receive information

- Consumers with smart charge points can switch energy suppliers/tariffs and access power consumption and charging time information. However, they are not necessarily choosing to do so, as they are not aware of opportunities associated with smart charging functionalities and potential savings and personalisation available.

Several external events coincided with the implementation of the Regulations: a disrupted supply chain following the COVID-19 pandemic; a global semiconductor shortage; the change to the global energy market associated with the Ukraine-Russia war; and related inflationary pressures. These made it more difficult for some industry stakeholders to respond to the requirements of the Regulations within the allotted timeframe.

What can be learned from the delivery methods used? What worked well, or less well, for whom and why?

The research and findings from the stakeholder engagement suggest that the following aspects **did work well**.

From an **industry perspective**:

- The two-phase approach, i.e., delaying the implementation of the security requirements, has helped stakeholders in their implementation, although it was noted that they needed even more time to transition to the new regulatory environment.
- The support provided by OPSS has eventually led to a good understanding of the Regulations on average across industry.
- Although prices appear to have increased slightly following the implementation of the Regulations, they were still below levels observed in 2020 H1 and 2021 H1.
- Openness in the wording of the Regulations allowed for different interpretations which has contributed to a variety of products and solutions on the GB market.

From a **consumer perspective**:

- Increased smart charge point availability in the market giving greater opportunity for consumers to access these products and their functionalities.

Based on this research again, key elements that **could have been improved** are presented below.

From an **industry perspective**:

- A perceived lack of consultation with key and ‘appropriate’ stakeholders, such as including policy experts from businesses rather than technical staff. Some smaller industry players were unaware of the consultation until the Regulations were finalised.
- Ambiguity in the text setting out the requirements of the Regulations, intended to facilitate innovation and flexibility, resulted in high familiarisation costs and frustration for those industry engaged.
- Including workplace charge points under the Regulations at a late stage without consulting industry of the effects of this.

- OPSS lacking capacity to respond quickly as manufacturers were rushing through their respective product development.
- A perceived lack of compliance standards and guidance being provided by OPSS/DESNZ while the Regulations were introduced; not only in terms of how to comply but also removing and disposing of non-compliant products from the market.
- The likely effect of external factors on the charge point industry at the same time they were being required to respond to the requirements in the Regulations.

From a **consumer perspective**:

- The continued lack of awareness of smart charging by consumers; etc and indication that this is not such a priority for some industry stakeholders which could limit or delay the intended benefits of the Regulations regarding consumer uptake.
- Limited availability of information for consumers concerning the status of their charge point products and the impact of the Regulations on them.

What could be improved?

Based on the lessons learned from the implementation of the Regulations so far, the following improvements could be made to support greater industry compliance.

- The consultation process appears to not have covered all affected stakeholders. Broader communication with industry stakeholders would have been beneficial to maximise engagement, for example with those not members of trade associations.
- Stakeholders sought clearer communication and guidance on the Regulations and their implications. For example, surgeries or events for stakeholders to go through Q&A.
- Industry feedback was that a 12-18 month lead time would be a more appropriate timeframe to enable manufacturers to consult and organise their supply chain and develop suitable solutions.
- Having redundant stock was a common issue for manufacturers and retailers as implementation applied to all products sold on the market. Another option could have been to require implementation in newly manufactured products only.
- Clarification and communication of the approach to consumers is needed regarding a way forward to retrofit or update non-compliant charge points.

The following improvements could also be made to support greater consumer uptake of smart charging.

- Greater provision of smart charging information targeting consumers is needed, whether that comes from industry or Government.
- Greater provision of information about the effect of the Regulations, targeting consumers, could help support consumers who were part way along the consumer journey when the Regulations were implemented.

A summary of the key research findings is provided below.

Industry and market research findings[4]

How has the charge point industry in GB responded to the Regulations so far?

Most industry **stakeholders interviewed reported that they found it difficult or very difficult to comply with the Regulations**. The short time to implement solutions before the implementation of the Regulations was cited as a key problem for manufacturers. Publicly available information suggests that manufacturers struggled to meet all the compliance requirements in time for the 30 June 2022 implementation date.

The **most commonly reported changes to charge point models** made upon implementation of the Regulations were software or firmware and hardware updates such as for tamper proofing. These required testing time prior to product launch. To a lesser degree, stakeholders reported development of new products and the discontinuation of some models as a potential effect of the Regulations. The removal of non-compliant stock from the market was cited as a key challenge for manufacturers and retailers.

A small number of stakeholders indicated that they had to develop GB specific products as there is no longer alignment with the EU market. A minority of manufacturers referred to the potential of ceasing operations in the GB market, one business interviewed said it had exited the market.

In interviews, some, but not all industry stakeholders reported communicating with their customers or end-consumers about the changes resulting from the Regulations. Engagement was facilitated through a range of channels – emails, social media, FAQs, magazines, workshops and webinars.

What are some of the economic and broader implications for the industry from complying with these Regulations?

Overall, the number of charge point models offered in the market initially decreased when the Regulations came into effect in June 2022 as non-compliant models were no longer sold. This was most notable in cases where manufacturers were able to comply with the requirements only after the enforcement dates, due to challenges encountered during the implementation of such requirements.

Implementation of the Regulations appears to have coincided with immediate or short-term increases in charge point prices associated with costs increases experienced by different industry stakeholders, both operational and capital expenditures. These were largely attributed by stakeholders to the Regulations. However, broader external factors, with existing supply chain challenges, the global semiconductor shortage and generalised inflationary pressures were also reported by charge point manufacturers.

A small number of stakeholders reported that the Regulations had effects on international competitiveness of GB charge points leading to changes in procurement and sales strategies.

[4] These results are based on a purposive sampling approach.

These include moving non-compliant stocks for sale in non-GB markets such as Northern Ireland and the EU. Some of those interviewed remained optimistic about an early mover advantage if similar regulations are adopted in the EU.

Consumer research findings

Consumer engagement for this study included private household EV drivers, 'domestic' consumers, i.e. homeowners or tenants, and 'non-domestic' consumers, i.e. commercial end users of EV charge points, such as businesses with fleets, workplaces with employees who use EVs, housing developers and landlords.

How have consumers responded to the new charge point offering?

Limited evidence was found of consumers actively responding to the Regulations. Consumers participating in the stakeholder engagement activities showed limited awareness of the Regulations and limited knowledge of smart charging. The use of specific smart charging features was also low for both consumer group samples. Rather than overriding features, domestic consumers were found to be more likely to not engage at all, while the level of interaction of non-domestic consumers differed depending on business type and activity.

The price, features, and aesthetics are important motivators for domestic consumers. Financial incentives also influence the purchasing decision. However, respondents were often confused about their eligibility for grants. While cost and financial support were also considerations for non-domestic consumers, social and environmental factors weighed more heavily as businesses seek to manage their reputation and meet environmental targets.

What are the experiences of consumers/users of smart charge points?

The evidence gathered from engaging stakeholders in this evaluation suggests that consumer knowledge and experience of smart charging is limited, and not universal across EV users. Smart charging experiences were generally reported as positive, with most barriers and issues occurring earlier in the consumer journey, in the information, purchase and installation stages.

Both consumer groups had limited experience of using smart charging functionalities knowingly. For some non-domestic consumers, their operational characteristics limit their ability to benefit from certain features, for example businesses with 24/7 operations reported less flexibility to make use of off-peak charging.

The awareness of their ability to switch energy tariffs is low amongst domestic consumers. Even those who do engage with switching reported they were confused about charger compatibility and energy providers were not accepting new customers so they had rarely gone on to implement the switch. In contrast, most non-domestic respondents noted that they are currently looking at alternative tariffs or are expecting to in the short term, in search of cheaper electricity.

The findings indicate that potential financial benefits of using smart charging are not yet being fully realised. The majority of non-domestic consumers had not received any form of financial

support and even those who were generally positive about smart tariffs, perceived the potential cost savings to be relatively small, which limited their interest.

1 Introduction

This report sets out the research and evaluation findings for the Process Evaluation of the **Electric Vehicle (EV) 'Smart Charge points' Regulations (2021)**[5] (the 'Regulations') following their phased enforcement in June and December 2022. This process evaluation was commissioned by the Department for Energy Security and Net Zero (DESNZ), formerly part of the Department for Business, Energy & Industrial Strategy (BEIS). It was conducted by Ricardo and Thinks Insight and Strategy. The project began in November 2022 and was completed in September 2023.

This structure of this document is structured into seven sections, as follows:

- **Section 1 - Introduction** including:
    - **Policy and social context:** Description of the context within which the Regulations have been implemented, including the opportunity presented by the EV market to decarbonise the transport sector, and progress to date.
    - **Overview of the Regulations:** Overview of the EV 'Smart Charge points' Regulations (2021) governing EV private charge points sold for use in a domestic or workplace environment in GB.
    - **Objectives of the Regulations:** Introduction to the aims and objectives associated with the implementation of the Regulations.
    - **Aims of the evaluation:** Introduction to the aims and objectives of this process evaluation.
- **Section 2 - An overview of the approach:** Outline of the research approach taken in this process evaluation; from development of the conceptual framework to data collection and analysis.
- **Section 3 - findings from the industry and market research:** Presentation of the evidence collected through desk-based research and fieldwork, responding to the industry research and evaluation questions specified.
- **Section 4 - Presentation of the consumer research findings:** Presentation of the evidence collected through fieldwork responding to the consumer (including domestic and non-domestic) research and evaluation questions specified.
- **Section 5 - A summary of lessons learned:** Overview of lessons learnt based on feedback collected during this study with respect to the implementation of the EV Smart Charge Points Regulations, including areas for improvement in future policy making, ways to increase compliance and uptake of smart charging.
- **Section 6 - Presentation of the evaluation findings:** This section collates the research findings to address the evaluation questions of whether the Regulations were

[5] The Electric Vehicles (Smart Charge Points) Regulations 2021, GOV.UK. Available at: https://www.legislation.gov.uk/uksi/2021/1467/contents/made

delivered as intended, how context influenced delivery, what worked well and less well, and subsequently what could be improved.

1.1 Policy and social context

In 2020, transport accounted for 24% of all UK GHG emissions, with the majority (91%) of emissions from domestic transport coming from road vehicles (89 MtCO2e).[6] The largest contributors were cars and taxis, making up 52% of the emissions from domestic transport (51 MtCO2e).[7] Electrification is a fundamental route to decarbonising the road transport sector. It is planned to contribute to the UK Government's targets of a 78% reduction of GHG emissions by 2035 compared to 1990 levels and net zero emissions by 2050[8].

To date, the sector has seen little progress in GHG emission reduction. However, the UK EV market is growing rapidly, which is expected to continue following the Government's announcement to end the sale of new petrol and diesel cars and vans by 2035[9].

An accelerated uptake of EVs will lead to a significant increase in electricity demand. Smart charging can help to address this impact on the electricity system through its capability to delay or modulate charging. Thus, allowing charging load to be controlled either directly by the user or through a third party, thereby enabling EV charging events to be shifted to periods when there is low demand on the electricity system such as overnight, or to times of high renewable energy generation. This could reduce or defer costs associated with additional electricity generation capacity and network reinforcement, and lower total costs of charging particularly at workplaces.

The Government held a market consultation in 2019 on the draft Regulations which were largely supported by those engaged. As a result, most of the proposals concerning these Regulations were adopted. A subsequent impact assessment conducted in 2021 highlighted three issues with the situation requiring Government intervention:

- Lower-than-desired consumer uptake and use of smart charge points in the UK;
- Risks to the electricity system from non-standardisation in terms of grid stability and cyber and data security; and
- Risks to consumers from non-standardisation related to interoperability, data and safety.

[6] DfT (2022) Transport and environment statistics 2022, GOV.UK. Available at: https://www.gov.uk/government/statistics/transport-and-environment-statistics-2022/transport-and-environment-statistics-2022
[7] Ibid.
[8] HMG press release. Available at: https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035
[9] In November 2020 the government announced to end the sale of new petrol and diesel cars and vans by 2030, this was the ambition at the time the evaluation was undertaken. In September 2023 the government announced that this target would be delayed until 2035. Available at: https://www.gov.uk/government/news/government-sets-out-path-to-zero-emission-vehicles-by-2035#:~:text=The%20government%20has%20today%20(28,cars%20from%202030%20to%202035

The following section provides a more detailed overview of the Regulations.

1.2 Overview of the Regulations

The Regulations implemented in June 2022 state that EV private charge points sold for use in a domestic or workplace environment in GB with smart cables[10] must **have smart functionality and meet certain device-level requirements**. The requirements include:

- **Smart functionality,** including the ability to send and receive information, the ability to respond to signals to increase the rate or time at which electricity flows through the charge point, demand side response services and a user interface.
- **Charge point network interoperability,** allowing the EV driver to charge at any charge point seamlessly ensuring that every charge point will have common smart functionalities regardless of charge point or energy distribution network operator.
- **Continued charging** even if the charge point ceases to be connected to a communications network.
- **Safety provisions,** preventing the user carrying out an operation which could risk the health or safety of a person.
- **A measuring system,** to measure or calculate the electricity imported or exported and the time the charging session lasts, with visibility to the owner of this information.
- **Security requirements** consistent with the existing cyber security standard ETSI EN 303 645 (these requirements came into force on 30 December 2022).[11]

The Regulations also state that charge points must also incorporate pre-set, off peak, default charging hours; allow the owner to accept, remove or change these upon first use; and allow for a randomised delay function.

Assurance of compliance with the Regulations is demonstrated through:

- a statement of compliance to be provided with the sale of any relevant charge point;
- a technical file to be kept by the seller for any relevant charge point that they sell, a copy of which can be supplied to any purchaser on request. Separate technical files are required where there are differences in make, model or software version.
- a record or register, to be kept by the seller, of sales of all relevant charge points sold from 30 June 2022 and maintained entries in this register for 10 years.

These Regulations do not apply to:

- Charge points sold in Northern Ireland

[10] Smart cables are an electrical cable which is a charge point and can send and receive information
[11] The enforcement date for the security requirements was set six months after the smart functionality requirements in response to industry feedback during the consultation stage, which requested more time to develop and incorporate necessary hardware changes.

- Charge points sold before 30 June 2022
- Charge points not intended to be used within Great Britain at any time
- Charge points sold by individuals outside of the purposes of their trade, such as second-hand sales
- Non-smart cables or rapid charge points[12]
- Charge points intended for use as public charge points.

The Office for Product Safety and Standards (OPSS) is the authority responsible for the monitoring and enforcement of compliance with the Regulations.

1.3 Objectives of the regulations

With the introduction of these Regulations, the Government aims to 'maximise the use of smart charging technologies to benefit both consumers and the electricity system'[13], whilst supporting the transition to EVs.

The Regulations were established to achieve these aims, which are underpinned by three specific policy objectives summarised below.

Policy Objective 1: Maximise the use of smart charging technologies:
To have smart functionality in any private charge points in scope that are sold in GB; including incorporating pre-set, off-peak default charging hours and allowing owners or users of these charge points to accept, remove or change the default settings.

Policy Objective 2: Support and protect grid stability:
To have technical capability to provide demand-side response (DSR) services in any private charge points in scope that are sold in GB enabling balancing of the electricity load; incorporating a ten-minute randomised delay function to avoid sharp secondary peaks in power demand; and configuring controls that provide protection to the electricity system.

Policy Objective 3: Protect the consumer:
To align the configuration of all private charge points in scope that are sold in GB with the existing cyber security standard ETSI EN 303 645; and to configure these charge points to: prevent risk to health and safety of a person; to continue charging even if the charge point ceases to be connected to a communications network; to ensure electricity supplier interoperability; and to provide a means of measuring or calculating the electricity imported or exported and the time the charging lasts via a monitoring system, with visibility to the owner.

[12] A rapid charge point as defined in the Regulations means a charge point that allows for a transfer of electricity to an electric vehicle with a power of not less than 50 kilowatts.
[13] Department for Transport and Office for Zero Emission Vehicles (2021) Electric vehicle smart charging consultation: Summary of responses, GOV.UK. Available at: https://www.gov.uk/government/consultations/electric-vehicle-smart-charging/public-feedback/electric-vehicle-smart-charging-consultation-summary-of-responses

1.4 Aims of the evaluation

This Process Evaluation forms part of a phased evaluation plan for the Regulations including:

- A baseline survey[14] carried out in January 2022 with EV drivers to help understand the public attitudes towards, and the current use of, smart charging at home and in the workplace. The study provides baseline evidence to inform the monitoring and evaluation of the progress of the Regulations against their objectives.
- A process evaluation of the implementation of the Regulations (this study).
- A future interim impact evaluation expected by 2025 and final impact evaluation by 2027.

