Department for Energy Security & Net Zero

Smart Secure Electricity Systems Programme: Energy Smart Appliances

Consultation on how government will ensure the appropriate regulation of energy smart appliances

Closing date: 21 June 2024

April 2024

Any enquiries regarding this publication should be sent to us at:
SSESconsultation@energysecurity.gov.uk

General information

Why we are consulting

A smart and flexible electricity system is critical to decarbonise our economy, help manage electricity demand and reduce consumer bills. In July 2022, UK government consulted on a range of proposals that would impact appliances and organisations with a role in controlling electricity usage, the aim of the proposals was to create the foundation for a smart and secure electricity system.

We are now further developing these proposals and this consultation focuses on the policy and proposed regulation for energy smart appliances with accompanying consultations on load control license design and tariff data interoperability as part of this publication bundle.

Consultation details

Issued: 16 April 2024

Respond by: 21 June 2024 at 23:59 GMT

Enquiries to:

Smart Secure Electricity Systems Team
Department for Energy Security and Net Zero
7th Floor
3-8 Whitehall Place
London
SW1A 2AW

Email: ssesconsultation@energysecurity.gov.uk

Consultation reference: Smart Secure Electricity Systems Programme: Energy Smart Appliances – Consultation on how government will ensure the appropriate regulation of energy smart appliances.

Audiences: This consultation is primarily aimed at manufacturers of domestic energy smart appliances. The consultation proposals will also be of interest to the smart technology sector, energy suppliers, energy networks and providers of demand side response services.

Territorial extent: Great Britain only.

How to respond

Responses are encouraged to be provided via the CitizenSpace page:

https://energygovuk.citizenspace.com/energy-security/smart-secure-electricity-system

or via the response form that can be found on the GOV.UK consultation page: https://www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-implementation

This response form can be sent via email to ssesconsultation@energysecurity.gov.uk or our postal address. When responding, please state whether you are responding as an individual or representing the views of an organisation.

Your response will be most useful if it is framed in direct response to the questions posed, though further comments and evidence are also welcome.

If you need a version of this document in a more accessible format, please email alt.formats@energysecurity.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.

Email response form to: ssesconsultation@energysecurity.gov.uk

or

Post response form to:

Smart Secure Electricity Systems Team, Department for Energy Security and Net Zero, 7th Floor, 3-8 Whitehall Place, London, SW1A 2AW

Confidentiality and data protection

Information you provide in response to this consultation, including personal information, may be disclosed in accordance with UK legislation (the Freedom of Information Act 2000, the Data Protection Act 2018 and the Environmental Information Regulations 2004). We intend to share all responses to this consultation with Ofgem given their central role in developing the programme.

If you want the information that you provide to be treated as confidential, please tell us, but be aware that we cannot guarantee confidentiality in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not be regarded by us as a confidentiality request.

We will process your personal data in accordance with all applicable data protection laws. See our privacy policy.

We will summarise all responses and publish this summary on GOV.UK. The summary will include a list of names or organisations that responded, but not people's personal names, addresses or other contact details.

Quality assurance

This consultation has been carried out in accordance with the government's consultation principles.

If you have any complaints about the way this consultation has been conducted, please email: bru@energysecurity.gov.uk.

Executive summary

The Smart Secure Electricity Systems (SSES) Programme is designed to create the technical and regulatory frameworks that will enable domestic-scale energy smart appliances to be used flexibly by consumers to contribute to demand management across the electricity grid. The purpose of the programme is to give consumers choice to use their appliances more flexibly and to enable them to shop around for deals that will reward them for doing so.

The high-level principles and objectives for this consultation were set out in the government's July 2022 consultation on Delivering a Smart and Secure Electricity System[1]. This consultation specifically focuses on the detail of future regulatory frameworks for energy smart appliances (ESAs) and future device-level requirements.

We propose to bring into force Phase 1 requirements in 2026. Phase 1 requirements are intended to ensure that devices with the greatest load potential (heat pumps, domestic battery energy storage systems and electric vehicle chargers) meet minimum levels of security and functionality. The security requirements include addressing cyber security risks through proposing to implement the standard ETSI EN 303 645 as well as requirements to mitigate potential risks to grid stability, such as a randomised delay function[2]. We deem that regulations on electric vehicle chargers already meet these requirements, and so we focus on other ESAs.

With regards to domestic battery energy storage systems, in line with our previous consultation and the powers to implement measures in the Energy Act 2023, we do not intend to mandate smart functionality but will set minimum requirements for batteries that are sold as 'smart'. This consultation then provides information on the heating technologies in scope and the proposed Phase 1 requirements on them, such as the ability to modulate energy usage in response to signals.

We propose to bring into force Phase 2 requirements in 2028. This set of requirements will build upon and subsume the Phase 1 requirements; they will rely on technical standards that are still in development, such as the technical standard PAS 1878, which is currently undergoing a revision supported by the Interoperability Demand Side Response innovation competition. This consultation provides further detail on how PAS 1878 and other relevant standards could form the technical framework. It also provides an update on the proposed governance for when the maintenance of these requirements will pass to industry-based

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[1] GOV.UK, 'Delivering a smart and secure electricity system: consultation on interoperability and cyber security of energy smart appliances and remote load control' (2022), https://www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-the-interoperability-and-cyber-security-of-energy-smart-appliances-and-remote-load-control, consultation closed 28 September 2022 (viewed on 5 March 2024)

[2] Randomised delay function refers to a delay applied at the start or end of a charging session, in which the duration of the delay is randomly chosen from within a fixed range, with the aim of reducing the risk of herding of devices. For further guidance on randomised delay functionality in relation to electric vehicle smart chargers please see: GOV.UK, 'Complying with the Electric Vehicles (Smart Charge Points) Regulations 2021, Guidance for sellers of electric vehicle charge points in Great Britain' (2022), page 14, https://assets.publishing.service.gov.uk/media/628ce214e90e071f653a494a/Guide-to-evscp-regulations-2021-V2.1.pdf (viewed on 5 March 2024)

enduring governance, and an implementation plan on how we aim to create the necessary governance bodies and systems.

We are proposing that once the second phase of ESA regulations are introduced, devices will need to comply with approved interoperability and cyber security standards in order to be sold in Great Britain. As set out in the document, in parallel to this consultation we intend to launch a review of PAS1878 ahead of considering it as a route to compliance with this requirement. We are also open to working with industry on the development of further, complementary standards that could work alongside PAS1878 and provide alternate routes to compliance. Appliance manufacturers, and DSR service providers will want to engage closely with this work to ensure that new standards can be introduced as seamlessly as possible to work with existing business models and services, while avoiding consumer lock-in.

Following this consultation, we will draft regulations to introduce Phase 1 requirements and plan to consult on these in spring 2025 ahead of laying them in Parliament. We will also consult further on the final detail of phase 2, including on finalised models for implementation governance and cost recovery, but seek further stakeholder views at this stage on our emerging thinking.

As per our 2022 consultation, our intention remains to draw together all regulations – including EV smart charge points – into a single set of regulations in due course. There has the benefit of providing a consistent framework for all regulated smart devices in the longer term given the common regulatory challenges that these devices pose.

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1. Introduction

Decarbonisation and Demand Side Response

The Smart Systems and Flexibility Plan[3] sets out how government will support achieving the UK's net zero goals through facilitating the transition to a smart and flexible energy system. A smart and flexible energy system will reduce consumer energy bills by reducing the amount of generation and network assets that need to be built to meet peak demand. It will give consumers greater control over their energy bills through access to smart technologies and services, such as enabling participation in Demand Side Response (DSR).

DSR is the process of changing when electricity is used or produced by consumers in response to needs of the electricity system; instead of generating or curtailing at times when supply doesn't meet demand, price signals reward consumers for changing their usage to meet the needs of the system. There are two forms of DSR – 1) explicit (also sometimes called response) DSR, in which energy use is modulated to provide a service to a 3rd party such as a network operator; and 2) implicit (also sometimes called routine) DSR, in which energy use is modulated to provide cost savings across a whole property or site.

Energy smart appliances

Energy smart appliances (ESAs) are electrical consumer devices that are communications-enabled and capable of responding automatically to incentive signals (such as price) or other more direct control signals (such as specific instruction to operate at a given power at a certain time of day), by shifting or modulating their electricity consumption, storage, and/or production.

Appliances with this functionality include electric vehicle (EV) charge points, domestic battery energy storage systems (BESS), heat pumps, heat batteries, storage heaters, air conditioning/ventilation systems, wet/cold appliances, smart EV charging cables and solar panels with 'smart' storage systems. All of these have high potential to provide flexibility through DSR.

Greater use of such appliances will encourage the emergence of new business models and services; these will involve organisations remotely managing consumers' ESAs according to their preferences, thereby reducing load on the grid and reducing consumers' bills. As an example, a smart EV charge point can be programmed to ensure that a consumer's vehicle is charged ready for when they need it, but it can optimise the time at which the car charges (at 3am in the morning for instance, when electricity tariffs are likely to be lower) to minimise impact on the grid. This will allow DSR to be delivered without the need for constant consumer

[3] GOV.UK, 'Transitioning to a net zero energy system: smart systems and flexibility plan 2021', https://www.gov.uk/government/publications/transitioning-to-a-net-zero-energy-system-smart-systems-and-flexibility-plan-2021 (viewed on 5 March 2024)

involvement, ensuring that consumers still get the same or better service but at lower cost. Consumers will always have control over the ways in which their devices are used.

In July 2022, the government published a consultation which focused on unlocking greater use of domestic and small-scale non-domestic DSR.[4] There are currently barriers and risks related to the growth of the domestic and small non-domestic DSR market. For the market to grow, communications between devices and services, and the means by which tariff information is shared, need to be standardised. Doing so will mean a wide range of DSR services can be offered to all domestic and small non-domestic consumers. Without this, consumer access to DSR services may be limited to certain service providers or manufacturers of devices.

The government will ensure that there are consumer protections in place to build confidence in the developing market and will also ensure that fair contractual arrangements pass the benefits of DSR onto consumers. Greater use of ESAs and other associated services could pose risks to the electricity system, such as creating new vectors for cyber-attacks and threats to grid stability. These risks will increase without government intervention.

Different types of ESAs present different risks and opportunities to consumers and the electricity system. As such, the proposals in this consultation do not apply uniformly to all ESAs and our proposals are primarily focused on unlocking flexibility from domestic-scale ESAs with the highest potential for the energy system and consumers. This group of appliances includes private EV charge points, electric heating appliances (including heat pumps, heat batteries and storage heaters) and domestic BESS. There is variation within the requirements placed already on these different technologies; for example, government has already taken steps to introduce minimum standards for EV charge points under the Electric Vehicle (Smart Charge Points) Regulations 2021. The proposals in this consultation document will build on the lessons learned from existing regulations, such as EV regulations, and government aims ultimately to have a regulatory framework that is consistent across all technologies.

While focussing on ESAs with the highest potential for flexibility, government may consider extending standardisation to a wider cohort of ESAs in the future as consumer uptake grows and markets mature.

The government's July 2022 consultation set out proposals, which stakeholder responses broadly supported, in three key areas to address these barriers and risks:

- creating the right technical frameworks to unlock the potential of flexibility for domestic and small non-domestic energy consumers
- improving the security of the electricity system
- giving consumers the confidence to engage with a smart energy system

[4] 'Delivering a smart and secure electricity system: consultation on interoperability and cyber security of energy smart appliances and remote load control' (2022), https://www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-the-interoperability-and-cyber-security-of-energy-smart-appliances-and-remote-load-control

Device policy principles

The government previously established the following principles for regulation of ESAs: interoperability, cyber security, data privacy and grid stability. A summary of these principles follows below.

Interoperability: The government intends that ESAs can receive and respond to time-of-use tariffs from different energy suppliers, and that they can access DSR services offered by different DSR Service Providers (DSRSPs). This will provide a minimum level of interoperability that will be essential to promoting growth in markets and building consumer demand for these services.