The primary objective of this process evaluation is to provide **an understanding of how the EV 'Smart Charge points' Regulations (2021) have been implemented and how industry and consumers have responded to this**.

This process evaluation covered inputs, activities and outputs as well as some early outcomes from the Regulations, as identified in the Theory of Change - shown in Table 4-1. The outputs of the evaluation will inform further policy developments on smart charging and provide lessons learnt for other developments concerning smart secure energy systems, smart heating appliances, and energy smart appliances, which have been recently introduced into Parliament through the Energy Security Bill[15].

DESNZ set out **five specific objectives for this project** and process evaluation, which are set out in the following section, Table 1-1.

1.5 Overview of the approach

Development of the conceptual framework for the evaluation

A framework was developed to confirm the scope of the evaluation as well as the technical and data requirements. It also offered an opportunity to identify ways to streamline the research questions set out in the original specification. The result of this exercise was a final list of process evaluation questions and sub-questions that have been targeted through the project to meet DESNZ's needs and the UK Government's technical standards. The long list of process evaluation questions and sub-questions that are the subject of this study can be found in Annex 1 Final Process Evaluation Questions.

[14] Department for Science, Innovation and Technology and Department for Business, Energy & Industrial Strategy (2023) Electric vehicle smart charge point survey 2022. GOV.UK. Available at: https://www.gov.uk/government/publications/electric-vehicle-smart-chargepoint-survey-2022
[15] UK parliament (2023) Energy bill [HL] publications - parliamentary bills - UK parliament, UK parliament. Available at: https://bills.parliament.uk/bills/3311/publications

Data collection and stakeholder engagement

Desk-research and field (or primary) research methods were used to collect the evidence necessary to provide insights against the research questions, as summarised in Table 1-1.

Table 1-1 Overview of data collection methods against the high-level research questions

High-level research evaluation questions	Data collection methods
1. How has the charge point industry in GB responded to the Regulations so far?	Charge point market review, pre-screening surveys and interviews with industry stakeholders, charge point cost information request, available public data.
2. What are some of the economic and broader implications for the industry from complying with these Regulations?	
3. How have consumers responded to the new charge point offering?	Pre-screening surveys and interviews with domestic and non-domestic consumers; focus groups with domestic consumers; interviews with industry and/or experts where necessary.
4. What are the experiences of consumers/users of smart charge points?	
5. What are some of the lessons learnt from the implementation of the Regulations so far? Is any other precedent that could be relevant?	Analysis of evidence collected against Questions 1-4, interviews with industry and consumer stakeholders, experts and policymakers; literature research.

Analysis

A thematic analysis was used to review the qualitative information gathered via the interviews and focus groups with stakeholders and consumers and identify key trends and common themes. Quantitative analysis was also used to review the range of charge point models on the market as part of the market review exercise to indicate levels of compliance.

Limitations

A key limitation of the charge point market review was its use of publicly available information and self-reported functionality. 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.

In the field research, the main limitations were the short timeframe which was affected by the 2023 Local Elections pre-election period (purdah); and limited engagement by industry stakeholders and non-domestic consumers. This was based on purposive sampling rather than random selection. Together, this resulted in a smaller than anticipated sample size for industry groups (see Annex 2: Engagement samples) with some information gaps and greater potential for response bias. Steps were taken to minimise response bias including the offer of incentives to consumers and reminder messages to all stakeholders. Whilst fewer responses were received than hoped, a useful mix of types of respondents was still achieved.

For the analysis, key limitations were associated with the limited sample of direct engagements with individual organisations as opposed to trade associations. This meant that any conclusions developed are indicative but not necessarily representative of the wider population. Comparison of results from different samples was carried out to help overcome this. More details regarding the methodology of this process evaluation can be found in the separate document: '*Smart Charging Process Evaluation: Methodology Report*'.

2 Industry and market research findings

Evidence was gathered via interviews with a sample of stakeholders and a desk-based review of the current GB charge point market to understand the effects of the Regulations on the charge point industry and wider trade. In this section, the composition of the charge point industry is presented firstly to provide context to the findings. Following on from this, the approach industry stakeholders have taken to interpret and respond to the Regulations is covered, and then the effects on availability, prices and sales of smart charge points as well as the costs to manufacturers associated with developing charge point models that meet the requirements set out in the Regulations. The following research questions are explored:

1. How has the charge point industry in GB responded to the Regulations so far?

- *1a. How have industry interpreted the Regulations?*
- *1b. How have industry made changes to comply with Regulations? Have they changed their products and, if so, how? Have they developed new models? What functionalities do these products provide (e.g., default settings, etc.)?*
- *1c. To what extent are charge points sold in compliance with each regulatory requirement? And why? Please consider how contextual factors may affect this. How have sellers demonstrated compliance?*
- *1d. How have businesses targeted consumers? Have they created partnerships to boost awareness of the smart charge point offering? For example, partnerships between charge point manufacturers and vehicle dealerships.*
- *1e. On the one hand, what has enabled industry compliance? On the other, what barriers and challenges have industry faced to comply with the regulatory requirements? And, what about selling the compliant smart charge points?*

2. What are some of the economic and broader implications for the industry from complying with these Regulations?

- *2a. Has the availability of charge points been affected? Are there more smart charge points offered in the market?*
- *2b. What are the prices of these smart charge points on offer? Alternatively, what about the costs of manufacturing?*
- *2c. How have smart charge point sales evolved over the last year?*
- *2d. How has trade evolved over the last year, including exports and imports especially associated with smart charge point technology? Have GB manufactured smart charge points remained competitive?*

2.1 How has the charge point industry in Great Britain (GB) responded to the Regulations so far?

2.1.1 An overview of the charge point industry in GB

Prior to discussing the response of the charge point industry in GB to the Regulations, it is important to understand the basic structure of the charge point industry and how its different industry stakeholder groups may have been affected.

The charge point industry in GB consists of groups of stakeholders working closely across the value chain to manufacture, distribute, retail, install and operate privately owned charge points for households and businesses. Figure 2-1 illustrates this structure. Stakeholders interact in different ways, particularly related to sharing information and data management, energy supply, or exchanging products and services.

These stakeholders are also grouped in colour-coded categories in Figure 2-1. Three categories capture the industry groups that were targeted by the relevant interview and evidence-gathering tasks. Engaged sub-groups are underlined below.

- **The Upstream Supply Chain group** (in yellow) largely covering suppliers to charge point manufacturers among which software solutions providers, hardware solutions providers and cyber-security leaders may be found. These stakeholders are indirectly affected by the Regulations as their supplies must meet the criteria and specifications needed by charge point manufacturers to comply with the Regulations.
- **The Product and Service Market group** (in green) are the stakeholders most directly affected by the Regulations. Among this group of stakeholders are, charge point manufacturers, charge point installers, charge point retailers and resellers (including exporters and importers). Vehicle dealerships and e-mobility service providers also make part of this stakeholder group within the private charge point market.
- **Energy System stakeholders** (in pink) produce, manage, distribute and supply the electricity with which the electric vehicles are charged. This group includes the electricity system operator, distribution system operators, and energy suppliers, as well as other stakeholders like energy aggregators, energy generators, and transmission network operator. These stakeholders are also affected indirectly by the changes made by the Regulation since some network operation conditions must be met to allow for instance interoperability. Also, other requirements regarding demand response and tariffs are of interest of this specific group.

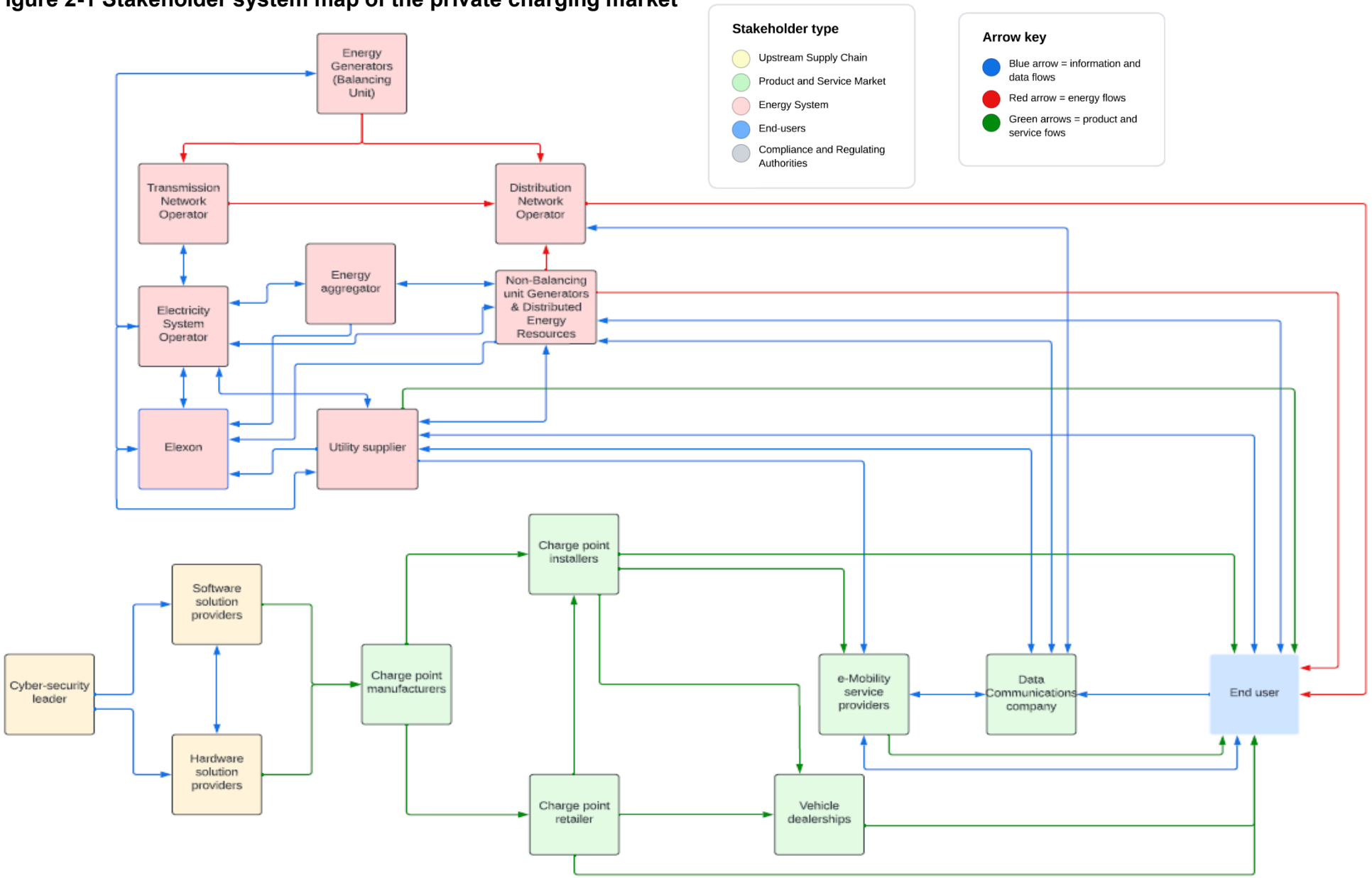
It is worth noting that some stakeholders can perform multiple roles depending on specific business models. For example, the e-Mobility service providers can act as the retailers, manufacturers, and installers (e.g., Pod Point).

In general, the stakeholders in the charge point industry are likely to have followed a basic process when complying with the Regulations. This process can be outlined as follows:

- **Step 1 – Interpretation of the Regulations by industry stakeholders:** Stakeholders have engaged in interpreting the Regulations to understand the requirements and the obligations imposed on them.
- **Step 2 – Changes to products and processes in response to the Regulations**: Stakeholders have made necessary changes to their products and processes, and/or developed new products to comply with the various requirements set out in the Regulations.
- **Step 3 – Extent of compliance of smart charge points on the market**: Subsequently, smart charge points that comply with the Regulations have become available in the GB market. These charge points meet the specified standards and regulations.
- **Step 4 – Marketing and selling of smart charge points:** The available compliant smart charge points are actively promoted, advertised, and sold to end consumers. Stakeholders undertake marketing efforts to create awareness and encourage the adoption of these compliant charge points.

Each of these steps is covered in more detail in the following sections, providing a comprehensive understanding of how the charge point industry in GB has responded to the Regulations. This is also complemented by a review of the reported enablers, barriers and challenges to compliance.

Figure 2-1 Stakeholder system map of the private charging market



2.1.2 Interpretation of the Regulations by industry stakeholders

RQ1a: How have industry stakeholders interpreted the Regulations?

Overall interpretation and understanding

In general, the consulted industry stakeholders demonstrated a good level of understanding of the different requirements outlined in the Regulations. The majority of respondents rated their understanding at 7 or above out of 10. A rating of 10 indicates a complete and unambiguous understanding.

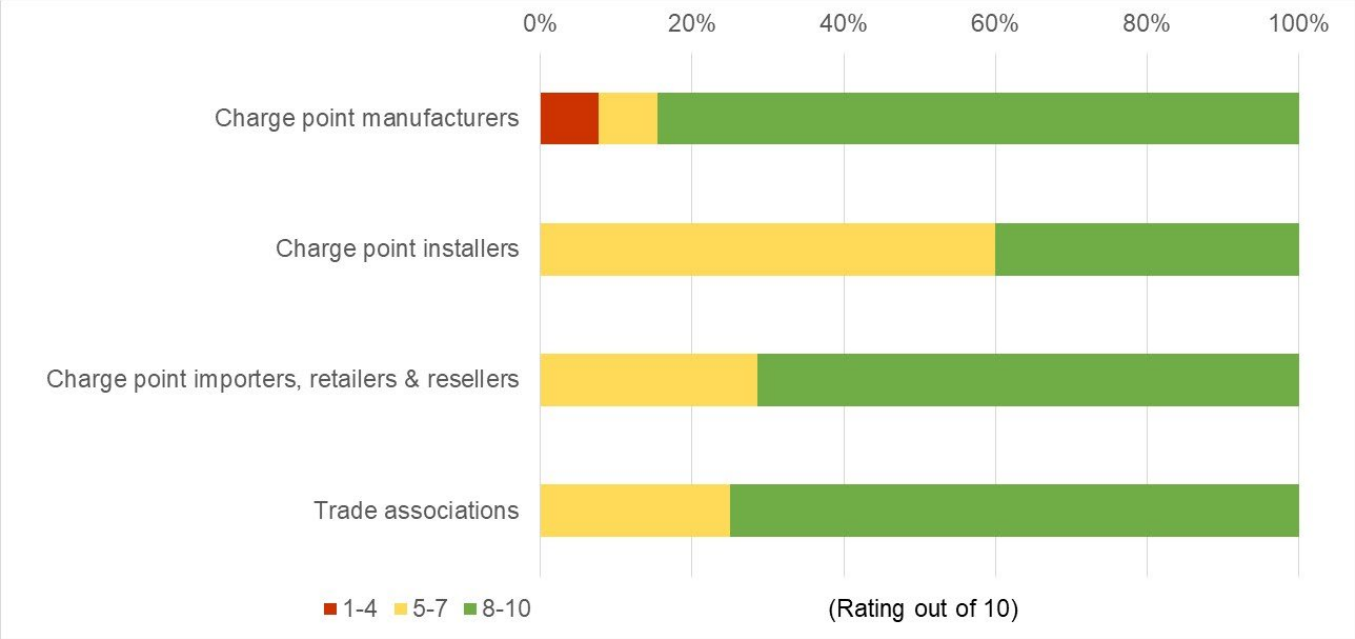
Figure 2-2 provides a summary of interviewees' self-reported scores on their current understanding of the Regulations from those groups directly affected. Trade associations represented the overall views of their members. Stakeholders such as charge point manufacturers and retailers/resellers rated their understanding higher, with the great majority of the consulted manufacturers scoring 9 or above and the great majority of interviewed retailers and resellers scoring above 8 out of 10. Their products and services required modifications directly influenced by the Regulations, which is likely to be a main driver of this result.

This direct impact compelled manufacturers and retailers to invest significantly in time and resources to attain the manifested high level of understanding.

The most common method undertaken by the industry to comprehend the Regulations was internal research, using the government website containing the Regulations text and the compliance guide from the Office for Product Safety and Standards (OPSS). Additionally, discussions and interactions with respective industry groups played a crucial role. Among charge point manufacturers, retailers and resellers, and installers, over half of interviewees reported using the OPSS seminars to enhance their understanding of the Regulations.