Cyber security: The government will set out requirements to protect against cyber security risks at both the device and system levels, which will inform future technical and regulatory frameworks for ESAs. These requirements will be in addition to cyber security requirements for organisations remotely controlling electrical load, and subject to licensing requirements.

Data privacy: Any future technical solutions for ESAs (such as ESA standards) will need specific data privacy requirements to ensure that data privacy and data security risks are mitigated, particularly when data is shared between devices, systems and organisations. Government will ensure that these requirements are fully compatible with UK data protection laws.

Grid stability: The government has proposed that future policy should mitigate risks posed to the grid by ESAs, such as synchronised changes in load (‘herding’) of ESAs at scale, unexpected step-changes or ramps in electricity usage at scale, oscillation in energy usage or production by ESAs at scale, and an inability to provide the flexibility necessary to the energy system when necessary.

Legislation

The government has powers under the Energy Act 2023 to introduce regulations for ESAs. These regulations may require, for example, that devices meet minimum technical requirements for cyber security, interoperability, data privacy and grid stability. Using these powers, the government will also be able to mandate that certain electric heating appliances placed on the market must have smart functionality.

Our intention remains to draw together all ESA regulations – including EV smart charge points – into a single set of regulations. There has the benefit of providing a consistent framework for all regulated smart devices in the longer term given the common regulatory challenges that these devices pose. We also believe that a single set of regulations will bring coherence to industry and consumers. Until this has been done, future amendments to the EV (Smart Charge Points) Regulations 2021, on which the government intends to consult, will be made using powers under the Automated and Electric Vehicles Act (AEVA) 2018. We will consider further, with reference to the first and second phases of regulation described in this document, the most appropriate timing to bring together ESA regulations covering EV smart charge points, heat pumps and domestic batteries, and consult further on our approach to doing so in due course.

Smart Secure Electricity Systems: Energy Smart Appliances

This consultation makes several detailed proposals in relation to ESA regulation. These proposals are divided into two sections:

First phase regulations: These regulations will come into force around 2026. They form the first part of this consultation from Chapters 2-4.

Second phase regulations: These are the regulations that will come into effect from 2028, building off and incorporating the first phase regulations. Chapters 5-7 cover the second phase regulations and the governance to manage them through a future industry-led process.

Alongside this consultation, the SSES programme has also published three additional documents focusing on other areas of the programme:

- Consultation Package Summary Document: an overarching summary document for the SSES consultation package
- Tariff Data Accessibility for Flexibility Services: outlining the government's proposals to enable interoperability of energy tariffs.
- Consultation on Proposals for a Load Control License: outlining the government's proposals for creating a licensing regime for organisations involved in load control.

2. First Phase Regulations: Overview

First Phase Regulations

The March 2023 government response[5] to the 'Delivering a Smart and Secure Electricity System' consultation[6] confirmed our intention to adopt a phased approach to the regulation of Energy Smart Appliances (ESAs) and, in addition, set out our high-level aims for the first phase ESA regulations.

Subject to parliamentary approval, the first phase ESA regulations will aim to cover the parts of the SSES programme that will benefit from regulation, including but not necessarily limited to:

- a smart mandate for certain electric heating appliances, including hydronic heat pumps, storage heaters and heat batteries. We are also seeking views (see below Question 4 in Chapter 3) on expanding the scope of the smart mandate to include additional heating appliances such as hot water storage and generation and hybrid heat pumps and
- minimum cyber security requirements and minimum grid stability requirements for ESAs such as electric heating appliances and Battery Energy Storage Systems (BESS).

Regulations would allow for a grace period to give industry time to adopt the new requirements. The government also intends that the requirements will work in harmony with other relevant policy or programmes, such as heat pump installation targets.

Our aim is for the first phase ESA regulations to come into force from 2026. The government intends that the first phase ESA regulations will become the foundation for the second phase ESA regulations (covered in Chapters 5-7), which will come into force from 2028.

The previous SSES consultation set out the intended outcomes for the first phase regulations. This consultation expands upon this, providing further detail on how we expect to deliver our intended policy outcomes and the associated implementation plan.

The development and delivery of the first phase of ESA regulations will constitute an essential stepping stone towards the government's long-term objective of ensuring relevant ESAs meet a standard or set of standards covering extensive requirements for cyber security, grid stability, data privacy and interoperability. This framework will be further built on and iterated with industry and stakeholder input, and the detail of what will be included in the first phase of regulations, including what is and what is not part of this consultation, can be found in the sub-section below.

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[5] GOV.UK, 'Delivering a smart and secure electricity system: Government response to the 2022 consultation on interoperability and cyber security of energy smart appliances and remote load control' (2023), https://www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-the-interoperability-and-cyber-security-of-energy-smart-appliances-and-remote-load-control (viewed on 7 March 2024)

[6] 'Delivering a smart and secure electricity system: consultation on interoperability and cyber security of energy smart appliances and remote load control' (2022), https://www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-the-interoperability-and-cyber-security-of-energy-smart-appliances-and-remote-load-control

What is being consulted on?

Chapters 3 and 4 of this consultation sets out key policy positions in relation to the first phase of ESA regulations. Of our principles for regulation of ESAs, minimum requirements for cyber security and grid stability can be found below whilst the smart mandate proposals include interoperability requirements. The first phase ESA regulations will also ensure, as confirmed in the 2023 government response, compatibility with UK data protection laws such as UK General Data Protection Regulation (GDPR). The following section maps out what is being consulted on and where this can be found in the document as well as noting what is not being consulted on at this point.

Table 1. Summary of proposals being consulted on for first phase regulations.

Proposal	What's included within this consultation	What's not included within this consultation
Establishing minimum requirements for cyber security *(*Chapter 4*).*	 Proposal for mandating ETSI EN 303 645 for ESAs with the greatest potential for load control.	 Specific cyber security requirements applicable to ESAs. These will be subject to future consultation on completion of architectural designs and assessment against the security principles of the SSES programme.
Establishing minimum requirements for grid stability (Chapter 4).	 Proposal to mandate randomised delay and other options.	 We expect that a full list of grid stability requirements will form part of the second phase ESA standards work in 2028.
Introducing the "smart mandate" to heating technologies (Chapter 3).	 Expanding the scope of the smart mandate to cover additional heating appliances.  Proposed minimum appliance-level requirements for a smart heat mandate.  An agreed approach to ESA functionality for smart heating appliances.	 Setting out the second phase regulations regime.  The role of an enforcement body.  Assurance mechanisms for smart mandate requirements for heating appliances are not discussed in Chapter 3.

First Phase ESA Regulations Indicative Timeline

The government will decide on the content and timing of first phase regulations requirements in the response to this consultation. Our current intention – subject to the responses received to this consultation - is to lay first phase regulations in the first half of 2025 following consultation on the draft Statutory Instrument, and that these regulations will come into force from 2026 following a 12–18-month implementation period. This timeline is indicative and is subject to change as we also bear in mind the wider pressures on industry alongside the timing of second phase requirements.

As per our 2022 consultation, our intention remains to draw together all regulations – including EV smart charge points – into a single set of regulations. There is benefit to providing a consistent framework for all regulated smart devices in the longer term given the common regulatory challenges that these devices pose. We also believe that a single set of regulations will bring coherence to industry and consumers. Until this has been done, future amendments to the EV (Smart Charge Points) Regulations 2021, on which the government intends to consult, will be made using powers under the Automated and Electric Vehicles Act (AEVA) 2018. We will consider further the most appropriate timing to bring together these regulations and consult further on our approach in due course.

We would like to seek industry feedback on the duration of two key timeline windows:

- first phase lead-in time, which is currently estimated to be approximately 12-18 months, and is the period for industry to implement the first phase of regulations
- following the coming into force of the first phase ESA regulations, a further lead-in period prior to the coming into force of the second phase ESA device regulations, which is currently estimated to be 2 years.

When considering what timelines are appropriate, we factor in the following considerations:

- the lead-in time required for industry to adhere to new regulations
- industry costs are minimised as far as is practicable by ensuring phase 2 requirements logically build on those in phase 1
- we remain open to the possibility of different technologies having temporarily different requirements that factor in their technology maturity levels
- phased ESA device regulation is not pursued if doing so would no longer be to the benefit of consumers and the industry.

1. **Do you have a view on the lead time industry will require to implement the first phase regulations as proposed in this document?**
2. **Do you agree with our plan to proceed on the basis of phasing ESA device regulations as set out above whilst committing to keep this approach under review?**
3. **Do you have a view on when the smart mandate for heating appliances should be implemented? Please provide evidence to support your answer.**

Metering policy considerations

Government is keen to ensure that ESAs enable consumers and load controllers to participate as fully as possible in demand side response (DSR) services and markets both now and in the future. Widespread consumer participation in DSR will unlock the broadest range of benefits by both reducing consumer energy bills and by reducing demands on the grid.

A smart device, such as domestic and workplace EV charge points, must be compliant with the requirements set out in the Measuring Instrument Regulations 2016 (MIR) when they are used in activity "for trade". These include a nominal 2% accuracy requirement and an inbuilt display, or hard copy display requirement. Currently an ESA is considered as being used for trade if it is used for billing purposes or when the consumer is engaged in flexibility services and they receive an incentive (whether a periodic financial reward, a flat fee or reward points) in line with the proportion of flexibility they trade with DSRSPs based on the electricity usage readings provided by the device meter.

Not all DSR business models will entail ESAs being used for trade. The Department for Energy Security and Net Zero (DESNZ) will engage with industry through existing working groups (such as the Industry Advisory Group) following the publication of this consultation to capture use cases on how ESAs are being used in DSR now, and how they are likely to be used in the future. Government will subsequently consider the extent to which the latter are likely to constitute use for trade under the MIR.

Government also notes that recently some parts of industry have raised concerns regarding the specific MIR requirement that smart devices that are being used in DSR markets for trade to have a meter that can indicate its result via an inbuilt display or by hard copy, as defined in the MIR[7]. More specifically, industry stakeholders raised concerns that new digital methods of managing electricity usage may make this display requirement for asset meters out of step with current and future industry best practices.

Government understands the importance of providing clarity to industry regarding its approach in the SSES Programme's future regulations (as well as whether the approach for the Electric Vehicles (Smart Charge Points) Regulations 2021 ("EVSCP regulations") will remain the same). Amending the inbuilt display requirement in the MIR, or exempting ESA meters from this specific requirement, would require separate legislation. Policy changes to this effect would also require further consideration of any wider impacts on (for example) equality of access. The Department for Business and Trade (DBT) has policy responsibility for the MIR and is currently considering these questions. Any consultation regarding potential changes to MIR requirements would be led by DBT.

Finally, government notes that for ESAs that will be used for trade, and which have a device meter, the MIR requires corresponding electrical power usage to be metered and measured to within a 2% accuracy level. Given that not all ESAs are currently being used in DSR for trade, government has not to date mandated a nominal 2% metered accuracy requirement for all ESA devices. However, government will use evidence gathered following further engagement on DSR use cases (see above) to determine what (if any) additional ESA measuring accuracy requirements should be placed in ESA future regulations (and any further updates to

[7] The Measuring Instrument Regulations 2016, available at: https://www.legislation.gov.uk/uksi/2016/1153/contents/made (viewed on 13 March 2024)

regulations), and in particular whether to require all ESAs in scope to meter electrical power to within a nominal 2% accuracy level.

4. **Would you support the introduction of a metering accuracy requirement to the effect that all ESAs should have a means to measure their import/export consumption to up to or better than 2% nominal accuracy?**

5. **If you are a manufacturer, would requiring a nominal 2% accuracy requirement impact your business or products? If yes, please outline the impacts and the costs and benefits with as much detail as possible.**

3. First Phase Regulations: Smart Mandate

This chapter sets out our proposed approach to mandating smart functionality for certain electric heating appliances. It seeks views on the appliances in scope, options for additional smart functionality for heating appliances, and options for regulating ESA functionality for smart heating appliances. There is also consideration of how we can build upon the requirements for EV smart charge points and our future approach to domestic energy battery storage in order to explore long term alignment of our approach to all ESAs.