Stakeholders from various stakeholder groups, such as installers and retailers, also reported acquiring more detailed knowledge of the Regulations through partnerships with manufacturing group stakeholders. Manufacturers, as the group most directly affected and possessing a high level of understanding, demonstrated their value in aiding the rest of the value chain to gain a deeper comprehension of the Regulations. Stakeholders from the energy system group, who are less directly affected by the Regulations, tended to provide lower understanding ratings, typically below 6.

Figure 2-2 Directly affected industry stakeholders' self reported overall understanding of the Regulations based on anecdotal interview evidence



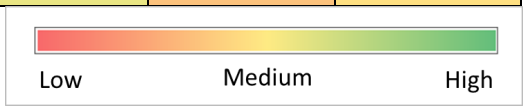
Interpretation and understanding of specific requirements

'Ability to charge without communication network' and 'Measuring system that is visible to owner' received the highest level of understanding, while 'Electrical supplier interoperability', 'Safety provisions', and 'Security requirements including cybersecurity' received the lowest.

Table 2-1 below shows the variation in understanding of different requirements across directly affected industry stakeholder groups. Overall, there was a good level of understanding of the Regulations and their specific requirements.

Table 2-1 Summary of the level of understanding ratings of the individual requirements among the industry stakeholder groups*

	Charge point manufacturers	Charge point importers, retailers & resellers	Charge point installers	Trade associations	Mean level of understanding
Ability to charge without communication network					
Measuring system that is visible to owner					
Pre-set off-peak charging					
Randomised delay					
User interface					
Electricity supplier interoperability					
Safety provisions					
Security requirements including cybersecurity					



**Note: Green shows high level, yellow medium level and red low level of understanding.*
*** The weighted average is calculated accounting for the total number of stakeholder responses (36) rather than a mean average across industry groups. This can reflect a heavier influence from industry groups most represented such as manufacturers.*

The primary feedback from industry stakeholders was that the legal text of the Regulations was ambiguous, which has led to different interpretations.

Ambiguity in the wording of the Regulations was identified by stakeholders as the main cause for diverse interpretations. In fact, most of the stakeholders interviewed (24 out of 36) agreed that "*the regulations could be updated with more precise language to avoid or limit ambiguity*". Particularly among manufacturers, divergence in the interpretation of the Regulations within the industry led to different paths or measures taken to be compliant.

Specific examples provided by industry stakeholders included:

The Regulations fail to consider a comprehensive range of use cases and charging scenarios.

- Some manufacturers and energy system stakeholders suggested that having the same approach for domestic and non-domestic charge points created conflict in terms of designing and operating a compliant product that could be practical for both use cases. This was particularly reported for the 'randomised delay' requirement, where a configuration for a domestic charge point might not necessarily be suitable for non-domestic use cases.

Ambiguous wording used in the legal text of the Regulations allows for various interpretations by different stakeholders in the industry.

- A set of retailers and energy system stakeholders, who participated in the Regulations roundtables, said that the use of legal language in some cases left the technical interpretation open, losing a precise definition.
- Key issues were cited around '*security requirements including cybersecurity'* with greater effort needed to interpret the need for various standards and the tamper-proof barrier requirement.
- Concerning the *'electricity supplier interoperability'* requirement, software developers, manufacturers and installers noted that there is a lack of concise technical guidance on demand-side response (DSR) mechanisms and a standardised guideline for switching between energy suppliers. Stakeholders sought additional instructions in the future to facilitate the necessary changes for a universal or an interoperable system that enables DSR mechanisms.

2.1.3 Changes to products and processes in response to the Regulations

RQ1b: How have industry made changes to comply with Regulations? Have they changed their products and, if so, how? Have they developed new models? What functionalities do these products provide (e.g., default settings, etc.)?

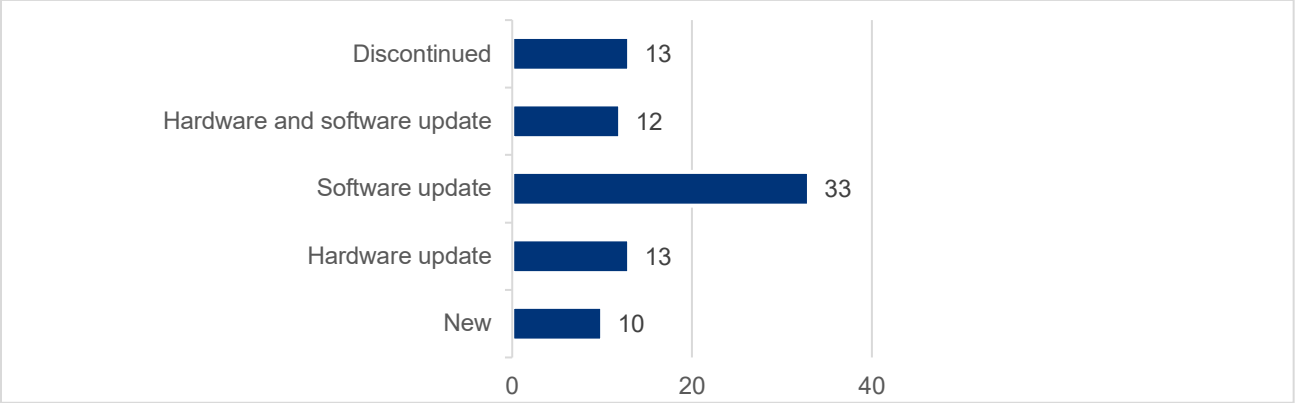
Changes to products

Upon the adoption of the Regulations, the most commonly reported changes made by industry stakeholders were software, firmware or hardware updates, such as for tamper proofing.

Software and firmware changes were reported by almost half of the industry stakeholders, and hardware updates, such as for tamper proofing were reported by a quarter of the consulted industry stakeholders. In addition to this, a small minority of manufacturers reported developing entirely new products. They typically worked closely with hardware and software solution providers.

Evidence from the charge point market review exercise supports these findings with respect to responding to the security requirements in the Regulations, as shown in Figure 2-3. Almost a fifth of the consulted stakeholders stated that they had to develop products specifically for the UK (GB) market due to misalignment with the EU market. A small number of manufacturers mentioned considering whether to withdraw from the GB market, while another indicated they already had.

Figure 2-3 New or updated charge point models released in December 2022 - March 2023



Source: Ricardo analysis, charge point market review (2023)

Changes to processes

The Regulations introduced additional requirements for retailers and resellers, such as maintaining sales records of smart charge points and providing consumers with a copy of the Statement of Compliance at the point of sale. Feedback from charge point manufacturers, retailers, and resellers indicated that most relied on manufacturers' one-sided declaration of product compliance without conducting due diligence on the products they sell. As a result, many retailers and resellers questioned the necessity of having both the Declaration of Conformity and the Statement of Compliance, considering the similarity between the two documents. This increased administrative work, collaborating with the OPSS to complete additional paperwork, resulting in additional costs for those stakeholders.

In addition to this, the Regulations prompted efforts to consolidate existing stocks through various channels, including returning stocks to manufacturers, applying Enforcement Undertakings to sell non-compliant products beyond the Regulations implementation date, and exporting stocks to other markets. Concerns were raised regarding the generation of e-waste because of excess non-compliant devices that cannot be sold in the market. More information on other responses to trading non-compliant charge points are covered in Section 2.2.5.

2.1.4 Extent of compliance of smart charge points on the market

RQ1c: To what extent are charge points sold in compliance with each regulatory requirement? And why? Please consider how contextual factors may affect this. How have sellers demonstrated compliance?

This section relies on publicly available information collected on 308 charge point models from 66 manufacturers released between January 2020 and March 2023. For more details on the data collection methodology, results, and limitations of the review, please refer to Annex 2: Charge Point Market Review.[16]

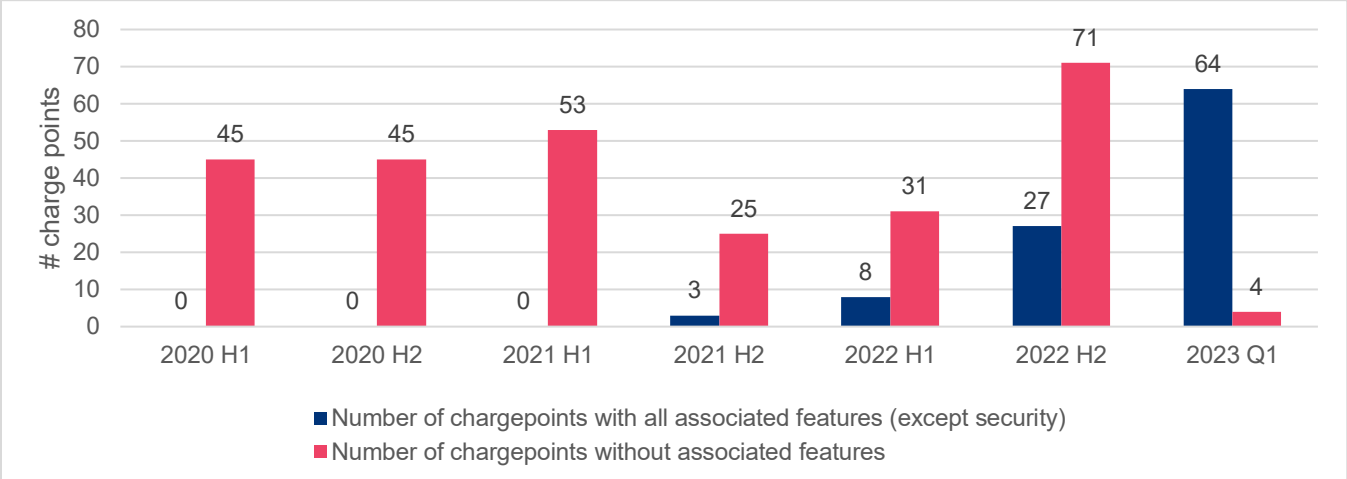
Overall extent of compliance

Based on publicly available information, manufacturers faced challenges in meeting all compliance requirements by the 30 June 2022 implementation date. However, in recent months, most requirements have been complied with as new charge point models have been released to the market.

The Regulations were implemented in two stages, with most requirements taking effect on 30 June 2022, and the security requirements enforced from 30 December 2022.

The evidence shows an increase in charge point models with the requirements under the June 2022 requirements as self-reported by manufacturers available in the market during 2023 Q1. Self-reporting showed 94% of newly released charge point models during 2023 Q1 had the features required by Regulations. This is a notable increase when compared to 2022 H2, where only 28% of the released charge point models self-reported having features required by the Regulations. This suggests that the market required time to respond to and meet the requirements outlined in the Regulations. This was confirmed by most of the industry interviewees. This analysis excludes self-reporting cyber security standards requirements, which are the most difficult requirement to adopt and with very low levels of compliance, according to the stakeholders interviewed for this study and the market review.

Figure 2-4 Total number 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[17]



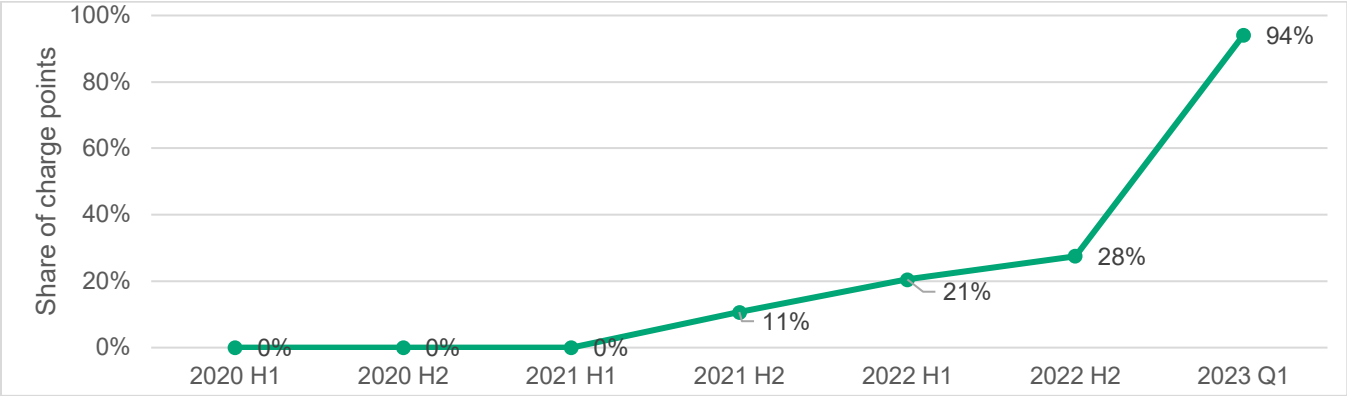
[16] As a limitation, it is worth noting that this review is based on self-reported features as stated on manufacturers' publicly available websites. Manufacturers may not have deemed it important to publicly advertise all the features, which could be relevant if certain features were not considered beneficial to the public. For example, the randomised delay feature, which based on industry consultation, may not be of high interest to end-users.

[17] 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.

Note: For 2023, data was available up to March 2023, hence the use of Q1 instead of H1. 2023 Q1 includes new charge points released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

Source: Ricardo analysis, charge point market review (2023)

Figure 2-5 Total 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[18]



Note: For 2023, data was available up to March 2023, hence the use of Q1 instead of H1. 2023 Q1 includes new charge points released, but also existing charge points which have been updated (hardware or software) to meet the Regulations.

Source: Ricardo analysis, charge point market review (2023)

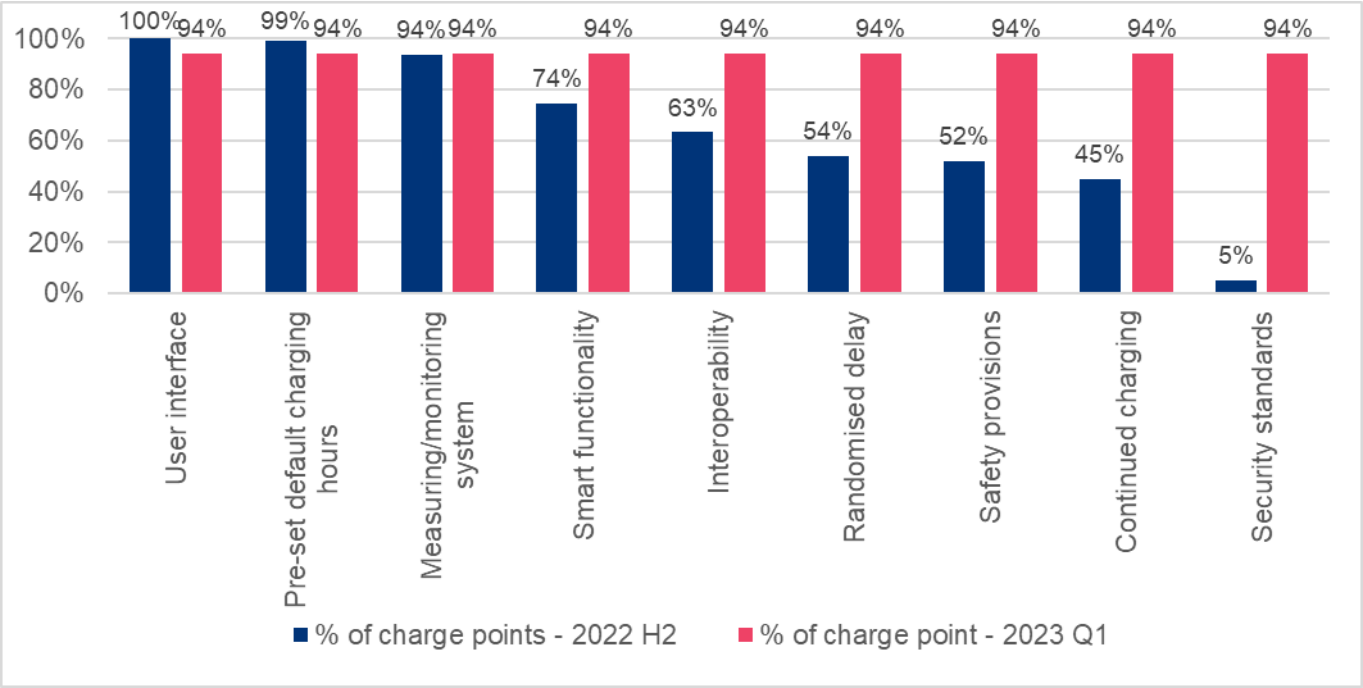
Compliance with specific requirements in the Regulations

Certain features required under the Regulation presented greater challenges for implementation than others. Specifically, security requirements have been the most difficult to implement.

It is evident that major advances towards compliance had been made in all requirements except security requirements. The sample of charge point models analysed for 2023 Q1 showed that 94% of all devices self-reported having all features required in the June 2022 requirements (i.e. excluding security features), as self-reported by manufacturers. This is a steep increase from self-reporting in 2022 H2, at which time some features outlined in the June 2022 requirements (i.e. '*continued charging', 'safety provisions', 'randomised delay', 'interoperability' and 'smart functionality')* were not implemented by a large proportion of charge point manufacturers (shown in Figure 2-6). This evolution in compliance during the first three months of 2023 shows that the market can take actions to comply when a reasonable timeframe or transition period to understand and introduce the necessary changes in products and services is allowed.

[18] 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.

Figure 2-6 2022 H2 and 2023 Q1 charge point models regarding self-reported compliance to individual requirements



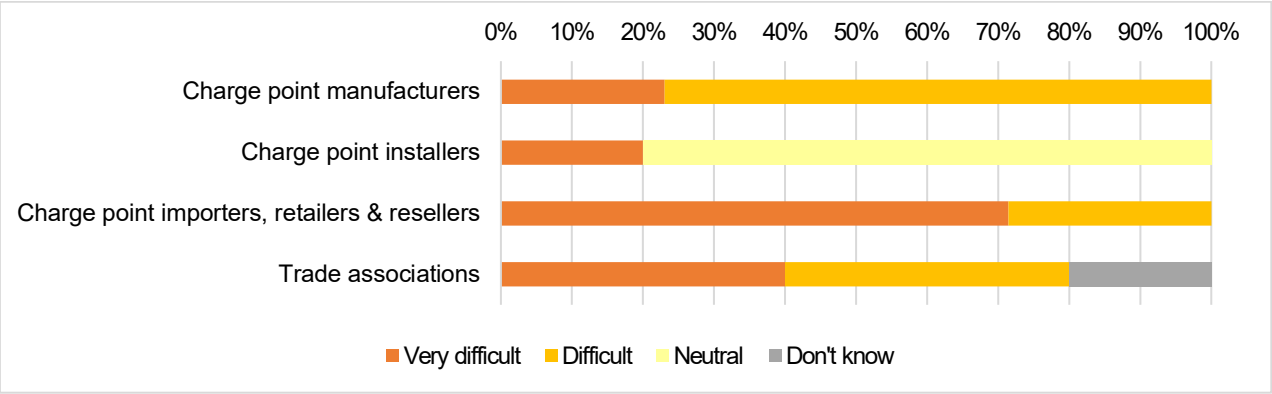
Source: Ricardo analysis, charge point market review (2023)

Difficulty of complying with the Regulations

Most industry stakeholders interviewed (around three quarters) reported finding it difficult or very difficult to comply with the Regulations.

Figure 2-7 provides a breakdown of this sentiment by those stakeholder groups directly affected. The evidence suggests that it was the stakeholders directly affected by the Regulations that primarily reported difficulties. All stakeholders in the manufacturers, retailers/resellers and importers groups, plus an installer group stakeholder, totalling 21 stakeholders, expressed difficulty or high difficulty to complying with the Regulations.

Figure 2-7 Reported stakeholder experience of complying with the Regulations[19]



[19] Difficulty to comply reported by trade associations refers to associations speaking on behalf of their members.

Section 2.2 describes the barriers and challenges for industry groups to achieving compliance with regulatory requirements, and Section 2.2.2 highlights the additional operation and capital costs for industry groups to comply with the Regulations.

2.1.5 Marketing and selling of smart charge points

RQ1d: How have businesses targeted consumers? Have they created partnerships to boost awareness of the smart charge point offering? For example, partnerships between charge point manufacturers and vehicle dealerships.

Industry communication to consumers about changes brought on by the Regulations was varied. Not all industry wanted to communicate with consumers.

Following implementation of the Regulations, a minority of the industry stakeholders, primarily manufacturers, retailers/resellers and installers, reported communicating with consumers or developing information to do so regarding the effect of the Regulations. Those that were still working out how to respond to the Regulations were less likely to have communicated the changes brought by the Regulations, due to a concern over losing customers as a result of them perceiving uncertainties about the new products.

A small number of stakeholders raised the point that it would be beneficial for the Government to provide information to help improve the perception of consumers towards smart charging. Thus saving additional work and expense from industry stakeholders busy with responding to the requirements in the Regulations.

Industry stakeholders employed distinct communication methods based on their specific purposes and business types. Engagement platforms used by industry stakeholders to communicate with domestic and business consumers include email chains to existing and new consumers explaining about the product changes, website FAQs, magazines, and workshops. A minority interviewed for this study used channels like social media posts to advertise their products. A few used Search Engine Optimisation (SEO) to enhance their online exposure and reach a wider audience.

Furthermore, some industry stakeholders tailored their communications to target installers or wholesalers specifically. This strategy was used by groups who would not usually communicate directly to consumers due to the nature of their businesses. Feedback from the wholesalers and installers was related to the reduced paperwork for selling charge points, without having to apply enforcement undertakings to sell non-compliant charge points. In contrast, other stakeholders, such as an installer, a retailer/reseller, and a manufacturer, conducted combined campaigns that addressed both industry and consumer audiences. The industry-specific communications were carried out through workshops and seminars aimed at introducing and educating stakeholders about the relevant regulations and their potential effects.

Moreover, partnerships and joint awareness campaigns played a role in communication strategies. A small number of stakeholders collaborated with others, such as manufacturers or energy suppliers.

The purpose and messages of the communications shared through the channels described above varied among the industry stakeholders. For manufacturers, installers, and hardware developers, the primary purpose was to advertise and promote their products to potential consumers. They used social media posts and other engagement platforms to achieve this goal effectively.

Conversely, when it came to communications targeting installers or wholesalers, the purpose shifted. Those stakeholders who usually did not directly communicate with consumers, aimed to inform, and educate the targeted audience about the Regulations that affected their businesses. This type of communication was essential for raising awareness and ensuring compliance within the industry. During the partnerships and joint awareness campaigns among different industry stakeholders the primary purpose was to introduce new products to consumers, such as innovative tariffs with EV charging options, or to pool resources and expertise to develop compliant products.

RQ1e: On the one hand, what has enabled industry compliance? On the other, what barriers and challenges have industry faced to comply with the regulatory requirements? And, what about selling the compliant smart charge points?

Enablers of industry compliance

Many industry stakeholders reported using OPSS-seminars, trade associations and industry group platforms to gain better understanding of the Regulations.

It was widely commented that stakeholders made use of OPSS seminars to seek clarification and raise queries on the compliance and enforcement aspects of the Regulations. In addition to this, more than half of the stakeholders interviewed gained knowledge about the Regulations through interactions with other industry stakeholders, especially via their industry group platforms or trade associations. One manufacturer involved in the consultation phase of the Regulations' development also indicated direct communication with the UK Government to understand the final version of the Regulations.

The two-stage approach to implement the Regulations was helpful for the industry.

Appreciation for bringing the Regulations into effect in two stages was mentioned during the interviews with two trade associations on behalf of their industry members and a software developer stakeholder. The stakeholders described that, having the more onerous security requirements including cybersecurity enforced at a later stage, had eased some of the pressure faced by the industry to deliver the changes required by the Regulations.

Barriers to industry compliance

An initial lack of official information and support from UK Government organisations (e.g., BEIS, DESNZ, OPSS) led stakeholders to consult various sources of information to interpret the Regulations.

Most product and service market stakeholders, including manufacturers, operators, and retailers highlighted a lack of official support and a point of contact when the Regulations were published as a key issue. Helpful documents and clarifications were provided by the UK Government to address industry questions and clarify the Regulations. However some manufacturers and retailers felt it was provided too late and not conducive to developing compliant products by the implementation date. Some manufacturers, retailers or resellers, and installers reported setbacks due to long response times and a lack of resources from OPSS. These setbacks hindered the industry's ability to obtain answers about compliance criteria, processes, and Enforcement Undertaking applications for extending the sales of non-compliant units beyond the Regulations implementation date.

An overview of the timeframe for developing the Regulations is provided for reference in Text box 2-1.

Text box 2-1 Key milestones in the development of the EV Smart Charge Points Regulations (2021), reported by DESNZ

- July 2021: Regulations confirmed to be taken forward following consultation with trade associations and industry forums
- December 2021: Regulations passed and available online
- February 2022: Regulatory guidance published
- 30 June 2022: Regulations enforcement date (excluding security requirements)
- 30 December 2022: Full regulatory requirements enforced

Lack of representation during the consultation period to provide technical suggestions contributed to the final Regulations being difficult to comprehend and implement.

Respondents perceived that the approach taken to develop the Regulations missed an opportunity for some relevant industry stakeholders to be involved in the consultation. Some organisations, particularly those not members of trade associations, reported to not have been engaged. Furthermore, some of the consulted stakeholders reported that the right technical engineers were not engaged to provide feedback and request prescriptive solutions from the Government. In the industry stakeholders' perspective, this is due in part to the complexity of the charge point industry, which some felt had not been fully recognised at the time, leading to confusion and further difficulties for charge point manufacturers to comply with the Regulations.

Ambiguity in the wording of the published Regulations not providing clear direction on compliant solutions.

Stakeholders expressed that the ambiguity of the regulation text left room for interpretation and did not consider a full range of use cases. Several manufacturers emphasised that more prescriptive instructions on how to comply the requirements of the Regulations would have eased and potentially sped up the compliance process.

Such ambiguity comes from the openness in the definitions of the Regulations aimed to provide room for innovation and the inclusion of new and diverse products in the market.

Key challenges to industry compliance

Those stakeholders involved in the manufacturing and selling of charge points were most likely to report challenges associated with requirements on them to comply with the Regulations and the barriers highlighted previously. A summary of these is provided below:

For manufacturers:

- Additional work and subsequent costs required to comply with the Regulations (see Section 2.2.2 for more detail).
- Component suppliers facing struggles in supplying parts due to external factors such as the global semiconductor shortages and supply chain issues at the same time as the Regulations were being implemented.
- Lack of awareness of the Regulations amongst downstream stakeholders, requiring additional explanation and training provided by the manufacturers.
- Making hardware modifications such as the tamper-proof barrier associated with the security requirements proved to be more challenging and required new equipment and tools to comply.
- The short lead time between signing and implementing of the Regulations making it difficult for the industry sector to study, interpret and develop compliant products. Some manufacturers had to shorten the product testing phase before launching a compliant product to the market. When asked about the ideal lead time, most stakeholders suggested a lead time of at least 12 months to 18 months.
- Larger manufacturers with more complex supply chains found they had less capability or flexibility to respond to the Regulations in the timeframe provided.
- Delaying scheduled new product launch and pushing back product development schedule for customer-wanted features because of the need to prioritise compliance with the Regulations.
- Getting rid of non-compliant stock when industry was not given a period to sell through old stock after the Regulations were introduced.
- The Regulations required manufacturers to procure new component parts so that their products would meet the necessary requirements. This was difficult to achieve within the allocated timeframe in a supply chain with long lead times and known global semiconductor shortage.

For retailer and resellers:

- Not having been informed of the regulatory changes and having large volumes of non-compliant stock to work out what to do with.
- Initially being unaware of the Enforcement Undertaking arrangements.
- Confusion about whether those at the point of sale, as well as at point of manufacturing, needed to apply for Enforcement Undertakings to sell non-compliant charge points and the subsequent increased difficulty for retailers and resellers to consolidate non-compliant stocks.
- Additional administrative work required following the implementation of the Regulations.

2.2 What are some of the economic and broader implications for the industry from complying with these Regulations?

The charge point industry stakeholders have made some changes to their products and services in response to the Regulations. This section highlights the economic and wider implications to the industry resulted by the changes the industry has made for the Regulations.

2.2.1 Availability of smart charge point models on the market

RQ2a: Has the availability of smart charge points been affected? Are there more smart charge points offered in the market?

More smart charge points are being offered on the market.

According to the impact assessment for the Regulations, there were estimated to be between 900 to 1100 charge point models available in the market prior to the Regulations that fall within the scope of domestic and workplace charge points[20]. Based on the market review covering 308 charge points models[21] released between January 2021 and March 2023 (Section 5.2), the share of newly released charge point models containing associated features[22] has increased gradually from 2021. A significant increase in self-reported functionality was recorded from 28% in 2022 H2 to 94% in 2023 Q1 when all the Regulations provisions (excluding security requirements) came into effect.

The market review found that no fully compliant charge point models were available for sale in 2022. However, the insights gathered from the interviews suggested that more fully compliant charge point models would become available in 2023. Difficulties in the supply chain from the remnant effects of the pandemic and the global semiconductor shortage had exacerbated manufacturers' difficulty to acquire parts in a timely manner. As a result, some manufacturers were still developing charge points to meet the Regulations at the point when the Regulations came into effect. Consequently, when these charge points are ready for sale during the course

[20]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015290/electric-vehicles-smart-charge-points-regulations-2021-impact-assessment.pdf
[21] The 308 charge point models cover new charge point models released to the UK market between January 2021 and March 2023, and does not include charge points released before January 2021.
[22] Associated features are all requirements in the Regulation minus the Schedule 1 security requirements

of 2023 it is expected that there will be a net increase in the offering of smart charge point models.

2.2.2 Costs of manufacturing

RQ2b: What are the prices of these smart charge points on offer? Alternatively, what about the costs of manufacturing?

An increase in operating costs (OPEX) and capital costs (CAPEX) was reported by those stakeholder groups most directly affected by the Regulations.

As shown in Figure 2-8, charge point manufacturers, retailers/resellers, importers and installers all commonly reported increased in costs associated with the implementation of the Regulations. More than half of industry stakeholders consulted indicated that their operational costs had increased to some degree, with an increase of up to 5% being the most common response. Over half of the interviewed stakeholders also reported an increase in capital costs, with an increase of 5-15% being the most common response (from just under a third of interviewed stakeholders).

Figure 2-8 Reported cost effects (operational expenditure - OPEX and capital expenditure - CAPEX) of the Regulations by directly affected stakeholder group[23]

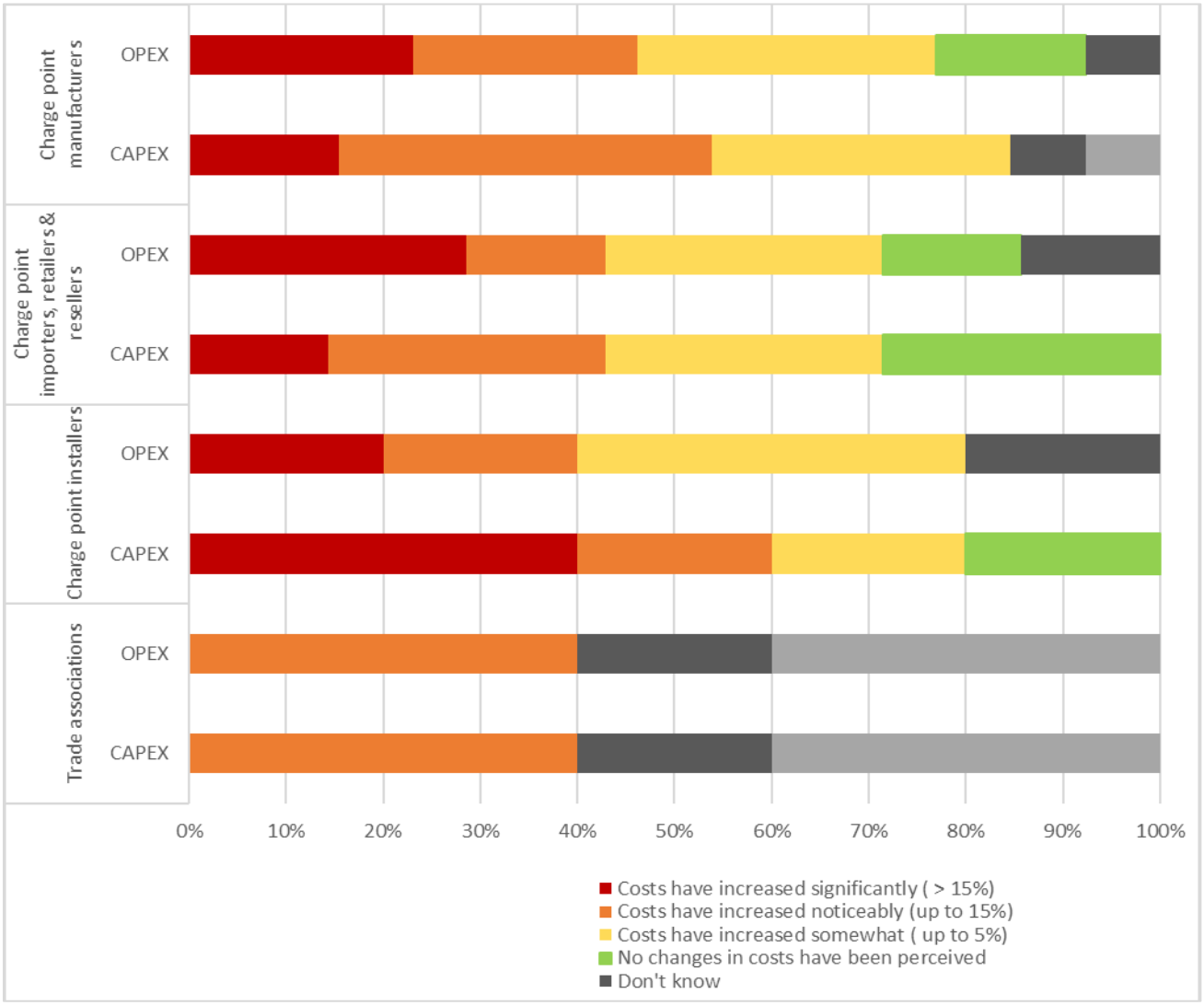


Table 2-2 Most reported additional costs associated with implementing the Regulations

Type of costs	Associated with manufacturing and production of compliant smart charge points	Associated with sales of compliant smart charge points
Increased operational costs / expenditure	• **Familiarisation costs** associated with interpreting and understanding the requirements of the Regulations for compliant charge point models	• **Increased administration** associated with having to keep records of charge points / SoC documents

[23] Trade associations reported the costs effects the Regulations had in their members' business activities. The results must be interpreted as the members of such trade associations being affected in their costs structures rather than the associations themselves.