Policy Background

The SSES programme is focused initially on those technologies with the greatest potential for load control – electric heating appliances, domestic energy battery storage systems and EV charge points – and we aim to have a coherent regulatory framework that is agnostic to the ESA technology type. However, there is recognition that initially there will be divergence between different ESA technologies as these technologies mature and are deployed at different paces, and we have seen this with the introduction of specific regulations on EV smart charge points in the Electric Vehicles (Smart Charge Points) Regulations 2021[8]. This chapter focuses on our approach to mandating smart functionality for certain heating technologies. We do not propose extending the scope of the smart mandate to include domestic battery energy storage systems (BESS) due to the evidence and assumption that the market may be able to deliver smartness for BESS without such an intervention. Further detail on this can be found in the 'Appliances out of scope of the smart mandate' section below.

In addition to ensuring that ESAs meet the proposed interoperability, cyber security, grid stability and data privacy outcomes outlined in the introduction, government has specific ambitions to increase the number of electric heating appliances with smart functionality. In the July 2022 consultation[9], we proposed a ‘smart mandate’ - that certain electric heating appliances (hydronic heat pumps, storage heaters and heat batteries) must have smart functionality, meaning that they are communications-enabled and able to respond to price and/or other signals by shifting and/or modulating their electricity consumption. This consultation builds on this proposal, setting out proposed minimum functional requirements for electric heating appliances with the greatest flexibility potential, and considering options for regulating the supply chain to ensure effective provision of smart functionality in devices.

Context and Rationale

[8] The Electric Vehicles (Smart Charge Points) Regulations 2021, available at: https://www.legislation.gov.uk/ukdsi/2021/9780348228434 (viewed on 7 March 2024)

[9] ‘Delivering a smart and secure electricity system: consultation on interoperability and cyber security of energy smart appliances and remote load control’ (2022), https://www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-the-interoperability-and-cyber-security-of-energy-smart-appliances-and-remote-load-control

Heat in buildings accounts for 23% of total emissions in the UK[10]. Reducing greenhouse gas emissions to net zero will require virtually all heat in buildings to be decarbonised. Decarbonising the way we heat our buildings is essential for reducing our reliance on fossil fuels and combating climate change.

We recognise that there is a growing electric heating market beyond heat pumps and understand that the transition to net zero may require several options for consumers and businesses both on and off the gas grid. The scaling up of the electrification of heat will significantly increase the demand on the electricity network. In addition to this, electricity generation will become increasingly diverse, as well as more decentralised, as the UK continues to connect more renewables to the grid. Mandating smart functionality will help build on the positive progress industry is making and ensure that smart electric heating will be taken up at the rate required to achieve the full benefits for consumers and the electricity system during the transition to electrified heat. The deployment of electric heating appliances in a smart and flexible way will help reduce heating running costs for consumers and minimise the need for wider, costly electricity network reinforcement and additional generation capacity, by reducing peak demand.

Our aim is that, by mandating smart functionality, we can ensure that more consumers have access to the benefits of a smart and flexible energy system, while providing space for innovation. This will help build in the benefits of flexibility in parallel to scaling up deployment of electric heating, helping ensure we can effectively integrate the expected rapid increase of heat pumps and other electric heating appliances into the energy system in the most cost-effective and beneficial way for consumers. We acknowledge that some consumers, such as low income or vulnerable consumers, may require additional support to realise the benefits of smart heating. A key principle behind the minimum ESA requirements, however, is that consumers will always retain the choice on whether, and to what extent, they will utilise the smart functionality that will be present in these devices.

In developing the smart mandate proposals, we have sought to replicate approaches used in other sectors, especially drawing inspiration from the Electric Vehicle (Smart Charge Points) Regulations 2021 (EVSCP)[11]. The EVSCP regulations set out similar requirements for smart functionality and other minimum appliance-level requirements for EV charge points sold for use in homes and workplaces. Based on the lessons learned from the development and implementation of the EVSCP regulations, we have developed proposals that will allow us to meet the policy aims of the smart mandate whilst remaining consistent with the approach previously taken to regulate ESAs.

Appliances in scope of the smart mandate

[10] GOV.UK, 'Heat and Buildings Strategy' (2021), https://www.gov.uk/government/publications/heat-and-buildings-strategy (viewed on 7 March 2024)

[11] The Electric Vehicles (Smart Charge Points) Regulations 2021, available at: https://www.legislation.gov.uk/ukdsi/2021/9780348228434 (viewed on 11 March 2024)

In its response to the first SSES consultation[12], government committed to the mandate including hydronic heat pumps, storage heaters and heat batteries, up to 45kW rated thermal capacity. These appliances are included as they have the greatest potential to be used flexibly to provide DSR (that is, the greatest ability to shift demand for electricity). We also anticipate that the above appliances will be deployed in great enough volumes that, without the ability to shift their demand, they would lead to the need for additional reinforcement of the grid.

In the government response we further committed to reviewing the possibility of expanding the scope of the mandate to cover additional electric heating appliances. We consider below the potential flexibility benefits of each additional technology and the likely deployment levels of each as to whether they should be included in the mandate at this point.

***Hot water storage and generation,* including:**

- **Indirect electric hot water storage cylinder:** A water cylinder connected to a fossil fuel boiler, or heat pump, where the boiler or heat pump heats the water stored in the cylinder, and then that water flows through a central heating system when needed. The hot water storage cylinders have additional electric immersion elements to provide an alternative method for heating if required.
- **Standalone direct electric hot water cylinder:** A water cylinder heated by an electric immersion element only and not connected to a centralised space heating device like a boiler or heat pump.
- **Hot water only heat pump:** A water cylinder with a heat pump element, often mounted on top, which uses electricity to transfer usable heat extracted from the air to heat hot water. It could be a potential solution to decarbonise hot water demand, particularly in homes which use direct electric space heating because they cannot accommodate or do not need a heat pump for both (for example, because they have a very low space heating demand, or where the hot water demand is becoming more equal with space heating demand).

Hot water storage and generation appliances have inherent flexibility from their storage capabilities that can be shifted and utilised with time of use tariffs (TOUTs). Standalone direct electric hot water cylinders and hot water only heat pumps have clear flexibility benefits and hot water only heat pumps are functionally the same as hydronic heat pumps that are already within the mandate.

We recognise that indirect electric hot water storage cylinders may be installed alongside another smart device (for example, a heat pump or heat battery), and requiring both devices to have smart capabilities may add additional cost to the devices. Where hot water cylinders are connected to a centralised space heating device, the immersion heating element is typically an emergency backup and not in regular use meaning there may be limited DSR opportunities. Due to increased costs, consumers may opt to purchase a hot water storage cylinder without an immersion element, leaving them without a back-up/emergency system to provide hot water, however the extent of this has not been fully assessed.

[12] 'Delivering a smart and secure electricity system: Government response to the 2022 consultation on interoperability and cyber security of energy smart appliances and remote load control' (2023), https://www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-the-interoperability-and-cyber-security-of-energy-smart-appliances-and-remote-load-control

Flexibility of hot water storage cylinders can however be maximised when used in conjunction with a heat pump and a TOUT to heat water during periods of low demand and cheap electricity. This will provide benefits for consumers, for example, where cylinders can directly communicate with the heat pump and accurately control the temperature of the stored water. Government also anticipates that indirect electric hot water storage cylinders will be installed alongside every non-combination gas boiler, estimated to be approximately 80,000 installations per year.[13] We welcome views on the inclusion of indirect hot water storage cylinders with electric heating elements within the scope of the mandate.

Considering the above, we propose that in addition to hydronic heat pumps, storage heaters, and heat batteries, hot water generation and storage (indirect electric hot water storage cylinders, standalone direct electric hot water cylinders, and hot water heat pumps) should be included in the scope of the mandate.

6. **Do you agree that the scope of the smart mandate should be extended to include hot water storage and generation (indirect electric hot water storage cylinders, standalone direct electric hot water cylinders, and hot water heat pumps)? If not, please provide supporting evidence.**

Hybrid heat pumps

Hybrid heat pumps (or 'hybrids') combine a heat pump with another heat generation technology (usually a fossil-fuel boiler). Common controls are often used to manage how the component technologies operate together to create a single hybrid heating system.

Hybrids have a unique flexibility potential compared to other electric heating appliances. A hybrid can provide the same flexibility services as a standalone heat pump but can also switch between fuel sources to maintain thermal comfort. When electricity is in peak demand, and therefore may be more expensive, a hybrid could switch from using the heat pump to use the alternative heat source (for example, a gas boiler). This can deliver cost savings for the consumer. This can also deliver cost savings for the electricity system; if there is significant fuel switching to significantly reduce peak demand, this may require less electricity generation and the network may not need to make the same degree of network reinforcements.

Having a single control (or 'common controller') for the whole hybrid heating system, that communicates with the heat pump and alternative heat source, can improve ease of operation for the consumer. Smart hybrid controls can deliver further benefits by optimising the operation of the system to minimise running costs, reduce carbon, provide DSR services or achieve a balance of multiple objectives (assuming that the hybrid has been correctly designed and installed). They can do so by varying operation in response to a range of inputs, including fuel price signals, real-time information on weather and temperature, system learning of the building's thermal efficiency, signals coming from the grid operators, and/or the consumer's inputted heating needs.

Whilst the UK hybrid market may be much smaller than the market for standalone heat pumps, including hybrid heat pumps within the scope of the mandate will ensure consistency. We have previously stated the intention for the mandate to capture the hydronic heat pump element of

[13] Building Services Research and Information Association (BSRIA), 'World Water Heating 2023' market intelligence reports, https://www.bsria.com/uk/market-intelligence/market_reports/heating/?filter=GBZMaD, accessible to BSRIA subscribers (viewed on 5 March 2024)

hybrids. We now propose that the smart mandate should apply to a whole hybrid heat pump system that utilises a common controller. This will be achieved by placing the requirement on the common controls that provide optimised operation of the component heat sources.

As a hybrid's 'common controls' or 'common controller' typically shares software, firmware or hardware to operate a heat pump (which is an electrical heating appliance), they fall under the definition of an ESA (whether or not they also control the operation of another fuel source).

We recognise that there are a wide variety of hybrid heat pump products and systems consisting of an electric heat pump and a boiler; heat pumps bought and installed alongside pre-existing boilers (retrofit hybrids), separate boiler and heat pump products combined by manufacturers or installers to create a single heating system (packaged hybrids), or where parts or all of the system are integrated into the same unit (integrated hybrids). We are therefore considering whether and how to mandate smart capabilities for different types of hybrids and how best to define a 'hybrid heat pump' for the purpose of the smart mandate.

We propose that in addition to hydronic heat pumps, storage heaters, and heat batteries, the smart mandate should also apply to hybrid heat pump systems as a whole system that must use optimised common controls.

7. **Do you agree that the scope of the smart mandate should be extended to include the whole hybrid heat pump system (rather than just the heat pump within a hybrid), with requirements placed on the common controller? If not, please provide supporting evidence.**

Appliances out of scope of the smart mandate

Battery energy storage systems

At this stage, we have no plans to include further additional technologies within the scope of the mandate. More specifically, we do not propose seeking powers to mandate that standalone domestic BESS have smart functionality.

Based on previous sector engagement, our understanding is that BESS for home energy storage is likely to already operate in a smart way. This means that legislating could cause minimal industry disruption and ensure consistency across the government approach. However, the smart functionality may not always align to the SSES programme's definition and implementation of smart functionality has not been fully assessed. Based on the assumption that BESS may already operate smartly, there is limited justification for future legislation as the market may be able to deliver the same outcomes without intervention.