Type of costs	Associated with manufacturing and production of compliant smart charge points	Associated with sales of compliant smart charge points
	• **Development costs** associated with R&D redirection and developing solutions compliant with the Regulations • **Retraining** of technical staff • **Manufacturing and component costs** associated with implementing new solutions (software, hardware)	• **Training** of customer service / support teams to deal with increase in customer queries • **Handling of non- compliant stock,** e.g. removing from the market
Increased capital costs / expenditure	• **Product investment**, particularly additional **hardware** and to a lesser extent, software, tooling, and certification of products.	

Operational costs

The most reported factors increasing operational costs were familiarisation with the Regulations, development costs, staff training and customer support.

The operational expenditure reported by stakeholders were primarily **one-off costs** associated with the initial response to the Regulations, shown in

Table 2-2. The work included interpreting the requirements, developing appropriate technical solutions, providing training on their implementation to technical staff. The time and effort invested in these processes resulted in increased costs, primarily for charge point manufacturers but also for retailers and resellers. These costs are in line with those initially identified in the Regulations Impact Assessment[24].

While quantitative data regarding specific costs was not collected, most of those interviewed charge point manufacturers stated that most of the increased operational costs were associated with additional staffing. The additional staffing was required for familiarisation and product development activities, as well as increased customer service demands. In the case of charge point installers most of their increased operational costs were related to additional staff training.

Some stakeholders, particularly retailers and resellers, highlighted issues associated with not being able to sell non-compliant charge point stock, risks from retailers returning non-compliant charge point stocks, and warranty costs from needing to upgrade faulty non-compliant charge points with compliant charge points within the warranty period. In addition to this, a majority of

[24] https://www.legislation.gov.uk/ukia/2021/92/pdfs/ukia_20210092_en.pdf

charge point retailers and resellers, noted having additional costs due to the time and effort spent removing non-compliant charge points from their distribution channels. Similarly, interviewed charge point importers also incurred additional costs dealing with non-compliant stocks.

In terms of an **ongoing** operational cost, additional increased administration and paperwork resulting from the Regulations was also reported.

Capital costs

The most common factors contributing to capital cost increases were product investment and component costs, particularly associated with hardware.

As with operational costs increases, most of the increased capital expenditure reported was linked to **one-off costs** (see

Table 2-2). This was primarily felt by charge point manufacturers, associated with purchasing of hardware components, and to a lesser extent software, in some cases opting to pay a premium to circumvent supply chain delays. In addition to this, costs associated with product line modifications such as moulds, additional tools and manufacturing process alterations were also cited.

Charge point retailers and resellers, and installers interviewed stated that the capital cost increases perceived by manufacturers was translated to them via increased charge point unit prices during 2022 when the Regulations initially came in place.

Charge point importers interviewed stated that the additional requirements from the Regulations had increased the charge point manufacturing costs, resulting in increased charge point prices during 2022 H2.

A further capital cost of the implementation of the Regulations reported by manufacturers, retailers and resellers related to the impact on non-compliant stock. This was either considered to be redundant, i.e. a stranded asset, or significantly devalued in the GB market as customer may wish to return or avoid buying, instead preferring to choose new compliant charge points.

2.2.3 Prices of smart charge points

RQ2b: What are the prices of these smart charge points on offer? Alternatively, what about the costs of manufacturing?

The overall trend is of decrease in charge point prices over time since 2020. However, a short-term increase in prices was observed in 2022 H2 associated with the implementation of the Regulations with possible impacts also from external factors.

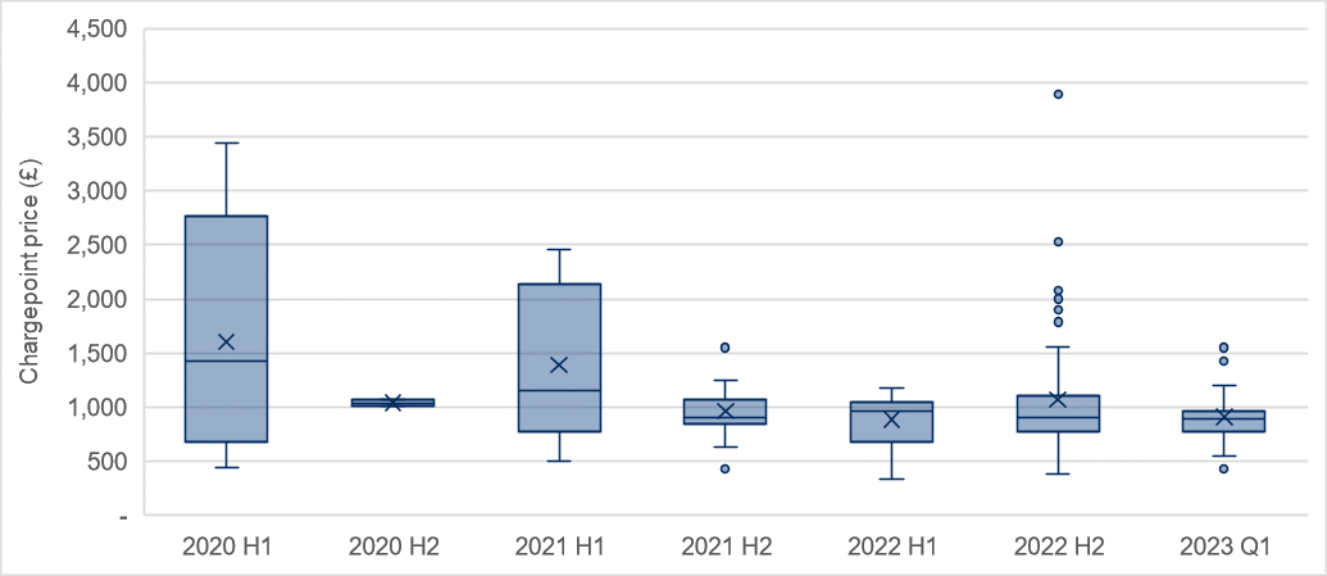
Newly released models

Figure 2-9hows the gradual decrease in prices of newly released charge points offered to consumers from 2020 up to March 2023. However, when analysing the period of implementation of the Regulations, the mean price increases between 2022 H1 and 2022 H2.

The cost increase to manufacturers was reflected in increased prices to the public. Some manufacturers indicated that not all costs were passed on. It is thought that once manufacturers understood and adopted the measures to meet with the Regulations, prices of newly released charge points stabilised (see 2023 Q1 in Figure 2-9).

It is possible that external factors such as the disrupted supply chain following the COVID-19 pandemic, a semiconductor shortage and higher inflation rates may have had additional effects on prices at the time of implementation of the Regulations.

Figure 2-9 Average prices to end-users of new charge point models released to the UK market during 2020 and 2023*.



**Note: Shows aggregated single phase and three phase models. Errors bars represent the maximum and minimum prices recorded costs for new released smart charge points in the given period.*

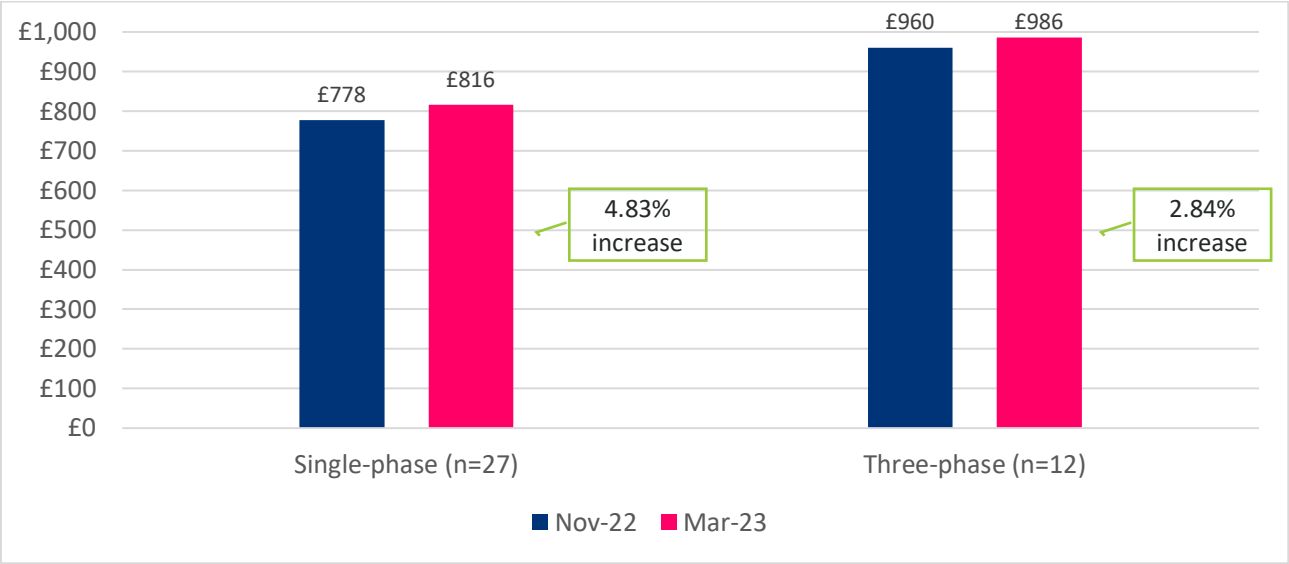
Source: Ricardo analysis, charge point market review (2023)

Updates to existing charge point models appear to have slightly increased model prices

Models modified in Q1 2023 to comply with security requirements

The previous section covered models newly released on to the market. However, in some cases, manufacturers could simply update existing products rather than producing new models to comply with the security requirements in the Regulations. Looking at the impact of this on prices of charge point models in Q1 2023, evidence gathered in the charge point market review exercise suggests that these software and hardware updates could have contributed to a small price increase as shown in Figure 2-10. However, this small increase in cost could also be attributed to inflation, and not a direct result of implementing the security feature.

Figure 2-10 Price changes for modified charge point models to be compliant to security requirements between November 2022 and March 2023



Source: Ricardo analysis, charge point market review (2023)

When comparing to 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.

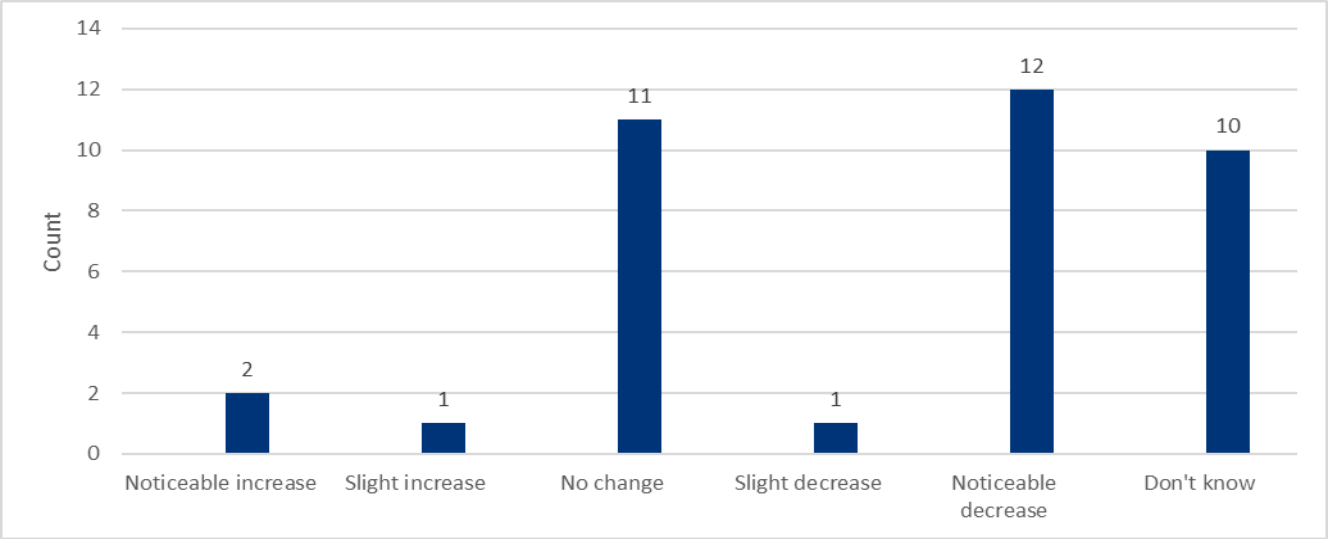
2.2.4 Sales of smart charge point models

RQ2c: How have smart charge point sales evolved over the last year?

While the Regulations may have resulted in temporarily slowed sales of smart charge points for some stakeholders, the overall picture is positive, with external factors reported to be supporting sales in the longer term.

When asked about sales of smart charge points to end consumers, stakeholders provided mixed feedback. A third said they saw a decrease in their smart charge point sales from June 2022 to April 2023; while around another third reported not observing any change as shown in Figure 2-11. This suggests that there was likely to have been some variety in the effect of the Regulations on sales across different businesses, possibly related to their initial response to the Regulations. However, no clear link was identified between responses and whether or not industry stakeholders had been granted enforcement undertakings.

Figure 2-11 Responses to perceived changes in smart charge point sales since June 2022



Amongst the manufacturers that reported a decrease in their charge point sales, key contributing factors identified were supply chain issues and the short lead time to produce a compliant product, and thus there was an absence of their products on the market. A minority of manufacturers with presence in international markets even decided to pull out of the market.

Feedback was also mixed with respect to the impact of competition between non-compliant and compliant charge point models being available on the market at the same time. Some manufacturers suggested that compliant models were being undercut by non-compliant models granted enforcement undertakings during the initial period when the Regulations came into effect. However, others expressed difficulty in selling non-compliant models because customers would rather purchase new compliant models.

While the Regulations were implemented, there was a change in the eligibility criteria for the Government's domestic EV charge points grants which may have influenced sales in 2022. As could EV sales, which are known to have been negatively affected by supply chain problems. As noted in Section 3 below, consumers may have delayed purchasing their charge point until their vehicle was delivered.

Of those that cited no change in sales, or even increased sales, this was perceived to be largely due to reasons not associated with the Regulations, including the initial boost when new products entered the market and an increase in EV sales in the GB market. These stakeholders perceived EV uptake and demand to have a greater effect on sales of charge points than the hindering effects of the Regulations.

2.2.5 Trade of smart charge points

RQ2d: How has trade evolved over the last year, including exports and imports especially associated with smart charge point technology? Have GB manufactured smart charge points remained competitive?

The Regulations do not appear to have had a major impact on imports and exports of smart charge points in the GB market. However, the limited sample collected cannot give a factual and definitive trend on whole market dynamics.

A large minority of the stakeholders engaged in the study did not know how imports and exports had been affected since June 2022. Therefore, the sample of results in this area is limited. Of those that did respond, the most common trade markets were the EU and Northern Ireland, with some also indicating they import products or components from China. A few stakeholders indicated that trade activity has remained consistent both before and after the Regulations, while a small number of other responding stakeholders gave mixed responses with no clear conclusion to the trends in import and export of charge points to and from GB.

A range of different responses to the Regulations were also gathered:

- One energy supplier switched their procurement from EU suppliers to sourcing in the UK for compliant smart charge point models;
- Some stakeholders, including a charge point manufacturer, retailers/resellers and installer moved their non-compliant stocks out of GB to sell in other markets such as Northern Ireland and EU Member States.
- Some stakeholders, including a charge point importer, installers, retailers and resellers stopped importing non-compliant charge point units into GB because of the Regulations, they continue to source parts from abroad.

Some stakeholders raised the issue of divergence between GB and EU Regulations.

A concern was raised by stakeholders regarding the divergence between the Regulations in the UK and the EU market where the latter has a larger customer base and opportunities. Consequently, stakeholders expressed uncertainty in whether EU consumers would value the additional functionalities brought by charge point models that are compliant with the GB Regulations. On the other hand, some UK-based manufacturers were more optimistic and believed other markets will soon announce similar regulations, and they will have a first-mover advantage to sell their already compliant charge point model in those markets.

3 Consumer research findings

Evidence has been gathered via interviews and focus groups with domestic and non-domestic consumers to understand the **effects of the Regulations,** one year on from their implementation in June 2022[25], **on consumer choice and experience.**

Domestic Consumers: This consumer group use smart charge points for personal use. The sample included individuals across variety of stages in the consumer journey; and

[25] While some impacts have developed within one year of implementation, impacts on consumers are expected to develop further overtime.

demographics including, those with varying baseline knowledge, engagement, and control over decisions related to installing a home charge point.

Non-domestic Consumers: This consumer type includes businesses with fleets; workplaces offering electric vehicle charging; landlords; and property developers.

In this section, the EV charge point consumer journey is presented, with a deeper exploration of the three stages (the information and awareness stage, the purchase and installation stage and the use stage) to unpick what are the key motivators and barriers to greater consumer uptake of smart charge points.

Two high level research questions are addressed across the three stages of the consumer journey:

3. How have consumers responded to the new charge point offering?

4. What are the experiences of consumers/users of smart charge points?

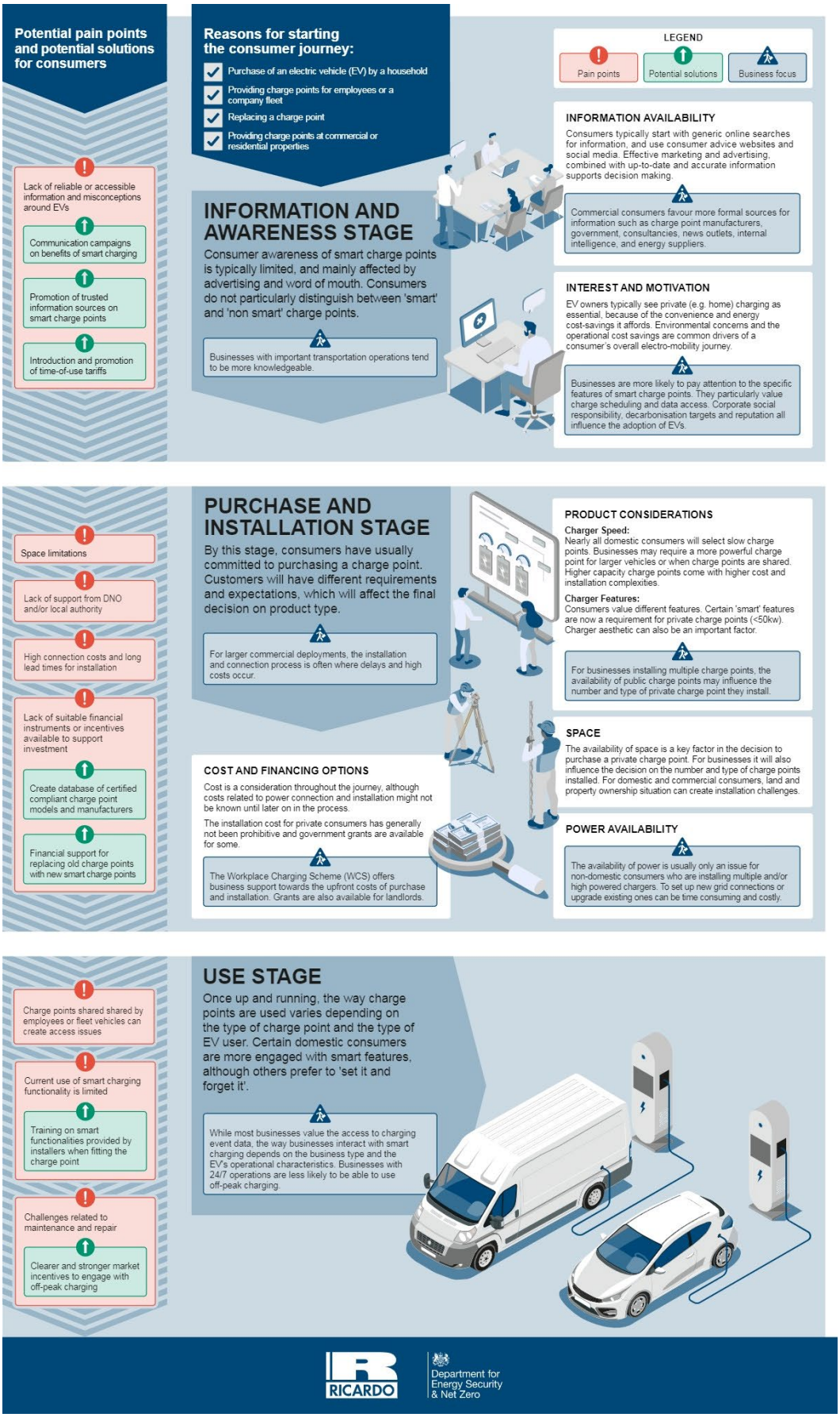
3.1 Overview of the consumer charge point journey

Firstly, consumer behaviours were explored across three stages, including their understanding and awareness (Stage 1), purchase and installation (Stage 2) as well as use (Stage 3) of the EV charge points and smart charging. This exercise also considered whether consumers are aware and/or have interacted with the Regulations to date; for example, whether there have been observed changes to consumer behaviour or attitudes since the Regulations came into effect and the market has changed. These stages as well as key drivers, enablers and barriers along the journey are outlined in Figure 3-1 below.

The three stages to the consumer journey are broadly common for all consumers, domestic and non-domestic. However, the speed consumers move through the journey and the relative

sensitivity and importance they will place on certain decisions and considerations will differ from person to person or business to business.

Figure 3-1: Consumer Journey Illustration



3.2 Stage 1: Information and awareness phase

RQ3a: Are consumers aware of and accessing information on smart charging and, if so, how? How are they influenced by stakeholders?

RQ4d: How are consumers accessing information about smart charge points?

RQ3b: How have consumers responded to these new, regulation-compliant charge points? Are they receptive, that is, purchasing these smart charge points in place of other options available to them? Why?

3.2.1 Consumer awareness of smart charging and smart charge points

Overall, knowledge of smart charging and smart charge points is moderate to low across consumer groups.

Domestic consumers typically had a very low starting knowledge and did not instinctively refer to charge points as ‘smart’ or ’non-smart’.

Even among those who owned smart charge points, within the domestic consumer sample, there was low awareness that their own charge point was smart. These owners commonly recognised the features described, such as scheduled charging, but did not use the same language to describe them. Some who have another reference points (such as those with greater interest in technology, or those with experience using others’ home chargers) were sometimes able to recognise differences in functionality between different chargers.

EV adoption currently occupies a transition point between the early adoption and mainstream phases of product development. Research findings for domestic consumers are contextualized according to where consumers land on this spectrum. Among tail-end early adopters[26] in the domestic consumer sample, there was a high degree of interest in technical aspects of chargers acquired during the information and awareness stage, and they were more likely to have heard about home chargers during their initial research into EVs. While these consumers were not necessarily driven by a specific interest in the chargers, their active interest in EVs tended to encompass the technological aspect of both the vehicles themselves and available charging options. There was some awareness of the existence of smart chargers among this group, but it was not universal. Early mainstream adopters[27], on the other hand, viewed chargers as a necessary accessory – but not integral part – of the EV ‘package’. With this in mind, they were unlikely to show an interest in the charger itself and tended not to engage with

[26] Tail end of early adopters are categorised as interested in technology and exhibiting greater intention with their EV purchase.
[27] Early mainstream adopters are categorised as accidental adopters with little to no intention to purchase an EV.

detailed information prior to purchase. In fact, some even assumed that the charger was included with the purchase of the vehicle.

> *"I was going to ask you what you meant by smart charger! Does it mean the charger has an app?" (Domestic consumer, home charge point installed)*

Awareness amongst non-domestic consumers interviewed was higher, with most respondents able to identify at least one smart charge point feature. User interface and charging event information were identified most frequently by the non-domestic sample, whilst continued charging was recognised the least.

When seeking general information in relation to charge points, domestic consumers typically started with a generic search online for information on 'electric vehicle chargers' and this was supplemented by consumer advice websites and social media platforms such as YouTube and Reddit. Information is most trusted when it comes from those who they perceive to be 'experts', although those considered as experts differs. For early adopters with an interest in technology, this typically additional sources included technology writers, whereas mainstream consumers opted for purchaser reviews on manufacturer websites and forums, including Facebook groups and Reddit sub threads.

In contrast, non-domestic consumers favoured more formal routes for information such as charge point manufacturers, government, consultancies, news outlets, internal intelligence, energy suppliers, and procurement practises. Responses from the non-domestic sample also suggest that information is gathered through multiple avenues within a single organisation, with several respondents citing information from between three and four different sources. This suggests that there is not one single source of truth when accessing information, and instead that several channels support the broader flow of information depending on the perspective of the non-domestic consumer.

> *"Government information came out and the organisation keeps track of regulatory changes.' (Non-domestic consumer, other (landlord and property developer installing EV charging facilities))*

Across the spectrum of domestic consumers, there was consensus that the information available is convoluted and difficult to navigate. This was exacerbated by the fact that apart from a select few early adopters in the sample (driven by an interest in technology), none showed pre-existing awareness of what purchasing a charger entails. As a result, many deferred to word of mouth to confirm their pre-existing thinking on the subject, utilising a network of friends, family and colleagues who have gone through the journey.

Unlike the domestic consumers, most of the non-domestic sample agreed that there was information available to support the purchasing of charge points. Only one respondent felt that information was neither accessible or available, and perceptions of the depth and accessibility of this information varied. Where concerns were identified, they were related to a specific complexity for developers and housing associations in sourcing information on the direction of planning regulation and policy, both at a national and local level.

3.2.2 Consumer awareness of the Regulations

Awareness of the Regulations among domestic consumers was minimal, whereas around half of non-domestic consumers had heard of the Regulations prior to engaging with this fieldwork.

Once familiar with the Regulations, the majority of those sampled in both consumer groups were supportive of their implementation, sharing limited concerns.

Among domestic consumers, most stakeholders admitted they would not have considered the Regulations if they had not been shown information. Even those with more of an interest in the technical features of their charger still did not feel responsible for checking content of the Regulations themselves, given that they felt it would come under the remit of regulators, manufacturers and energy suppliers. The features or issues considered in the Regulations appeared to have had no or minimal effect on decisions about whether to purchase a charger or which charger to select. Particularly regarding security, as again domestic consumers expected Government to be working with manufacturers to ensure they comply with new Regulations, rather than needing to check this themselves.

> *"Knowing that's what the regulations are is comforting in a sense, but on the day-to-day, it doesn't have any impact." (Domestic consumer, home charge point installed)*

Non-domestic consumers identified several advantages to the Regulations, most of which can be linked to commercial benefits for the organisation including standardisation, reduced grid demand, supplier roadmaps, and transparency of data. Where concerns were raised within non-domestic interviewees, they pertained only to the potential of increased costs associated with compliance.

> *"[I] can see the benefits in all the things stipulated. [The] only potential drawback would be if the cost of these units would increase and stop others taking things forwards' (Non-domestic consumer, other (business that operates a fleet of vehicles; workplace with employees who need access to charge points now or in the future))*

3.3 Stage 2: Purchase and installation

RQ3d: What has motivated consumers to purchase smart charge points and use the smart charging functionality? On the other, what barriers and challenges have consumers faced, both in purchasing these charge points as well as using their smart functionality?

3.3.1 Drivers for purchasing smart charge points

While drivers across both groups varied, cost was identified as the main factor influencing the purchase of smart charge points across both consumer groups.

Domestic consumers mainly focused on aesthetic appeal, features, and capability. While non-domestic consumers were less focused on aesthetics and more so on the social and

environmental values they uphold. There was, however, heterogeneity between the main driver of purchasing as cost was a key consideration for both types of consumers.

> *'Reputation is key around everything social value related so we would publicise the fact that we have EV charging points' (Non-domestic consumer, other (business that operates a fleet of vehicles; workplace with employees who need access to charge points now or in the future))*

A small number of tail-end early adopters in the domestic consumer sample reported specifically seeking to purchase a smart charger due to the benefits to them personally from the charger's features such as saving money through off-peak charging. As well as operational costs there was recognition across the domestic consumer group that the purchase is significant, and attention was paid to the associated cost. Some domestic consumers specifically noted the expensive nature of home chargers as a reason for deciding against purchase.

Despite the recognition of cost, uptake of grant schemes and was limited across both groups, with interviewees citing complexity and confusion around eligibility. In relation to domestic consumers, this may be related to the change in eligibility to the home charger grant from 1 April 2022.

There was some scepticism of the Regulations among participants who already have low trust in the UK Government. These participants did not believe that the domestic charging of EVs would pose any problem for the grid soon, so were mistrustful of the motive for introducing the Regulations. Some participants were resistant to feeling 'forced' to use a smart charger, either due to privacy concerns or because they did not want to use an app.

Other concerns raised but appeased by information provided by interviewers, included concerns that consumers could personally get a fine if they own the wrong charger and worries that they would not be able to override scheduled charging. There was a little evidence that some EV owners were hearing misinformation about the Regulations. One participant relayed inaccurate information heard from their electrician, which contributed to them not continuing with their purchase.

3.3.2 Barriers and challenges faced by consumers at the purchase / installation stage

Across both consumer groups there were a limited number of negative experiences overall when considering the purchase of smart charge points. However, most minor barriers experienced related mainly to installation.

> *"We ended up asking around and someone helped. It was more trial and error. Sometimes finding a reliable tradesman is just difficult.' (Domestic consumer, home charger installed)*

> *"They did the site survey on where the fuse board was located. They just took care of it and said what they would do… it was brilliant. The first place I wanted wasn't suitable because of the cables. So, they suggested putting it closer to the fuse box to have cables less on show and for security." (Domestic consumer, home charger installed)*

> *"The biggest challenge is the grid and the cost of securing increased capacity. All of their sites are brownfield sites where they are reusing existing power capacity' (Non-domestic consumer, property developer installing EV charging facilities)*

Interestingly, domestic consumers noted that experiences of barriers could be linked to third party organisations i.e. businesses consumers interact throughout the charger purchase journey. Engineers, electricians, customer service representatives for both EVs and home charge points all can either disappoint or help the consumer through the process. For those that had a positive experience with these individuals, it was felt to relieve them of stress. Many cited useful video calls or seamless coordination for engineer visits. Conversely, a significant minority who had negative experiences felt their journey was directly affected by those individuals.

For non-domestic consumers managing smaller installations, feedback was that the process had been generally smooth with no challenges or major issues. For larger installations some challenges were raised around time and costs, these issues were attributed to permitting, procurement processes and power availability on site.

Location of charge points and the effect of location on grid capacity was noted by several interviewees across both consumer groupings, either as an issue they had experienced directly, or one they were aware of for future installations, for example:

> *'There is an element of existing infrastructure that might need rejigging and look at capacity.' (Non-domestic, other (landlord and property developer installing EV charging facilities))*

> *'Although there's power to the garage it's not on the main fuse board. I was told because of that it would be limited amount of power to the garage' (Domestic consumer, journey leaver)*

A minority in both consumer groups experienced a more complicated process than anticipated, involving more structural work due to specific brickwork in their homes or businesses, errors carried out by engineers or finding it difficult to source an engineer in their local area. One non-domestic respondent recalled a particularly negative experience due issues surrounding power supply, incorrect power line routing and old connections, leading to significant delays and additional costs. There were also issues with metering, which subsequently affected an auto upgrade and caused faults across the organisation's 12 double socket 22kW charge points.