8. **Do you have a view on whether standalone domestic battery energy storage systems (BESS) should be included in future legislation in order to be subject to the smart mandate requirements associated with the first phase regulations? Please provide evidence to support your answer.**

9. **Do you have any data on what proportion of installed domestic battery energy storage systems (BESS) have smart functionality? Smart functionality is defined as being communications-enabled and able to respond to price and/or other signals by shifting and/or modulating their electricity consumption.**

10. **Do you have evidence on the extent to which domestic battery energy storage systems (BESS) with smart functionality already meet the minimum requirements set out in Table 1? Please provide evidence to support your answer.**

Alternative electric technologies

Air to air heat pumps, electric panel heaters and infrared heaters have no storage abilities and limited shifting potential depending on whether pre-heating is possible. Given market demand and deployment levels are currently unclear, innovation could be hindered by regulating too early. Similarly, whilst electric boilers do have the capacity to shift their demand, and depending on model, have storage capacity, growth in electric boiler demand is uncertain as they have lower efficiency and higher running costs so are unlikely to be adopted outside of small flats with low heating demand.

The inclusion of these appliances will be kept under review. Government will continue to consider the scope of the smart mandate to ensure we are maximising the opportunity for a smart, flexible energy system.

Additional smart functionality for smart heating appliances

This section sets out the policy proposals for smart functionality that will be required to enable DSR that balances the benefits to consumers and networks without limiting innovation and being too onerous for manufacturers to comply with.

Smart functionality can encompass a wider range of functions, beyond those that are core to providing the required outcomes of the smart mandate[14]. Some of these functions could enhance the consumer experience of using the ESA or potentially act as premium functions to differentiate appliance models. There is a choice to be made between limiting the scope of the minimum requirements to only those functions that are necessary to enable the functionality defined above, or whether it is expanded to include other functions that could provide significant benefits to consumers. There is also a need to consider trade-offs between allowing manufacturers to innovate with new ideas and preventing innovation by mandating an approach in regulations that is unduly onerous. We want to avoid the risk of suboptimal products being sold into the market whilst also avoiding the proposed requirements creating additional barriers to ESA deployment and impeding government's ambition to install 600,000 heat pumps per year by 2028[15] and decarbonising heating.

For the purpose of the smart mandate, the following definitions, using those in PAS (Publicly Available Specification) 1878 as a basis, are referred to below:

- **Demand side response (DSR):** the shifting (in time) and/or modulation (increase or decrease) of electricity consumption and/or production through the controlled operation of ESAs, in line with consumer preferences, in response to signals from, and acting in agreement with, regulated electricity market participants.

[14] This is a working definition to support the development of the regulations, and not necessarily the exact definition of smart functionality that may be used in future legislation.

[15] GOV.UK, 'Heat and Buildings Strategy' (2021), https://www.gov.uk/government/publications/heat-and-buildings-strategy (viewed on 7 March 2024)

- **Load controller:** an organisation that directly controls the ESAs to provide demand side-related energy management services (whether for routine or response DSR).
- **Response DSR (also known as explicit DSR):** devices operate based on requests made in real time, often due to firm bi-lateral contracts (for example, grid frequency response request via a load controller). For rapid load responses and for control by other grid-side actors, direct control of load is required, and consumers are rewarded for allowing their appliances to be controlled for the overall benefit to the network.
- **Routine DSR (also known as implicit DSR):** devices operate to perform energy management functions according to consumer preferences and based on incentives set in advance, which are often multi-party market signals. For example, electricity suppliers altering the tariff that electricity consumers pay, which encourages the use of appliances at times outside of peak demand or at times when excess generation capacity is expected to be available.

As set out in the first SSES consultation, and confirmed within the government response, we are proceeding with our approach of not specifying how the smart functionality is supplied, either embedded within the appliance or delivered by an add-on module. Consideration of how we regulate the provision of this functionality is set out later in this document.

Minimum requirements

Based on stakeholder engagement conducted following the first consultation, some industry stakeholders have suggested that we develop the smart mandate to align with PAS 1878[16]. PAS 1878 is a standard that was sponsored by government in 2021 through an industry-led process to set technical requirements for DSR-enabled energy smart devices, including heating devices.

It was acknowledged within the first SSES consultation and government response, however, that amendments or additions to PAS 1878 are likely to be required before it can be deployed at scale, alongside a need to recognise openness to innovation around future approaches, as further explained in Chapter 6. The next iteration of PAS 1878 requires further development, which will be aided by feedback from the Interoperable Demand-Side Response (IDSR) innovation programme[17], the Energy Smart Appliance Technical Working Group, and further industry input.

The proposed minimum requirements for electric heating appliances included in the scope of the smart mandate are set out below. The recommendations for the smart mandate have been informed by the existing EVSCP regulations, looking at the lessons learned in relation to the development and implementation of the regulations, including industry interpretation, consumer understanding, and the success of enforcement. Development of these requirements has also been driven by the different types of products included in the scope of the mandate and

[16] British Standards Institution, 'PAS 1878 – Energy smart appliances' (2021), https://knowledge.bsigroup.com/products/energy-smart-appliances-system-functionality-and-architecture-specification?version=standard (viewed on 11 March 2024)

[17] GOV.UK, 'Interoperable Demand Side Response programme' (2022), https://www.gov.uk/government/collections/interoperable-demand-side-response-programme, Stream 1, Stream 2 and Stream 3 of the competition closed to applications on 29 July 2022 (viewed on 11 March 2024)

recognition that the properties installing these heating appliances will have different characteristics.

A summary of the proposed requirements is set out in the table below. More detailed rationale for their development and inclusion are included in the section below.

Table 2. Overview of proposed requirements for the Smart Mandate.

Proposed Smart Mandate requirement		**Existing EVSCP Regulations**[18]	**Alignment**
Modulating Output	Electric heating appliances must be able to modulate output and/or change the time at which electricity is consumed in response to signals, including price and other signals that facilitate DSR.	Charge point must be able to respond to signals by increasing/decreasing the rate or time at which electricity flows through the charge point; and be capable of using this to provide DSR services, including response DSR services.	The smart mandate proposal is aligned with current EVSCP requirements.
Device communication	Electric heating appliances must provide two-way communication that allows them to receive and act upon price and other direct control signals, and at a minimum to send signals on the status of the device, whether it is responding to a signal or has ceased to do so.	Charge point must be able to send and receive information via a communications network; and be able to respond to these signals by increasing/decreasing the rate or time at which electricity flows through the charge point.	The smart mandate proposal goes beyond current requirements within the EVSCP regulations. Heating appliances have a greater number of variables compared to charge points and a simple definition of sending and receiving information will not achieve the required flexibility.
Interoperability	Any electric heating appliance within the scope of the mandate must not be configured in such a way that it ceases to have smart	The EVSCP regulations have a high-level requirement that a private charge point must retain its smart functionality even if	There is no plan at present to mandate open data communication standards for the EVSCP-energy supplier interface in recognition of recent regulatory changes

[18] The Electric Vehicles (Smart Charge Points) Regulations 2021, available at: https://www.legislation.gov.uk/uksi/2021/1467/contents/made (viewed on 5 March 2024)

Proposed Smart Mandate requirement		Existing EVSCP Regulations[18]	Alignment
	functionality if the owner changes electricity supplier or DSRSP. A staged approach to DSRSP interoperability: **2026:** As part of the first phase ESA regulations, devices must utilise an open standard communication protocol for the application interface. **2028:** Second phase regulations will set out the minimum required communication protocol, which may be based on the revision of PAS 1878.	the owner switches electricity supplier. These regulations do not currently mandate an open data standard for communication between the private charge point, the charge point management system and the energy supplier or DSRSP.	imposed on the industry. Instead, the intention is to explore this as part of future second phase regulations. Further, government aims to introduce a staged approach to implementing requirements that heat devices must be interoperable with DSRSPs. This will prevent lock-in when, as the market matures, users potentially split their electricity supplier and DSRSP to access the most competitive rates.
Safety	Electric heating appliances must prioritise safe operation over responding to instructions (third party information or user input) where to do so would compromise device safety or result in a risk to the health or safety of the user.	Charge point must not allow the owner or other end-user to carry out a specified operation (namely overriding default charging, DSR services, or randomised delay) where to do so could risk the health or safety of a person.	The smart mandate proposal is aligned with current EVSCP requirements and existing Product Safety legislation.
Loss of communications network access	In the event of a loss of network connectivity, an electric heating appliance must be able to continue to function to provide	Charge point must retain its ability to charge an electric vehicle even in the event it ceases to be connected to a	The smart mandate proposal is aligned with current EVSCP requirements.

Proposed Smart Mandate requirement		**Existing EVSCP Regulations**[18]	**Alignment**
	heating and/or hot water as appropriate for the device.	communications network.	
Maximum turn/shut down time	The smart mandate does not require a maximum turn/shut down time or a minimum speed of response.	The EVSCP regulations do not reference maximum turn off times.	The smart mandate proposal is aligned with current EVSCP requirements.
Control strategies	The smart mandate does not require any specific controls to be installed with the electric heating appliance.	The EVSCP regulations do not reference control strategies.	The smart mandate proposal is aligned with current EVSCP requirements.
Hybrid heat pumps	Hybrid heat pumps must be able to receive and act upon signals (for example, electricity tariff data) and be able to utilise the alternative heat source to meet heat demand during a DSR instruction.	Hybrid heat pumps are not within scope of the EVSCP regulations.	Hybrid heat pumps are not within scope of the EVSCP regulations.
Consumer interfaces	Electric heating appliances must provide a user interface (through any combination of an app, web portal or physical interface on the device or other).	Charge point must have at least one user interface.	The smart mandate proposal is aligned with current EVSCP requirements around the provision of a user interface; however, it further specifies that the interface is for the purpose of allowing users to enter their preferences only. The provision of the user interface is key to consumer protection, as without some form of interface, a user cannot enter their preferences for how the device functions, including DSR functionality.

Proposed Smart Mandate requirement		Existing EVSCP Regulations[18]	Alignment
Monitoring	Electric heating appliances must be able to estimate or calculate their power consumption to participate in DSR services. Manufacturers are free to choose the measuring approach of the device, for example a meter or look-up table. Electric heating appliances will not be required to collect data on their thermal output.	Charge point must measure or calculate the electricity imported or exported, the time the charging event lasts, and allow the owner to view this information. The charge point must also be able to measure or calculate electrical power and be capable of providing these values via a communications network.	In line with EVSCP regulations, the smart mandate proposals require electric heating appliances to estimate or calculate their power consumption.
Defaults	Electric heating appliances, on set up, must have users set their heating preferences. DSR and TOUT operations should be enabled by default and for operations, where appropriate, schedules should be pre-set to operate outside of peak hours (8am to 11am and 4pm to 10pm on weekdays), giving the user the opportunity to accept, remove or change those defaults.	Charge point must incorporate default charging hours and must allow the owner to accept, remove or change these upon first use and subsequently. The default hours must be pre-set to not charge during times of peak electricity demand (between 8am and 11am, and 4pm and 10pm on weekdays) but must allow the owner to override them.	The smart mandate proposal is aligned with current EVSCP requirements.

Modulating output

The fundamental requirement for creating flexibility is that a device can modulate its output, that is to decrease or increase the amount of electricity that it is consuming in response to a signal. This might be because of price signals from a TOUT, as well as other types of indirect

signals such as CO2 offset which the appliance may optimise against, or direct signals from a Load Controller in response to requests from grid operators, which could be caused by a shift in grid frequency due to demand and generation not being balanced. Examples include lower generation from renewables or high demand, constrictions on the transmission and distribution networks, or to consume more electricity because of excess renewable generation.

In the development of the EVSCP regulations[19], government proposed a requirement that smart charge points should respond automatically to remote signals by adjusting the electricity consumption flowing through the charge point. Based on concerns that manufacturers were interpreting this requirement to set up their devices to only respond to on/off signals from the user, rather than work with Load Controller services, the regulation was expanded to require not only modulating output, but that the devices must be capable of providing DSR services, including response DSR services. To avoid any similar ambiguity in manufacturer interpretation of the smart mandate, the requirement should require heating appliances to work with price and other signals that facilitate DSR.

Further, this proposal is closely aligned with the criteria that an electric appliance needs to meet to perform and be classified as an ESA as set out in PAS 1878:2021 (3.1.17)[20].

On this basis, we propose that the mandate should require electric heating appliances to be able to increase or decrease the rate of electricity flowing through it and/or to change the time at which electricity is consumed in response to signals, including price, and that the device must be capable of providing DSR services.

11. **Do you agree with government's proposal that electric heating appliances must be able to modulate output and/or change the time at which electricity is consumed in response to signals, including price and other signals that facilitate DSR?**

Device communication

For an electric heating appliance to respond automatically to signals to shift or modulate its electricity consumption, it needs at a minimum to be able to receive those instructions and to act upon them. However, there is also an extent to which a device communicates back to the Load Controller sending the signal and what level may be required – whether this is simply an acknowledgement of receiving the signal through to potentially providing a range of information about the operation of the device, with potential privacy implications at each level.

There are examples of this requirement in PAS 1878:2021 which lays out the technical requirements for devices to enable two-way communication between devices and Load Controllers and what information the device needs to be able to send and receive throughout its operation, for example upon registration and initialisation the device is required to provide a range of information (5.3.1 to 5.3.4), or when operating in normal operation (5.3.5.1 to 5.3.5.2). Developed with the principle of data privacy in mind, and following the minimisation principle of

[19] GOV.UK, 'Electric Vehicle Smart Charging' (2019), https://www.gov.uk/government/consultations/electric-vehicle-smart-charging, consultation closed 7 October 2019 (viewed on 7 March 2024)

[20] British Standards Institution, 'PAS 1878 – Energy smart appliances' (2021), https://knowledge.bsigroup.com/products/energy-smart-appliances-system-functionality-and-architecture-specification?version=standard (viewed on 11 March 2024)

GDPR, PAS 1878 requires only the minimum amount of data to be shared with the Load Controller to enable consumers to participate in Response-type DSR.

Based on this, we propose that electric heating appliances are required to provide two-way communication that allows them to receive and act upon price and other direct control signals, and at a minimum to send signals on the status of the device, whether it is responding to a signal or communicating when the device has ceased to do so.

12. **Do you agree with the proposal that electric heating appliances within the scope of the mandate must provide two-way communication in order to receive and act upon direct control signals, and to send signals on the device status?**

Interoperability

As more partnerships are taking place in industry, there is a risk that devices could have their smart functionality restricted to a certain DSRSP or energy supplier. This would limit competition in the market and prevent consumers swapping DSRSP or energy supplier to meet their preferences or requirements.

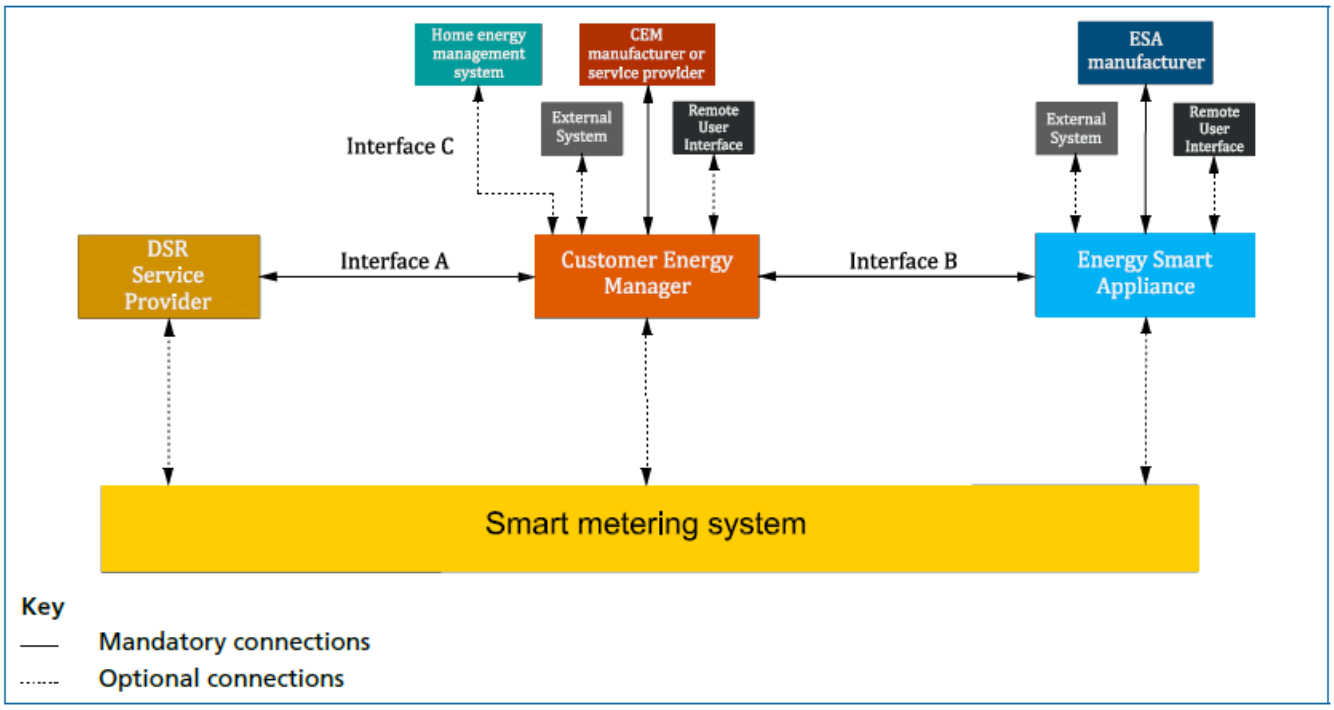
The EVSCP regulations have a high-level requirement that a private charge point must retain its smart functionality even if the owner switches electricity supplier. These regulations do not currently mandate an open data standard for communication between the private charge point, the charge point management system and the energy supplier or DSRSP. There is no plan at present to mandate open data communication standards for the EVSCP-energy supplier interface in recognition of recent regulatory changes imposed on the industry. Instead, the intention is to explore this as part of future second phase regulations. As described in the EV charge point section below, at this stage we are exploring views on open data standards for EV smart charge points and other barriers to interoperability.

Regarding the smart mandate for electric heating appliances, we propose that any standard we develop should aim to ensure that consumer choice and competition is not limited in either energy supplier or DSRSP markets. We therefore propose that the mandate require that any appliance must not be configured in such a way that it ceases to have smart functionality if the owner changes their electricity supplier.

We are further proposing to introduce a staged approach to DSRSP interoperability, to ensure that appliances are interoperable with DSRSPs as separate DSRSP organisations start to offer direct services. We describe here our intention for electric heating appliances and then below in the EV section how we intend to develop EV and BESS interoperability with DSRSPs over time.

Currently, PAS 1878:2021 (5.1.2.1) requires that the interface between the Customer Energy Manager (CEM) and the DSRSP (Interface A) must use OpenADR as a minimum, so that a user can switch between DSRSPs. The main components associated with the system level functional architecture are shown in Figure 1 below.

Figure 1. Representation of the communications interfaces of the ESA DSR systems architecture (PAS 1878:2021)[21].



The communication between the device (Energy Smart Appliance or ESA) and the CEM can, however, be in a proprietary format as this does not impact on interoperability as Interface A in this case is already interoperable. To mandate a specific application layer protocol for Interface A based on PAS 1878 (or any alternative standards for ESA interoperability) in the first phase of the ESA regulations would not provide sufficient time for industry to adapt given the current proposed timelines for the revision of the PAS 1878 standard as set out below in Chapter 6.

Therefore, as part of the first phase ESA regulations to be implemented in 2026, we propose that electric heating appliances must utilise an open data standard for communication at the application interface to remove a barrier to consumers switching DSRSPs. Through further consultation, and as part of the second phase regulations to come into force in 2028, we will develop this requirement to further specify a required minimum communication protocol. This will be based on further engagement with industry and the planned revision of PAS 1878 through the IDSR programme and ESA Technical Working Group.

13. **Do you agree with the proposal that electric heating appliances within the scope of the mandate must be designed to be interoperable so that devices do not cease to have smart functionality if the owner changes electricity supplier?**

14. **Do you agree with the proposal that, as part of the first phase ESA regulations, electric heating appliances within the scope of the mandate must be designed to utilise open standard communication protocols for the application interface to remove a barrier to interoperability with DRSRPs?**

[21] Permission to reproduce extracts from British Standards is granted by BSI Standards Limited (BSI). No other use of this material is permitted. British Standards can be obtained from BSI Knowledge https://knowledge.bsigroup.com/

Safety

As an electric heating appliance will be receiving instructions from third parties and users will be able to override the device behaviour, a device could be instructed to operate in a way that could compromise device safety or result in a risk to the health or safety of the user (for example, being rapidly instructed to turn on/off, or rapidly increase electricity consumption).

There are existing safety laws and guidance that provide a framework which extends to covering heating appliances and products. Some examples include:

- General Product Safety Regulations 2005[22]
- Electrical Equipment (Safety) Regulations 2016[23]
- BS EN 60335-1: Household and similar electrical appliances. Safety – General Safety Requirement[24]
- IEC 60730-1: Safety standard – Automatic electrical controls[25]
- Building Regulations[26]

Further, PAS 1878:2021 (5.3.5.2)[27] currently sets out a hierarchy of operation where safe operation of an ESA is prioritised above all other functions. Response mode (activation of flexibility offers in accordance with consumer preferences) overrides Routine mode. However, response mode can be overridden by the consumer (to modify, decline or cancel any mode operation), and Failsafe mode takes priority over any of these actions, which prevents an unsafe, harmful, or hazardous operation.

Backed up by the principles set out in PAS 1878 and existing legislation, we propose that the mandate should require electric heating appliances to prioritise safe operation over responding to information or user input. We propose that this requirement specify that devices should not be damaged by operations, either by an instruction or user input, where to do so would compromise device safety or result in a risk to the health or safety of the user, as well as ensuring key priorities in operation modes to aid grid stability (giving priority to faster acting services and then optimisation).

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[22] The General Product Safety Regulations 2005, available at: https://www.legislation.gov.uk/uksi/2005/1803/contents/made (viewed on 11 March 2024)
[23] The Electrical Equipment (Safety) Regulations 2016, available at: https://www.legislation.gov.uk/uksi/2016/1101/contents (viewed on 11 March 2024)
[24] British Standards Institute, 'BS EN 60335-1:2012+A15:2021, Household and similar electrical appliances: Safety - General requirements' (2021), https://knowledge.bsigroup.com/products/household-and-similar-electrical-appliances-safety-general-requirements-2?version=standard (viewed on 11 March 2024)
[25] International Electrotechnical Commission (IEC), 'IEC 60730-1:2022 Automatic electrical controls', https://webstore.iec.ch/publication/66089 (viewed on 11 March 2024)
[26] The Building Regulations 2010, available at: https://www.legislation.gov.uk/uksi/2010/2214/contents/made (viewed on 11 March 2024)
[27] British Standards Institution, 'PAS 1878 – Energy smart appliances' (2021), https://knowledge.bsigroup.com/products/energy-smart-appliances-system-functionality-and-architecture-specification?version=standard (viewed on 11 March 2024)

15. **Do you agree with the proposal that the mandate should require electric heating appliances to prioritise safe operation over responding to information or user input?**

Loss of network access

As internet connectivity will be required for the electric heating appliance to provide the smart functionality, there is a risk that the device could become incapable of operating should it lose connectivity, particularly if users utilise an app interface to control the device. A requirement is specified in both PAS 1878:2021 (6.14.1.2; 7.9)[28] and the ETSI EN 303 645 (5.9)[29] that resilience should be built into consumer Internet of Things (IoT) devices and services, considering the possibility of outages of data networks. This requires consumer IoT devices to remain operational in the case of a loss of network access. In line with this, we propose that in the event of a loss of connectivity, a device must be able to continue to function to provide heating and/or hot water as appropriate for the device.

16. **Do you agree that the mandate should require electric heating appliances to be able to continue to function to provide heating and/or hot water services when network connection is lost?**

Maximum turn/shut down time

As there are several electric heating appliances within the scope of the mandate, which have different levels of storage and capability to pre-heat, alongside properties being highly variable on how thermally efficient they are, requiring maximum turn/shut down times is likely to have limited benefits for consumers.