Those who chose not to go on to buy a charger (journey leavers) reported barriers to installation, such as high projected costs of electrical work or disruption from alterations to their home. Interestingly, challenges associated with structural work were noted by some as reasons to abandon the charge point journey entirely, although this barrier was identified in the information and awareness stage rather than during the installation.

> *"They would have to drill through a big wall which is fine but it's a lot of faff…I wouldn't say we're against it completely, but I wouldn't see the benefits" (Domestic consumer, journey leaver)*

Others chose not to continue to use or purchase their EV, due to it not meeting their needs or concerns about the reliability of the wider public charging network.

Neither group appeared to back out of the charge point journey beyond the purchase stage. Although some report difficulties with their charger during or after installation, these barriers are typically easier to resolve than those that occur at the preparation phase.

3.4 Stage 3: Use

RQ3c: To what extent are consumers who own smart charge points using smart charging functionalities? In particular, do they use the pre-set off-peak default settings? Do they use the randomised delay functions? Or are they overriding these settings? What are their reasons (e.g. hardware or software design, needs, etc.)?

RQ4b: Have consumers experienced any service disruptions (e.g. from losing connection to a communications network and/or cyber-attacks) and how have they reacted?

RQ3d: On the one hand, what has motivated consumers to purchase smart charge points and use the smart charging functionality? On the other, what barriers and challenges have consumers faced, both in purchasing these charge points as well as using their smart functionality?

RQ4c: Are consumers aware they can switch between energy suppliers and/or tariffs? What proportion of consumers have attempted a switch and what has their experienced been (e.g. any disruptions, administrative hurdles, etc.)?

RQ4d: How are consumers accessing information about smart charge points? Are consumers who own smart charge points aware of their power consumption and charging time information from their smart charge point? Do they make use of this information?

3.4.1 Use of smart charging functionalities

Among domestic consumers, respondents classified as ‘early adopters’ were relatively more engaged with the use of smart features. Many stakeholders engaged in this exercise did not fully re-engage after the initial set-up, preferring to ‘set it and forget it’. Scheduled charging was the most familiar feature to the domestic group and while owners commonly recognised the features described, they did not always use the same language to describe them. This is in line with the 2022 Baseline Evaluation Survey, where charge-scheduling was the most selected functionality available to respondents who owned a charge point.

> *“‘I think mine is a smart charger and can do everything [mentioned]. It’s something I use and I would be disappointed if I didn’t have it.” (Domestic consumer, home charge point installed)*

Most non-domestic respondents do not currently own or operate smart charge points. Thus, there was limited information collected on their use of smart features and none could provide insight into how often the pre-set 'Off-Peak Charging' and 'Randomised Delay' functionalities were set or overridden. However, they did provide insight into how they would expect to interact with these features, with varied responses showing that it is likely to be dependent on the type of business, and operational characteristics. In some cases, smart charging was not seen as practical. This was typically the case for business that had 24/7 operations and operated larger vehicles with longer charging times. Some businesses also noted the inflexibility they have to switch energy supplier. This is also supported by the 2022 survey, which found that the majority (66%) of respondents with battery-electric vans have a 3-pin cable as their main charger.

No participants from either consumer group reported experiencing any service disruptions due to external factors.

3.4.2 Motivations and barriers to using smart charge points

The price and features are the important motivators for domestic consumers. Incentives also influence the purchasing decision. However, there is often confusion around eligibility. For non-domestic customers, cost and financial support were also considerations while social and environmental factors were highlighted as more general motivational factors for electrification, as businesses seek to manage their reputation and support enablement of environmental/net zero targets.

Those domestic respondents who did seek out smart chargers cited the potential money-saving benefits of scheduled charging, as well as the benefits of being able to remotely control charging through an app. Interestingly, while respondents expected cheaper electricity prices at off-peak times, there was low awareness of specific time of use or similar tariffs. Furthermore, those who did consider switching energy supplier or tariff rarely go on to do so.

> *"I tried my hardest to switch, but I couldn't – the companies wouldn't let us switch. I'm now not considering switching though." (Domestic consumer, home charge point installed)*

All non-domestic respondents were aware that different EV tariffs existed, but they were not explicitly aware of the support provided by the Regulations to enable them to switch between energy suppliers and/or tariffs. The most common features that appealed to non-domestic consumers were the ability to switch business tariffs, charge scheduling, and data access.

> *"We don't have scheduling charging but wish we did" (Non-domestic consumer, workplace with employees who need access to charge points now or in the future)*

The domestic consumers not using some or all 'smart' features rarely indicated that they are actively overriding these settings; instead, they were simply not engaging with the features. Respondents classified as 'early adopters' were relatively more engaged with the use of smart features, while others engaged in this exercise did not fully re-engage after the initial set-up, preferring to 'set it and forget it'. One explanation, that was also seen with non-domestic consumers, was a view that they might not benefit financially. Furthermore, other barriers that

non-domestic consumers did identify included prioritisation of operational requirements, and inflexible energy contracts.

> "We do not encourage the use of smart charger functionalities, as we are a 24-hour operation so do not have 'down-time' in evening. Ideally, we would charge in the evening but do not have a 9-5 operation to do so" (Non-domestic consumer, other (Landlord and property developer *installing EV charging facilities*))

4 Evaluation findings and conclusions

The primary objective of this process evaluation has been to provide an understanding of how the EV 'Smart Charge Points' Regulations (2021) have been implemented and how industry and consumers have responded to this. In addition to the evidence collected from consumers and industry stakeholders about the level of awareness, compliance and use of smart chargers, direct feedback was also collected from policy officers, industry stakeholders and consumers as to lessons learned from the implementation of the EV Smart Charge Points Regulations so far, and areas for improvement in future policy-making.

This final section draws on the research findings to provide lessons learned, improvement opportunities, and answers to the fundamental process evaluation questions of whether the Regulations were delivered as intended, how context influenced delivery, what worked well and less well, and subsequently what could be improved.

4.1 Were the Regulations delivered as intended?

To answer this, it is helpful to refer to the theory of change, which is presented at a high-level in Table 4-1. The Theory of Change (ToC) captures direct and indirect key inputs, activities and outputs, outcomes and impacts intended by the Regulations. This process evaluation, especially given the timetable, focuses on the intended outcomes and short-term impacts, as the Regulations have been implemented for less than 12 months at the time of writing.

Table 4-1 Theory of Change for the EV (Smart Charge Points) Regulations 2021

Context: The UK's EV Smart Charge Points Regulations 2021

Inputs	Activities and outputs	Outcomes	Impacts (net effects)
1. EV smart charge points Regulations 2021 to mandate smart functionality	1. Engagement between DESNZ/OPSS and industry to support and ensure compliance of charge points with the regulations 2. Industry stakeholders understand regulations, review their products (manufactured locally and/or imported) and adjust as per the requirements of the regulations 3. Charge point manufacturers, retailers, resellers, and importers comply with regulations 4. Enforcement of regulations by OPSS 5. Industry engage with consumers about smart charge points 6. Consumers purchase charge points with smart functionality (and all other regulatory requirements)	1. All charge point installations are compliant with regulations 2. Innovation (R&D expenditure and number of patents) is not stifled 3. UK charge point products remain competitive (when compared to products of overseas manufacturers) 4. Regulation compliant charge points are used for smart charging where applicable 5. Consumers use pre-set off-peak default charging setting and randomised delay functions, and do not override smart settings 6. Consumers have a positive experience using smart charge points and do not experience service disruptions or risks to safety and security 7. Consumers are able to switch energy suppliers or tariffs without disruptions 8. Consumers can access power consumption and charging time information from a monitoring system	***Short-to-medium term*** 1. Increased sales of compliant charge points / decreased sales of non-compliant charge point 2. Greater production of smart charge points 3. Price of smart charge points stabilises/ decreases 4. Greater uptake of/ use of smart charging 5. Decreased use of 3-pin plugs for EV charging 6. More smart tariffs offered to consumers 7. Consumers are more informed about power consumption/ costs ***Long term (outside the scope of this study)*** 8. Reduced peak power demand and absence of secondary peaks 9. Less grid reinforcement needed 10. Increase in electricity system flexibility 11. Reduced grid stability risk 12. Better utilisation of renewables 13. EV charging is cheaper 14. Earlier/ increased EV uptake 15. GHG emission reductions in transport sector

It is assumed and expected that industry stakeholders such as charge point manufacturers are supportive of the principle of the regulations and will comply.

The regulations are expected to bring about changes to charge point manufacturing processes and/or to the charge point products sold in GB, leading to an increase in purchase of smart charge points by consumers.

These regulations are expected to increase functionality, safety and security associated with EV charging for consumers and GB's electricity system. Smart tariff price signals are assumed to overcome inconvenience of delayed/ overnight charging.

Note: blue text indicates directly related, grey text indicates indirectly related

4.1.1 Activities and outputs

Overall, all the activities and outputs as identified in the theory of change have been delivered; however, this has not been without its challenges.

In 2023 Q1, over 90% of the charge point models available in the market self-reported to have the required features (except security features); which came into force later

From an **industry perspective**, the implementation of the Regulations remains in a transition period with some remaining non-compliance and a lack of understanding within industry as to how to comply with all aspects of the Regulations (concerning output 2 in the ToC).

Some key barriers or frictions which have affected the application of the activities and outputs of the Regulations have been identified:

- The GB charge point market was significantly disrupted because of the need to comply with the Regulations. Industry stakeholders interviewed, particularly manufacturers and retailers/resellers, reported incurring additional costs and administration, and negative impacts with respect to their strategic roadmaps.
- The openness of the wording of the Regulations is likely to have contributed to increased familiarisation costs for some industry stakeholders and contributed to the delays of some compliant products reaching the market (linked to output 3 in the ToC).
- Lack of OPSS resources contributed to delays in industry interpreting the Regulations and being able to develop suitable solutions (linked to activity 1 in the ToC).

Enforcement of the Regulations is now underway (activity 4 in the ToC). However, several charge point manufacturers have been granted enforcement undertakings. This indicates there are still some manufacturers not able to comply with the Regulations. However, in 2023 Q1, over 90% of the charge point models available in the market contained all features required under the Regulations (except for the security features); which cam into force later (output 3 in the ToC). Compliance with the security requirements implemented from 30 December 2022 is expected to take longer to achieve due to its complexity and delayed phasing in.

From the **consumer perspective**, this high level of industry compliance (indicated by the market review) supports the opportunity for consumers to purchase compliant smart charge points. However, evidence gathered in this process evaluation suggests that this has not necessarily affected the capability or motivation of consumers to do so (output 6 in the ToC). This is related to the relatively limited awareness of the potential benefits of using smart charging, particularly in domestic consumers, and the limited communications by industry regarding new compliant smart charge points.

4.1.2 Outcomes and impacts

Intended outcomes and short-term impacts have not necessarily materialised yet.

Associated with the challenges identified in delivering the activities and outputs, the following key intended outcomes and short-term impacts have not necessarily materialised yet.

From an **industry perspective:**

- Not all charge point installations are likely to be compliant with the Regulations (outcome 1 in the ToC) on the basis that some charge point sellers still have enforcement undertakings in effect enabling them to continue selling non-compliant charge points until the enforcement undertaking period expires. However, the high level of compliance by industry stakeholders suggests that this should improve in the longer term.
- Overall, sales of charge points do not appear to have been directly affected by the Regulations (impact 1 in the ToC). In some cases there were decreased sales associated with less availability of smart charge points, and the withdrawal of some industry stakeholders from the GB market due to the Regulations. However, external factors are thought to be contributing towards a longer-term trend of increased sales of smart charge points.
- There are uncertainties around the trade effects of the Regulations.
- In terms of imports a small number of stakeholders indicated plans to halt importing of EU charge points to GB since these no longer meet the requirements of the Regulations. Some suppliers are reconsidering their position and ongoing involvement in the GB market at this time.
- When considering whether GB charge points are currently competitive in broader markets (outcome 3 in the ToC), a small number of industry stakeholders suggested they were moving their GB non-compliant stock to be sold in Northern Ireland and the EU. A small number were hopeful that in the future, GB charge points could have a first-mover advantage if and when the EU and other markets adopt similar regulations.
- While the openness of the wording in the Regulations enabled a range of solutions to be developed eventually in response (outcome 2 in the ToC), industry stakeholders have indicated that this need to suddenly change activity and incur additional costs has contributed to delays or pausing of other R&D activities.
- The overall trend is of decreases in charge point prices over time since 2020 (in relation to impact 3 in the ToC). However, a short-term increase in prices was observed in 2022 H2. This could be related to both the implementation of the Regulations and external factors such as supply chain disruption and high inflation attributed to the Ukraine-Russia war. It is thought that as all manufacturers comply with the Regulations, prices will stabilise (subject to external factors).

From a **consumer perspective:**

- Use of smart functionalities, such as pre-set off-peak default charging setting and randomised delay functions appear to be immature (linked to outcomes 4 and 5 in the ToC). Consumers are more likely to not engage with the functionalities at all rather than

overriding them. Several non-domestic consumers suggested that smart charging isn't viable for their business operations.

- Consumers with smart charge points can switch energy suppliers/tariffs and access power consumption and charging time information (outcomes 7 and 8 in the ToC). However, they are not necessarily choosing to do so as they are not aware of opportunities associated with smart charging functionalities and potential savings and personalisation available.
- While no specific service disruptions were reported by consumers, associated with the lack of engagement with the smart functionalities, some consumers did indicate a lack of positive experience (outcome 6 in the ToC). This was particularly reported by those consumers who purchased charge points prior to the implementation of the Regulations who raised concerns over the safety and security of their charge points and when these would get updated in line with the Regulations.
- There was lack of evidence regarding progress to date in relation to impacts 4 – 15 in the ToC.

4.2 How has the context influenced delivery?

Several external factors have been identified that coincided with the implementation of the Regulations and may, therefore, have influenced the activities, outputs, outcomes and short-term impacts of the Regulations.

At the policy development stage, several different standards and protocols were developing at the same time, such as the open charge point protocol and the combined charging system protocol. This posed challenges for the drafting of the Regulations in terms of what reference points could be used, being mindful of avoiding the Regulations would become quickly outdated or stifling innovation.

As mentioned in the key challenges to industry compliance section in Chapter 2, a disrupted supply chain following the COVID-19 pandemic has been a longer running issue for many in the manufacturing industry and the charge point industry has been no exception to this. Similarly, there is an ongoing global semiconductor shortage. Both factors are reported by some industry stakeholders to have made the tight timeframes for complying with the Regulations more challenging and more expensive than they might have been otherwise.

Moreover, the global energy crisis associated with the Ukraine-Russia war that commenced in early 2022 caused inflationary pressures which likely also affected the market, particularly by increasing their production and processing costs.

Removal of the home charge point grant for homeowners may hinder the uptake of private domestic charge points.

From 1 April 2022, homeowners with off-street parking are no longer eligible for the OZEV chargepoint grant, however, this remains available for owners of flats, and those in rented accommodation. This coincided with the implementation of the Regulations in June 2022. As a

result, there is the potential for this to have affected sales of new, compliant charge points, although this specific outcome was not identified as part of this study.

4.3 What are some of the lessons learned from the implementation of the Regulations so far?

4.3.1 What worked well?

The Regulations have led to greater availability of different smart charge point models on the market and this has been without significant price rises for consumers.

The research and findings from the stakeholder engagement suggest that the following aspects **did work well**.

From an **industry perspective**:

- The two-phase approach, i.e., delaying the implementation of the security requirements, has helped stakeholders in their implementation, although it was noted that they needed even more time to transition to the new regulatory environment.
- The support provided by OPSS has eventually led to a good understanding of the Regulations on average across industry.
- Overall, a good level of compliance has eventually been reported for all except security requirements, over 90% in 2023 Q1.
- Although prices appear to have increased slightly following the implementation of the Regulations, they were still below levels observed in 2020 H1 and 2021 H1.
- Openness in the wording of the Regulations allowed for different interpretations which has contributed to a variety of products / solutions on the GB market. The Regulations encouraged innovation in the sector.

From a **consumer perspective**:

- Increased smart charge point availability in the market giving greater opportunity for consumers to access these products and their functionalities.

4.3.2 What worked less well?

Overall, the rapid implementation timeframe compounded by the external factors posed real difficulty for industry to develop compliant smart charge point products in time.