The heating appliances in scope all operate differently and manufacturers may have different specifications within their product range. Therefore, we are proposing to not mandate a minimum response time for devices as it could either be set at a speed that is too quick for all devices to meet or be set so slowly that it is effectively useless. Moreover, information that can specifically classify an ESA product category, such as DSR response time or maximum/minimum power limits, requires additional permission from the service subscriber if it is deemed to be personal information.

We propose that the mandate does not require a maximum turn/shut down time or a minimum speed of response. It is government's view that manufacturers are the appropriate actor to determine these features, and these may be communicated to the DSRSP, following appropriate consent from the service subscriber, as part of the previous recommendation on device communication. We note that some response requests, such as Frequency Response, will continue to have specific response time requirements, for example as set out in Annex C of PAS 1878:2021.

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[28] British Standards Institution, 'PAS 1878 – Energy smart appliances' (2021), https://knowledge.bsigroup.com/products/energy-smart-appliances-system-functionality-and-architecture-specification?version=standard (viewed on 11 March 2024)

[29] European Telecommunications Standards Institute (ETSI), 'ETSI EN 303 645 V2.1.1 (2020-26) Cyber; Cyber Security for Consumer Internet of Things: Baseline Requirements, 5.9 Make systems resilient to outages', https://www.etsi.org/deliver/etsi_en/303600_303699/303645/02.01.01_60/en_303645v020101p.pdf (viewed on 8 March 2024)

17. **Do you agree with government's proposal that the mandate should not require a maximum turn/shut down time or minimum speed of response?**

Control strategies

We have considered whether to mandate certain control strategies as part of these regulations, for example weather or load compensation. We propose that the mandate does not require any specific controls to be installed with electric heating appliances. Not all controls may be appropriate to all devices in scope in all scenarios and manufacturers are best placed to determine this. Some of these controls are already requirements for a product to be Microgeneration Certification Scheme (MCS) registered[30] and so there would be limited benefit to government intervening.

18. **Do you agree with government's proposal that the mandate should not require specific control strategies to be installed with electric heating appliances?**

Hybrid heat pumps

We propose that the mandate requires that hybrid heat pumps (as a whole heating system that is operated by common controls) are able to receive and act upon signals (for example, electricity tariff data) to optimise operation. This would allow hybrid heat pumps to optimise heating to take advantage of periods of comparatively lower electricity prices, which could lead to increasingly heat pump-led operation of the system.

During a DSR instruction, hybrid heat pumps must be able to utilise the alternative heat source, rather than the heat pump element, to maintain thermal comfort for the user. Whilst deployment of hybrids is currently low, not adding this functionality could be a significant missed opportunity in a scenario where their deployment ramps up.

As set out above, we will work to develop a definition of a hybrid heat pump for the purpose of the smart mandate, taking into account the need for common controls.

19. **Do you agree with government's proposal that hybrid heat pumps operated by a common controller must be able to receive and act upon fuel tariff data and be able to utilise the alternative heat source to meet heat demand during a DSR instruction?**

Consumer interfaces

We propose that the mandate requires that all electric heating appliances must provide a user interface (through either an app, web portal or physical interface on the device or other) that can only be accessed physically (for example, buttons, keypad, touchpad, screen) to allow users to enter their preferences. Whilst many manufacturers do provide an interface for users to control their devices, this is not always the case, and given the need to ensure that users are always able to choose whether to take part in DSR and to have control over their device, mandating an interface for every device is necessary to ensure this. This is backed up by the

[30] Microgeneration Certification Scheme (MCS), https://mcscertified.com/ (viewed on 7 March 2024)

requirement set out in PAS 1878:2021 (5.1.2.4)[31] that a local (built in) or remote user interface shall be provided for the ESA.

20. Do you agree with government's proposal that all electric heating appliances within scope must provide a user interface?

Monitoring

We propose that electric heating appliances must be able to estimate their power consumption to participate in DSR services. We propose that manufacturers are free to choose the measuring approach of the device, for example a meter or look-up table.

Our proposed approach is in line with PAS 1878:2021 (5.6) which states that an ESA shall be capable of measuring or calculating its power consumption/production value in W or kW (for example, by using an internal measuring approach or using a look-up table), with an accuracy upper limit of 10% standard deviation error on reported power values[32].

In PAS 1878, the ESA is offering flexibility options to the DSRSP. The consumer is rewarded for allowing their appliances to be controlled for the overall benefit to the network, so the DSRSP will trade with the consumer based on the amount of flexibility, rather than electricity, they provide. The purpose of the measuring instrument in this instance, either meter or look-up table, is only to allow the DSRSP to quantify the scale of response it has achieved back to the grid-side actor for audit purposes.

A look-up table involves devices being able to estimate their power consumption by using the values measured previously in a laboratory testing environment. This requirement will allow DSRSPs to receive information on the power consumption of appliances, related to a counterfactual of the appliance maintaining its intended operation, in order to provide an aggregated estimate to the grid operators for audit purposes, hence enabling devices to participate in 'Response' type DSR.

If a device has a meter, the purpose of the meter is also so that the DSRSP can confirm to the electricity system operator (ESO) the amount of load that in aggregate has been shifted. Whilst the customer is paid by the DSR service provider for participation in the scheme, the customer does not receive a payment with reference to any quantity value provided by the meter in the device, rather this is based on the number of times that they are called to provide DSR and they respond. For Response DSR, the meter is used for audit purposes only.

It is our understanding that smart electric heating appliances are not typically being used for trade when participating in DSR services and therefore do not need to comply with the Measuring Instruments Regulations 2016 (MIR)[33]. MIR only includes active electrical energy

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[31] British Standards Institution, 'PAS 1878 – Energy smart appliances' (2021), https://knowledge.bsigroup.com/products/energy-smart-appliances-system-functionality-and-architecture-specification?version=standard (viewed on 11 March 2024)

[32] PAS 1878:2021 (5.6) states that: 'The DSRSP needs to report back to its grid side client the DSR response that has been enacted using a cohort of N individual ESAs. If the error in the power measurement of the N devices is normally distributed and random, the accuracy of the total power change achieved is improved by the square root of N. As an example, 10 000 ESAs supplying a power response of 1 kW each, with a measurement accuracy of 10%, will allow the total response of 10 MW to be reported to the grid side client to an accuracy of 0.1%'.

[33] The Measuring Instruments Regulations 2016, available at: https://www.legislation.gov.uk/uksi/2016/1153/contents/made (viewed on 11 March 2024)

meters within its scope where they are “for use for trade”[34]; hence it follows that, for a meter to be within the scope of MIR, the quantity measurements provided by it must be relevant to the transactions between parties. This is not the case for response DSR as the quantity measurements provided by the meter are used only for audit purposes and bear no relation to the compensation paid to the customer. We welcome evidence on any future or potential smart heating business models that may be regarded as qualifying as for trade.

It is our understanding that most smart electric heating appliances do not currently have an inbuilt asset meter. Requiring a meter per appliance would add additional costs and as demonstrated, is not required for the Response DSR use case.

Whilst this proposal is currently suitable for domestic response DSR, if there is a future development in domestic DSR supply that moves into using meters in smart electric heating appliances for trade, for example services related to the amount of electricity supplied to a device, then manufacturers would be obligated to ensure that the meters used are compliant with MIR. Furthermore, if a manufacturer wishes to go beyond offering Response DSR services in a way which constitutes using a meter for trade, then they would also have to ensure that the meter used meets the relevant regulatory requirements in MIR. However, this is currently out of scope of the proposed smart mandate minimum requirements for electric heating appliances.

We recognise that requiring electric heating appliances to monitor and collect additional data such as thermal output could add costs to devices, particularly heat pumps that would require a heat meter to enable monitoring and may increase installation time and cost. As the individual financial benefits for taking part in DSR are already low, this extra cost could remove any benefits for consumers. This requirement will also not extend to servicing and fault detection, in line with EV smart charge point regulations.

21. **Do you agree with government’s proposal that electric heating appliances must be able to estimate their power consumption, with the manufacturer free to choose the estimating (calculating or measuring) approach?**

22. **Do you see any difficulty with the position that government is proposing? Please provide evidence to support your answer.**

23. **Do you agree with government’s proposal that electric heating appliances will not be required to collect data on their thermal output?**

Defaults

We propose the requirement that all electric heating appliances, on set up, must have users set their heating preferences (and hot water preferences where relevant). DSR and TOUT operations should be enabled by default and where possible, schedules should be pre-set to operate outside of peak hours (defined as 8am to 11am and 4pm to 10pm on weekdays) for operations where appropriate, giving the user with the opportunity to accept, remove or change those defaults. Functions that can be undertaken outside of peak hours could include a heat pump pre-set to heat a hot water cylinder overnight to provide the property’s hot water, or a heat battery/storage heater charging the core.

[34] ”Use for trade” is defined in section 7 of the Weights and Measures Act 1985. Weights and Measures Act 1985, available at: https://www.legislation.gov.uk/ukpga/1985/72 (viewed on 13 March 2024)

Whilst having electric heating appliances that can operate in a smart way is important, there will be little benefit to the network if users do not make use of that functionality. Therefore, we are proposing that upon commissioning, devices are enabled to provide DSR and utilise TOUTs by default to encourage uptake of the use of them whilst providing the user with the opportunity to accept, remove or change those defaults. Defaults can have a powerful impact on adoption and even where consumers choose not to take part in DSR, if they adopt the defaults for activities like hot water generation, this could avoid adding additional load to the network by shifting that demand to other times.

24. **Do you agree with government's proposal that all electric heating appliances, on set up, should require users to set their heating preferences, that DSR and TOUT operations to be enabled by default, and for functions that can be undertaken outside of peak hours to be pre-set to do so?**

25. **Are there any other requirements that you believe should be included in the minimum requirements for the smart mandate?**

We are working to develop the approach that we will take to put these minimum requirements into regulation as part of the first phase ESA regulations.

As shown by the Next Steps/Forward Look section of the standalone Summary Document and also the indicative timeline included in the First Phase Regulations: Overview section earlier on in this consultation document, our current intention is for the first phase of energy smart regulations, including these smart mandate minimum requirements, to come into force in 2026 following a 12-18 months implementation period for industry (a more precise lead-in time will be determined via the review of our approach to phasing ESA device regulations that will be undertaken as set out earlier). This timeline also includes a period of consultation on the draft Statutory Instrument before it is laid in Parliament. However, the timeline is only indicative at this stage.

Regulating ESA functionality for smart heating appliances

This section sets out government's proposed regulatory approach to ensure that the ESA functionality of a smart electric heating appliance is delivered, in line with the aims of the smart mandate. Our primary powers allow us to place requirements on ESAs and on any economic actors (including manufacturers, sellers, distributors). The key issue is how that ESA functionality is going to be delivered and how we regulate this effectively.

Provision of ESA functionality[35]

In the first SSES consultation, and confirmed in the government response, we proposed that the mandate would apply at the device-level. The 'ESA functionality' of an electric heating appliance may be provided by a separate piece of hardware and/or organisation, and/or in the Cloud. Based on this, and as set out in the first SSES consultation, and confirmed within the government response, we are proceeding with our approach of not specifying whether the smart functionality is integrated into the appliance or delivered by an add-on module. Our proposed regulatory approach will therefore require electric heating appliances to be smart, secure, and interoperable, either through embedding ESA functionality within the device boundary or through providing an 'add-on' module that gives the appliance 'ESA functionality'

[35] The provision of ESA functionality is a separate issue to considerations around Home Energy Management Systems (HEMS) and in-home interoperability/optimisation.

(for example a smart thermostat connected to an appliance via a communication method, or a smart controls 'box' physically attached to the appliance). Some developers may also place functionalities in the Cloud. For the smart mandate, we therefore consider the 'provision of ESA functionality' to mean the provision of the hardware and/or software required to make a non-smart heating appliance into an ESA.