Based on this research again, key elements that **did not work well** are presented below.

From an **industry perspective**:

- A lack of consultation/engagement with key and ‘appropriate’ stakeholders, e.g., including technical rather than only policy experts and a lack of representation from trade associations during the development of the Regulations, which has damaged

relations between Government and some stakeholders and considered by some to have resulted in a disconnect between the text of the Regulations and real-world application. Some smaller industry players were unaware of the consultation until the Regulations were finalised.

- A small number of industry stakeholders cited a lack of forward thinking by policy makers in terms of what would happen with the existing or available stock of smart chargers. There was no clear guidance or a deadline for having full compliance or removing non-compliant charge points from the market and routes to doing this.
- Ambiguity in the text of the Regulations, intended to facilitate innovation and flexibility, resulted in high familiarisation costs and frustration for those industry engaged.
- Including workplace charge points under the Regulations at a late stage without consulting industry of the effects of this.
- OPSS lacking capacity to respond quickly as manufacturers were rushing through their respective product development.
- A perceived lack of compliance standards and guidance being provided by OPSS/DESNZ while the Regulations were introduced; not only in terms of how to comply but also removing and disposing of non-compliant products from the market.
- The likely effect of external factors on the charge point industry at the same time they were being required to respond to the requirements in the Regulations.

From a **consumer perspective**:

- The continued lack of awareness of smart charging by consumers; etc and indication that this is not such a priority for some industry stakeholders which could limit or delay the intended benefits of the Regulations regarding consumer uptake.
- Limited availability of information for consumers concerning the status of their charge point products and the impact of the Regulations on them.

4.4 What can be learned from the delivery methods used?

The charge point market ecosystem is complex and wider engagement of technical experts and technology developers could have been beneficial to address or prevent some of the barriers raised by industry during the implementation of the Regulations.

Industry stakeholders highlighted the importance of **ensuring policy makers understand the complex and fragmented EV charge point ecosystem**. They consider that a lack of understanding may have contributed to:

- **lack of engagement** from key and ‘appropriate’ stakeholders, e.g., including technical rather than only policy experts.
- **lack of representation** from trade associations and therefore some smaller industry players were unaware of the consultation until the Regulations were finalised.

These factors had knock-on implications on the regulatory timeline adopted, and were perceived as setting unrealistic timeframes to implement changes, particularly for the larger manufacturers with more complex supply chains. Those that raised the issue suggested that 12 – 24 months would be a more appropriate timeframe to enable manufacturers to consult and organise their supply chain and develop suitable solutions. Stakeholders also noted that **increased engagement with industry would have been beneficial as part of the development of the legal text**, so due consideration could be given to the effect of extending the Regulations to different use cases, such as domestic and non-domestic uses.

A small number of industry stakeholders cited a lack of forward thinking by policy makers in terms of what would happen with the existing or available stock of smart chargers. There was no clear guidance or a deadline for having full compliance or removing non-compliant charge points from the market and routes to doing this. As a result of this, numerous manufacturers and retailers had strategic business issues concerning their suddenly non-compliant charge points on the market and experienced additional costs associated with their removal, disposal and/or export of these products.

The ambiguity and lack of clarity in the wording of the Regulations caused additional issues for industry stakeholders.

One of the key considerations for policy makers whilst developing the Regulations was balancing the need to intervene in a fast-growing market with the desire to support and facilitate high levels of innovation and variety of product on the market. To manage this, the approach taken avoided being overly prescriptive, leaving some aspects open to interpretation. This was even revisited in 2021 to reset the approach to be even higher level, and avoid mandating specific solutions which might constrain and hamper innovation in the industry.

However, as noted in Chapter 2, this approach was not welcomed by industry stakeholders interviewed in this study. They commented that the ambiguity of the wording in the Regulations was problematic, as it has meant that stakeholders have had to spend a lot of time and effort (and cost) interpreting the Regulations and trying to work out how to comply with them. Thus, they conclude, this should be improved, and could also benefit from more guidance and clarity from OPSS.

This was compounded by the short time imposed and the perceived lack of capacity of OPSS to deal with the high volume of queries being submitted from across stakeholder groups, as well as external factors such as the semiconductor shortage and supply chain disruption post COVID pandemic which created a very challenging situation for industry stakeholders.

Despite this, the result has been that different interpretations have been made, for instance, different solutions and implementation methods were applied for the randomised delay feature across the industry according to some of the interviewed manufacturers. This suggests that the Regulations have contributed to a diverse range of solutions being developed, demonstrating innovation in the GB market in line with the intentions of the regulatory approach.

Relationships between UK Government and the charge point industry were negatively affected by the approach to implementation of the Regulations.

Industry stakeholders engaged suggested that the approach taken by policy makers to implement the Regulations damaged relations with industry stakeholders, who have felt they have not been appropriately engaged or that their views were not taken on board.

In fact, some industry stakeholders did not engage in this Process Evaluation study because of consultation fatigue and frustration with the implementation of the Regulations, which they associate with severe effects to product development roadmaps and financial losses for businesses. More discussion around the complexities in the ecosystem could be beneficial. In particular, this could be of value in terms of understanding further the implications for GB trade and of GB products.

4.5 What could be improved?

Based on the lessons learned from the implementation of the Regulations so far, the following improvements could be made to support greater industry compliance.

1. The consultation process appears to not have covered all affected stakeholders. Broader communication with industry stakeholders would have been beneficial to maximise engagement, for example with those not members of trade associations.

- This could include consulting on the legal wording as well as initial content of the Regulations, to sense check and validate the applicability against real world use cases; and engage the relevant stakeholders from across industry groups, including technical engineers who would be required to implement the required changes and those not represented by trade associations.

'Regulations should consider all key products and business models known today, whilst taking into account that other alternatives may exist or be developed and outline how these would be covered by the Regulations' (Charge point manufacturer)

2. Stakeholders sought clearer communication and guidance on the Regulations and their implications.

- For example, surgeries and/or events for stakeholders to go through Q&A, streamlining the number of sessions, and more group sessions to answer industry queries.
- Widespread provision of compliance guidance up front alongside the Regulations, both in terms of charge point products but also paperwork and administration requirements would have been beneficial to industry stakeholders.

3. Industry feedback was that a longer lead time is needed for industry to implement changes, also considering external factors.

- Industry generally suggested that 12 – 18 months would be a more appropriate timeframe to enable manufacturers to consult and organise their supply chain and develop suitable solutions. Industry did not feel listened to in this respect.
- Perceived additional difficulties posed by external factors such as other legislation evolving, supply chain issues and semiconductors / chip shortages were perhaps not

fully understood by policy makers during the development of the timeframes for the Regulations.

4. Having redundant stock was a common issue for manufacturers and retailers as implementation applied to all products sold on the market. Another option could have been to require implementation in newly manufactured.

- This could have allowed products already at the point of sale to be sold beyond the implementation date, reduce the cost / loss of value for manufacturers and retailers / resellers to withdraw products from sales channel and reduce the amount of waste associated with the Regulations.

6. Clarification is needed on a way forward or options to retrofit non-compliant charge points.

- The Regulations focused on charge points at the point of sale, i.e. those being manufactured and sold. However, they do not indicate any requirement for the update of existing smart charge points already installed and being used that may have some but not all the functionalities set out in the Regulations. A consequence of this has been that some industry stakeholders have been disposing of non-compliant stock as waste and non-domestic consumers raising concerns over what will happen to their existing charge points, particularly from a security risk perspective. Therefore, options and timeframes for retrofitting existing charge points could also been considered.

The following improvements could also be made to support greater consumer uptake of smart charging.

1. Greater provision of smart charging information targeting consumers is needed, whether that comes from industry or Government.

- This research suggests that domestic consumers broadly felt that knowing this information would not significantly affect their purchasing decision. However, it is possible that this is because they are not fully aware of the potential benefits available to them in terms of personalised charging options and cost savings with off-peak charging. Therefore, further information regarding the benefit of specific smart charging features for consumers could be beneficial to encourage uptake and help realisation of the wider benefits associated with the Regulations.
- Communicating about financial incentives for the user for using these features might also help to drive uptake.
- User friendly interfaces and default settings consumers could negate the need for consumers to need to fully understand smart charging to engage.
- Four industry stakeholders suggested that the Government should produce and share information to educate consumers on EV smart charge points, rather than delegating the responsibility to the EV charge point industry. These interviewees suggested this would both ease the pressure on an already struggling fragmented charge point industry, and improve perception of consumers who have mistrust in smart charging.

2. Greater provision of information about the effect of the Regulations, targeting consumers, could help support consumers who were part way along the consumer journey when the Regulations were implemented.

- A key lesson learned from the implementation of the Regulations is that there is limited accessible information available for consumers in relation to the implications of the Regulations on them. This was in relation to:
    - A bias toward information on hardware and limited guidance or emphasis on the relative importance of the Regulations in the process of installing charge points and the wider planning context whereby consumers need to have the car parking space and ensure there is power availability.
    - Lack of clarity on appropriate points of contacts, resulting from the market situation and poor accessibility through websites.
    - Difficulties finding out if suppliers were compliant with the Regulations and the implications of voluntary undertakings. Consumers are expected to own a charge point for up to seven years and are therefore concerned if it had out-of-date security features when it was installed.

3. A clearly defined certification and compliance scheme.

- A key point raised by industry stakeholders was around the lack of compliance guidance released initially alongside the Regulations. Further to this, some non-domestic consumers have highlighted that it has been difficult to find out if their supplier is compliant with the Regulations or not.
- It is suggested that a clearly defined certification and compliance scheme could be of benefit to industry and consumers. This could document the specific steps required and acceptable vs unacceptable solutions developed by industry in response to the Regulations, making compliance records easily acceptable to customers without the need to chase suppliers first hand for the information.

5 Annexes

Annex 1: Final Process Evaluation Questions

The following table presents the final process evaluation questions covered by this study.

Table 5-1 Final process evaluation questions structured into five groups

High-level questions	Final longlist of research questions
1. How has the charge point industry in GB responded to the Regulations so far?	a) How have industry interpreted the Regulations? b) How have industry made changes to comply with Regulations? Have they changed their products and, if so, how? Have they developed new models? What functionalities do these products provide (e.g., default settings, etc.)? c) To what extent are charge points sold in compliance with each regulatory requirement? And why? Please consider how contextual factors may affect this. How have sellers demonstrated compliance? d) How have businesses targeted consumers? Have they created partnerships to boost awareness of the smart charge point offering? For example, partnerships between charge point manufacturers and vehicle dealerships. e) On the one hand, what has enabled industry compliance? On the other, what barriers and challenges have industry faced to comply with the regulatory requirements? And, what about selling the compliant smart charge points?
2. What are some of the economic and broader implications for the industry from complying with these Regulations?	a) Has the availability of charge points been affected? Are there more 'smart charge points' offered in the market? b) What are the prices of these smart charge points on offer? Alternatively, what about the costs of manufacturing? c) How have smart charge point sales evolved over the last year?

High-level questions	Final longlist of research questions
	d) How has trade evolved over the last year, including exports and imports especially associated with smart charge point technology? Have GB manufactured smart charge points remained competitive?
3. How have consumers responded to the new charge point offering?	a) Are consumers aware of and accessing information on smart charging and, if so, how? How are they influenced by stakeholders?
	b) How have consumers responded to these new, regulation-compliant charge points? Are they receptive, that is, purchasing these smart charge points in place of other options available to them? Why? Please consider any external or contextual factors that may affect consumer decisions.
	c) To what extent are consumers who own smart charge points using smart charging functionalities? In particular, do they use the pre-set off-peak default settings? Do they use the randomised delay functions? Or are they overriding these settings? What are their reasons (e.g. hardware or software design, needs, etc.)?
	d) On the one hand, what has motivated consumers to purchase smart charge points and use the smart charging functionality? On the other, what barriers and challenges have consumers faced, both in purchasing these charge points as well as using their smart functionality?
4. What are the experiences of consumers/users of smart charge points?	a) How do consumers perceive their consumer journey from point-of-purchase, to installation, to use of a smart charge point?
	b) Have consumers experienced any service disruptions (e.g. from losing connection to a communications network and/or cyber-attacks) and how have they reacted?
	c) Are consumers aware they can switch between energy suppliers and/or tariffs? What proportion of consumers have attempted a switch and what has their experienced been (e.g. any disruptions, administrative hurdles, etc.)?

High-level questions	Final longlist of research questions
	d) How are consumers accessing information about smart charge points? Are consumers who own smart charge points aware of their power consumption and charging time information from their smart charge point? Do they make use of this information?
5. What are some of the lessons learnt from the implementation of the Regulations so far? Is any other precedent that could be relevant?	a) Are there any lessons learnt from the implementation of the policy so far (from both the industry's and consumer's perspectives)? What could be improved to enable an even more effective implementation of the Regulations?
	b) What other measures or actions could be taken to improve industry compliance, if at all possible?
	c) What are other measures or incentives that could be introduced to improve consumer uptake of smart charge points and use of the smart functionalities?
	d) Is there any precedent (in other jurisdictions or other policy areas) with learnings that should be considered for the ongoing implementation of these Regulations?

Annex 2: Engagement samples

The following samples were obtained in this process evaluation.

- Industry stakeholder sample of 36 participants
- Domestic consumer sample of 47 participants
- Non-domestic consumer sample of 12 participants
- A breakdown of each of these is provided in Table 5-3, Table 5-4 and Table 5-5.

Table 5-2: Summary of field research undertaken across industry stakeholders (08 March - 05 May 2023)

	51 pre-screening surveys completed *NB: Some organisations identify as multiple stakeholder groups, number in brackets includes total number of organisations identified as having multiple roles.*	**36 interviews of 60 min each completed**
Charge point manufacturers	19 (28)	13 (16)
Charge point installers	7 (11)	5 (9)
Charge point retailers /resellers	10 (17)	5 (13)
Energy supplier	2 (3)	1 (2)
Distribution system operators	2 (2)	2 (2)
Trade associations	4 (4)	5 (5)
Software solution provider	3 (5)	1 (2)
Hardware solution provider	1 (1)	1 (1)
Electricity system operators	1 (1)	1 (1)
Charge point importers	2 (3)	2 (3)

Table 5-3: Summary of domestic consumers who participated in Wave 1 of the fieldwork (18-27 January 2023)

14x pre-interviews (30 mins each) *NB: follow-up depths with these participants took place in Wave 2*	**12x standalone depth interviews (60 mins each)**
5x who are considering purchasing a home charger	4x who are considering purchasing a home charger
4x who have purchased a home charger, but not yet had it installed	2x who have purchased a home charger, but not yet had it installed
5x who have recently purchased and installed a home charger	6x who have recently purchased and installed a home charger

Table 5-4: Summary of domestic consumers who participated in Wave 2 of the fieldwork (9-17 March 2023)

12x follow-up interviews (60 mins each)	2x focus groups (90 mins each)
4x who are considering purchasing a home charger	1x group (4x participants) who have completed the home charger purchase journey 1x group (5x participants) who started and abandoned the home charger purchase journey
4x who have purchased a home charger, but not yet had it installed	
4x who have recently purchased and installed a home charger	

Table 5-5: Summary of non-domestic consumers who participated in field research (08 March – 03 May 2023)

14x Pre-screening Surveys (60 mins each)	12x Interviews (60 mins each)
4x organisations which operate a fleet of vehicles • *1x in the process of researching charge points and/or EVs but with no fixed purchasing plans* • *2x with charge points already installed and being used* • *1x with charge points already installed, being used but looking to install more*	3x organisations which operate a fleet of vehicles • *1x in the process of researching charge points and/or EVs but with no fixed purchasing plans* • *1x with charge points already installed and being used* • *1x with charge points already installed, being used but looking to install more*
2x property developers installing EV charging facilities • *1x in the process of choosing charge points* • *1x with charge points already installed*	2x property developers installing EV charging facilities • *1x in the process of choosing charge points* • *1x with charge points already installed*
5x workplaces with employees who need access to charge points • *1x in the process of choosing charge points for installation*	5x workplaces with employees who need access to charge points • *1x in the process of choosing charge points for installation*

• *4x with charge points already installed and being used*	• *4x with charge points already installed and being used*
2x organisations who both operate vehicles, install charge points as property developers and have workplaces where employees require access to charging • *1x in the process of choosing charge points for installation* • *1x with charge points already installed and being used but looking to install more*	2x organisations who both operate vehicles, install charge points as property developers and have workplaces where employees require access to charging • *1x in the process of choosing charge points for installation* • *1x with charge points already installed and being used but looking to install more*
1x EV supplier	

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