We recognise that there may also be several appliances that are locally connected to form one heating system (for example, multiple storage heaters in a flat), and this connected system may only need one shared 'add on' that provides the 'ESA functionality'/communicates externally.

Breaking down the provision of ESA functionality, there are two elements:

1. Communications-enabled and capable of receiving signals. This could be integrated into the device, be in the Cloud, or in both, or delivered through an 'add on', either provided by the heating appliance manufacturer or a third party, for example a smart controls manufacturer.
2. Able to respond by shifting or modulating electricity consumption. This must be designed into the appliance by the heating appliance manufacturer.

We recognise that an electric heating appliance cannot be effectively controlled by a third party without effective communication between the appliance and the 'add on' smart controls. This enables the third party to access information about the operation/status of the heating appliance and control it in a safe and effective way.

Based on the above, we have considered options to mandate specific communication protocols for electric heating appliances and smart controls. As there is not currently an established open protocol used for controlling electric heating appliances (for example, OpenTherm, which is commonly used for communication between boilers and controls), we have explored placing an obligation on both manufacturers and sellers to provide heating appliances that meet a common standard so that any control can give any appliance ESA functionality. However, this could create less innovation in the market as manufacturers cannot deviate from the standard that is specified. It would also introduce increased costs for consumers - if the manufacturer does not choose to provide smart functionality as standard, consumers would need to choose to pay for third party controls for appliances to have access to, and receive the benefits of, smart functionality.

Government's view is that the appliance manufacturer is very well placed to know how their system does and should work and would therefore be a gatekeeper in determining which controllers can and should work with their appliance. We therefore propose to place a regulatory obligation on the appliance manufacturer to either provide embedded ESA functionality within the device boundary, or connectivity to an add-on ESA functionality (smart controls manufactured by the appliance manufacturer, or by a third party who has entered into a partnership with the appliance manufacturer).

This approach can utilise closed propriety protocols, based on individual agreements between the third party and ESA manufacturer, or open communication protocols when available. Even if the smart functionality is provided by a third party through 'add-on' controls, the manufacturer remains responsible for ensuring compliance with the regulations. This option will ensure that non-smart appliances are provided with the controls to give them 'ESA functionality' whilst continuing to give consumer choice over whether they utilise that functionality.

As part of longer-term standard developments, we will continue to explore the option of developing an open standard for appliances and controls. An open protocol would mean that

all controls would work with all heating appliances and increase consumer choice, however, to introduce this as part of the first phase of the ESA regulations would take significant time to develop and legislate.

26. **Do you agree with government's proposal to require the appliance manufacturer to provide appliances with integrated or 'add-on' ESA functionality?**

Requirements on supply chain actors

Sellers

We consider 'sellers' to include any actor that is involved in the onward sale of appliances after they leave the manufacturer (including importers, distributors, wholesalers, retailers). Installers may also be involved in the sale of appliances but are considered separately.

We propose to recommend placing requirements on sellers to ensure that an electric heating appliance (or system of appliances) is sold with either integrated or add-on 'ESA functionality', based on manufacturer information. This requires sellers to only sell products that the manufacturer has shown to be compliant and ensure that if the product is compliant only when part of a 'bundle', that the bundle is sold together. This option will minimise the regulatory burden on sellers, whilst still providing an additional layer of assurance to ensure 'ESA functionality' is provided, and capturing a point in the supply chain where non-smart electric heating appliances could be made available to consumers. This remains in line with similar types of product legislation, including the EVSCP regulations, which typically state different obligations for different market actors.

We propose that this could be a straightforward process for sellers, for example confirming an 'add-on' control has been provided through a 'tick box' exercise, based on information provided by the manufacturer such as compliance documentation. We do not want to add disproportionate burdens onto sellers who ultimately have no influence over how products are designed. The responsibility for ensuring and demonstrating compliance with the smart mandate would still rest with the manufacturer (for example, the testing and provision of compliance documentation/certification).

27. **Do you agree with government's proposal to require sellers to ensure that an electric heating appliance (or system of appliances) is sold with either integrated or add-on ESA functionality?**

Installers

Installers will play an important role in ensuring that smart heating appliances are set up correctly and the ESA functionality can be used, including connecting the appliance to the internet (if required) and completing the handover with the consumer.

We propose to place no requirement on installers but will explore other levers to ensure installers are aware, and capable, of installing smart electric heating appliances and handing over to consumers. This may include exploring options to formalise requirements for installers by introducing specific government guidance and encouraging manufacturers to provide their own training for installers, with smart specific guidance embedded into Continuing Professional Development (CPD). This will equip installers of relevant appliances with the knowledge and skills to ensure that devices are installed correctly, and that smart functionality can be used; for example, if functionality is provided via a separate 'add on' module alongside the appliance, the appliance must be installed such that it can access the smart functionality via that module.

We do not want installed smart devices that are effectively 'dumb' if they are not connected or set up properly, and want to avoid the consumer handover being a potential point of failure if consumers are unaware how to effectively utilise the smart functionality of an electric heating appliance.

Government recognises that placing significant legal requirements on installers may deter installer growth and exacerbate installer shortages, whilst being resource intensive to enforce effectively. The proposed approach will minimise the burden on the supply chain, whilst taking steps to create 'informed' installers to support our policy aims. This does however represent a point in the supply chain where non-smart appliances (for example, appliances without 'add-on') could be made available, or where smart appliances could be installed incorrectly leading to potential additional cost to consumers. We are exploring options to increase installer awareness and ability to combat this risk.

28. **Do you agree with government's proposal not to place any legal obligations on installers of smart heating appliances?**

29. **Do you have a view, and supporting evidence, on how government ensures that installers have the awareness and ability to successfully install smart heating appliances?**

EV interoperability with energy suppliers and DSRSPs

In the future second phase regulations, we wish to ensure that private EV charge points have the capability to communicate with all energy suppliers and DSRSPs. This means exploring open data standards in due course.

The EVSCP Regulations have a high-level requirement that a private charge point must retain its smart functionality even if the owner switches electricity supplier. These regulations do not require an open data standard for communication between the private charge point, the charge point management system and the energy supplier or DSRSP. There is no plan at present to mandate open data communication standards for the EVSCP-energy supplier interface ahead of second phase regulations, in recognition of recent regulatory changes imposed on the industry. Instead, the intention is to propose this as part of future second phase regulations. At this stage we are only exploring views on open data standards for EV smart charge points and other barriers to interoperability.

We recognise that, for charge points to be able to communicate with all energy suppliers and DSRSPs, shared communication data standards for communication between EVSCPs, charge point management platforms and energy suppliers, and DSRSPs, are required. We also recognise that the industry is increasingly converging around the OCPP standard.

We further recognise that, to enable EV access to the full range of tariffs and DSR services provided by energy suppliers and DSRSPs, there is also a need for communication at the EV-EVSCP interface regarding EV battery state of charge. Government will be exploring barriers and potential solutions in this space over the coming months. We are also aware of developing EU legislation on access to state of charge data.

30. **Do you agree that open data standards are required to enable EV charge point interoperability with energy suppliers and DSRSPs?**

31. **What are the barriers to implementing such open data standards?**

32. **From your experience does EV-EVSCP interface communication regarding battery state of charge pose a barrier to access to the full range of EV tariffs and DSR services?**

33. **What other technical and commercial barriers have you experienced to EV drivers accessing a full range of available tariffs and DSR services?**

4. First Phase Regulations: Cyber Security and Grid Stability

The purpose of this chapter is to set out our current approach and policy position for minimum cyber security and grid stability requirements within first phase ESA regulations.

Cyber Security Requirements of Energy Smart Appliances (ESAs)

Background

In Chapter 3 of the July 2022 consultation on Delivering a Smart and Secure Electricity System[36] we set out proposals for minimum cyber requirements for organisations controlling large amounts of electrical load. The consultation also set out proposals to protect against other cyber security risks at both device and system levels. The consultation recognised that cyber incidents could damage network infrastructure, consumer confidence, and adversely affect the uptake of DSR.

The consultation sought views on the following 8 security outcomes that ESAs may need to deliver:

- protecting the integrity of messages and external data sources
- protecting against unauthorised access
- protecting against mis-use by authorised entities
- mutually authenticating communicating entities and system messages
- verifying and validating all received data and messages
- enabling regular and urgent security updates, using secure update processes
- protecting the confidentiality of system messages, data-at-rest and sensitive processes
- enabling the detection of response to and recovery from compromise.

Consultation respondents overwhelmingly agreed with the above proposals. Accordingly, as set out in the consultation response, the government plans to take the 8 proposals forward to inform technical and regulatory frameworks for ESAs.

[36] 'Delivering a smart and secure electricity system: consultation on interoperability and cyber security of energy smart appliances and remote load control' (2022), https://www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-the-interoperability-and-cyber-security-of-energy-smart-appliances-and-remote-load-control

Respondents were also asked for views on the use of the standard ETSI EN 303 645 as an appropriate standard for minimum device-level cyber security requirements, and for views on whether minimum device-level cyber security requirements should be implemented for heat pumps, storage heaters and heat batteries. No respondents disagreed with these proposals.

Government therefore plans to use ETSI EN 303 645 as the foundation for ESA security requirements. This approach also aligns with the 8 proposed outcomes for cyber security for ESAs proposed in the July 2022 consultation.

ETSI EN 303 645 was designed to prevent large-scale attacks against smart devices by establishing a security baseline for connected consumer products. It also provides a basis for future Internet of Things certification schemes. The Electric Vehicle (Smart Charge Points) Regulations 2021 ("EVSCP Regulations") introduced requirements based on ETSI EN 303 645. It supports a good security baseline for connected consumer products, establishing a set of 13 standards.

Current activities

The Department for Energy Security and Net Zero ("the Department"), in collaboration with the National Cyber Security Centre (NCSC), has completed a cyber security risk assessment for the SSES programme which identified risks at device level and organisational level.

Based on this assessment, and on other assessments, government was able to establish the risks to the domestic DSR system from ESAs. Work is currently underway within government to create the security architecture for the SSES programme which is due to complete in 2024 and will establish device level security controls based on risk and proportionality.

We will continue to engage relevant stakeholders ahead of laying device level regulations by the beginning of 2025 in preparation for the implementation of first phase regulations in 2026. We recognise that requirements for ESAs may need to evolve along with the market and are committed to applying appropriate controls that remain consistent.

In June 2023, the Department established a SSES Cyber Security Working Group with members from across government, industry and academia to support the development of the security requirements required to deliver smart, secure, and interoperable ESAs and DSR services. In addition, this Group is required to advise on other non-functional matters with security impacts, including governance, delivery and security assurance. Members of this group bring experience from the development and implementation of the EVSCP Regulations and will be engaged throughout the programme lifecycle.

Policy update

Government has engaged with subject matter experts to test our current assumption that the 13 standard principles in the current version of ETSI EN 303 645 are an appropriate baseline on which to establish future ESA security requirements. We recognise that security architecture work will not be complete at the time this consultation is published, and therefore further engagements with subject matter experts from the relevant stakeholders will be required before baselining the final ESA security requirements for consultation by early 2025.

Government recognises additional guidance will be required to help manufacturers and developers with the interpretation and implementation of the future regulations of ESAs and will work with industry to ensure it is provided within an appropriate timeframe. In addition, we will

also engage with manufacturers and other parts of the supply chain where appropriate to fully understand lead in times for implementing changes to development and/or distribution processes to ensure they align with regulatory timelines for compliance and enforcement.

We will take forward lessons learned from other government led programmes where appropriate, including the implementation of ETSI EN 303 645 in the EVSCP Regulations. Formal exercises undertaken by the Department to understand lessons learned will inform our policy development and creation of technical and regulatory approach. In addition, we are engaging with the Office for Product Safety and Standards (OPSS) as they have been involved in the enforcement of the EVSCP Regulations.

34. **Do you foresee any issues with adoption of ETSI EN 303 645 for Phase 1 requirements for all ESAs? If so, how could these issues be mitigated?**

The Department is currently working with NCSC to assess appropriate options for ESA testing and security assurance as a more robust approach may be required in future as cyber risk evolves. Based on this engagement and the outcome of the cyber security risk assessment process, we are exploring a range of options, including whether independent security testing of devices may be required in advance of an ESA entering the GB market. This could be delivered, for example, by an NCSC approved assurance scheme with accredited test facilities. Government will consult in more detail on device assurance by early 2025.

35. **To what extent would requiring cyber security testing of ESAs prior to them being sold or distributed in GB impact ESA supply chains? What other approaches could be used to provide sufficient assurance that cyber security requirements were being met?**

Grid stability

In the July 2022 consultation, government identified the following risks to grid stability:

- synchronised changes in load (‘herding’) of ESAs at large scale
- unexpected step-changes or ramps in energy usage at scale, in a short space of time
- oscillation in energy usage or production of ESAs at scale
- inability to provide the flexibility necessary to the energy system.

These risks could be caused by inappropriate design or configuration of ESAs (including their associated systems), the misuse of ESAs, or consumer behaviour.

Based on these risks, government proposed that future policy should ensure that ESAs:

- protect against unintended synchronised changes in load (for example, when responding to a time-of-use tariff (TOUT), or following loss of power or communications)
- enable load-impacting settings to be remotely updated over-the-air, ensuring they are not hard-coded into appliance firmware
- collect and share data relevant for DSR and grid stability securely and reliably
- enable detection, alert and protection against anomalous load-impacting communications that could negatively impact grid stability.

ESAs can have a detrimental impact on grid stability if remotely controlled in sufficient numbers through synchronised changes in load, referred to as herding. The potential impact of herding will grow as uptake of ESAs increases.

Respondents' feedback to the July 2022 consultation indicated a majority in broad agreement with the grid stability mitigations mentioned above. Respondents agreed that there is a need for grid stability measures; several respondents stated that the mitigations must be compatible with consumer needs, such as comfort, convenience, and safety.

Random Offset Function in PAS 1878

One of the grid stability risks from proliferation of domestic load control is the synchronised response to external signals/incentives ('herding') when optimising against an external incentive, such as a TOUT. If the TOUT changes at a certain time, this could cause all devices on that tariff to increase their consumption at the same time. From a grid stability perspective, herding has the potential to introduce very steep rates of change in demand.

The 2022 consultation asked if government should mandate a randomised offset function for ESAs. Respondents provided mixed views on this question. A high percentage of respondents raised concerns on other topics related to the EVSCP Regulations, particularly on consumers being able to manually override the randomised offset function within devices to avoid the potential negative impact on user experience.

In PAS 1878, this risk is mitigated by a randomised offset function:

'*To avoid large simultaneous unwanted switches in load on the electricity network, the ESA shall be capable of applying a randomised offset to the profile start time when creating Intended operation profiles. This offset shall be applied only when the data source(s) used to calculate the Intended Operation profile does not already include a randomised offset. The ESA shall be capable of applying a randomised offset in the range 0 seconds to 1800 seconds'. When operating in Great Britain, the ESA shall apply a randomised offset in the range 0 s to 600 s by default (unless specified otherwise in Distribution Connection and Use of System Agreement, DCUSA, Schedule 8 [N1]). This randomised offset shall be applied only when the data source(s) used to calculate the Intended Operation profile does not already include a randomised offset. The consumer override function [..] shall be able to override the randomised offset, if activated by the consumer.'*

Therefore, the randomised offset function only applies when there is a risk of large simultaneous unwanted switches in load on the electricity network. The randomised offset function does not apply when:

- the device is responding to a request from the grid operators (called 'Response mode' in PAS 1878)
- the consumer wants to manually turn on the device at a certain time (as this is not a synchronous incentive)
- the incentive (data source) is already randomised
- the ESA consumption changes to take advantage of local generation in the household, such as photovoltaic.

Assuming the errors of the power consumption calculated or measured by the ESA are normally distributed and random, with a PAS 1878 requirement of an accuracy of at least 10%, there will be a ramp at the transformer points in relation to ESAs due to statistical reasons.

Randomised Offset Function in the Electric Vehicle (Smart Charge Point) Regulations 2021 (EVSCP Regulations 2021) (For context)

The EVSCP Regulations mandate that charge points sold for private (domestic and workplace) use in Great Britain have smart functionality and meet other device-level requirements, including those related to cyber security and grid stability. There are additional requirements in these Regulations which fall outside of the scope of PAS 1878.

The Regulations set out a requirement for randomised offset charging (Regulation 11). A charge point must be configured to operate a default randomised offset of up to 600 seconds (10 minutes) at each charging instance with the capability to remotely increase that delay to up to 1800 seconds (30 minutes) if required. The policy intention was that the randomised offset requirement should only apply in instances where there was risk of herding, though feedback from stakeholders has highlighted confusion on this point. Government therefore intends to consult on a change to the Regulations for randomised offset function to only apply when there is a risk of herding. This will form part of a wider and separate consultation on proposed amendments to the EVSCP Regulations.

Grid stability policy

Government is committed to working with subject matter experts from National Grid Electricity System Operator (ESO), Distribution Network Operators (DNO) and wider industry to fully understand the impact of any proposed mitigations to grid stability risks. We have therefore established working groups with these operators to support the programme in achieving its objectives in a way that enables the right outcomes. In developing policy on grid stability, government has also analysed lessons learned from the EVSCP Regulations.

The working groups are working on identifying other ways to mitigate grid stability risks. Government has not, at this stage, discounted any potential controls to mitigate the risk of large-scale synchronised changes in load. We therefore continue to welcome views on this question. We plan to work closely with the working groups to establish scenarios, parameters and use cases for the controls outlined to ensure that there is a clear consensus between government, ESO and DNOs. This work will feed into the PAS 1878 update to ensure appropriate alignment between requirements.

Government will consult in more detail on the grid stability requirements in early 2025.

36. Do you have any suggested alternative solutions to the random offset function which would mitigate the risk of large-scale synchronised changes in load?

Impact appraisal

Government has carried out an indicative cost appraisal of the requirements of the first phase ESA regulations for electric heat appliances, which can be found in full in the analytical annex to this consultation. Table 2 below sets out the central assumptions used for each requirement per firm. These are largely based on the analysis underpinning the EVSCP impact assessment[37]. The costs of providing consumer interfaces and monitoring are currently not included. Government is seeking to validate or improve these assumptions to refine its analysis ahead of the final impact assessment.

[37] GOV.UK, 'The Electric Vehicles (Smart Charge Points) Regulations 2021 Impact Assessment (IA)', https://assets.publishing.service.gov.uk/media/61324b8ee90e070437d8b9f8/electric-vehicles-smart-charge-points-regulations-2021-impact-assessment.pdf (viewed on 8 March 2024)

Table 3. Central assumptions used in the indicative cost appraisal of the requirements of the first phase ESA regulations.

Requirement	Impacted businesses	Occurrence	Central	High
Smart development costs	Manufacturers	One-off	£300,000	£300,000
Personalised defaults	Manufacturers	One-off	£20,000	£30,000
Cyber - firmware and software	Manufacturers	One-off	£100,000	£300,000
Randomised delay	Manufacturers	One-off	£20,000	£20,000
Assurance - testing	Manufacturers and importers	One-off	£30,000	£30,000
Familiarisation	Manufacturers and importers	One-off	£20,000	£80,000
Cyber - annual review	Manufacturers and importers	Annual	£50,000	£100,000
Assurance - audits	Manufacturers and importers	Annual	£10,000	£10,000

37. **Please comment on the assumptions and methodology used in the cost appraisal of the analytical annex. Can you provide estimates of the costs of providing consumer interfaces and monitoring?**

5. Second Phase Regulation: Overview

The next chapters of this consultation focus on the second phase regulation for ESA devices that will follow on and build from the first phase regulations in a phased approach to implementation. In this section we set out the high-level timescales for each proposal with consideration of decarbonisation, energy security and consumer protection requirements, and lead in times for industry to adapt to the proposed final requirements. This builds on the timelines from the previous consultation and for each proposal we intend to consult with industry in further detail on specific areas with consideration to policy and implementation.

The timelines provided below are indicative and may change as policy and the sector evolves. We also acknowledge that successful implementation of our proposals will depend on other initiatives and necessary developments such as the introduction of half hourly settlement[38] and the role that the Future Home Standard[39] will play in 2025.

We will meet our policy objectives using technical documents, such as standards and protocols. The following chapters consider how we will create and manage the framework of these technical standards and the accompanying cyber security requirements. This also includes the necessary governance as industry transition into a leading role as well as considering how device requirements will interact with other policy areas such as licensing for load control organisations.

Table 4. Indicative timeline for the development and implementation of the second phase regulation for ESA devices.

Proposal/Indicative timeline	2024	2025	2026	2027	2028
Development and adoption of an ESA standard	Policy development on how PAS 1878 and/or other standards will be used in regulation.	Development of secondary legislation.			Proposals to become operational.
ESA security requirements	Policy development for mandatory requirements applicable to ESAs.		Development of secondary legislation.		Proposals to become operational.

[38] Ofgem. 'Electricity Retail Market-wide Half-hourly Settlement: Decision and Full Business Case' (2021), https://www.ofgem.gov.uk/publications/electricity-retail-market-wide-half-hourly-settlement-decision-and-full-business-case (viewed on 8 March 2024)

[39] GOV.UK, 'The Future Homes Standard: 2019, Consultation on changes to Part L (conservation of fuel and power) and Part F (ventilation) of the Building Regulations for new dwellings, Summary of responses received and Government response' (2021), https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings (viewed on 8 March 2024)

ESA randomised offset function	Policy development for mandatory requirements applicable to ESAs.	Development of secondary legislation.	Proposals to become operational.
Governance model	Consultation on the possible governance models.	Implementation of governance model.	Proposals to become operational.

6. Second Phase Regulation: Technical Frameworks

The technical framework provides the list of documents (for example, technical standards) through which we will deliver our policy outcomes. This chapter provides an update on the creation of a technical framework for the SSES programme, including on the revision of the technical standard PAS 1878 and how we envision standards to be used in future regulation. Governance for technical frameworks and the second phase regulations is covered in Chapter 7.

Background

We set out in the July 2022 SSES consultation[40], and confirmed within the government response[41], the outcomes that future policy ESAs will support. These outcomes are interoperability, cyber security, data privacy and grid stability. We acknowledge that the delivery of these outcomes will require an appropriate technical framework.

We define a technical framework as a document that lists the various regulatory instruments and options, such as technical standards or guidance, as well as how these instruments are utilised (for example, principle-based vs rules based, and minimum technical standards vs maximum technical standards) to achieve desired policy outcomes.

Government committed to having an ESA standard based on PAS 1878[42] within the technical framework. PAS 1878 was developed in conjunction with PAS 1879[43], a code of conduct for the actors operating in this market. PAS 1878 aims to set the minimum requirements an ESA (both the physical device and remote systems, as this is a functional architecture) requires for the delivery of the four SSES policy principles for Explicit (also known as Response) DSR. Explicit DSR is the direct control of devices by a Load Controller to provide services to electricity network operators.

The July 2022 consultation also explored different approaches, considering their advantages and disadvantages, for the use of ESA standards within the SSES technical framework. The

[40] 'Delivering a smart and secure electricity system: consultation on interoperability and cyber security of energy smart appliances and remote load control' (2022), https://www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-the-interoperability-and-cyber-security-of-energy-smart-appliances-and-remote-load-control

[41] 'Delivering a smart and secure electricity system: Government response to the 2022 consultation on interoperability and cyber security of energy smart appliances and remote load control' (2023), https://www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-the-interoperability-and-cyber-security-of-energy-smart-appliances-and-remote-load-control

[42] British Standards Institution, 'PAS 1878 – Energy smart appliances' (2021), https://knowledge.bsigroup.com/products/energy-smart-appliances-system-functionality-and-architecture-specification?version=standard (viewed on 11 March 2024)

[43] British Standards Institution, 'PAS 1879 – Energy smart appliances. Demand side response operation' (2021), https://www.bsigroup.com/en-GB/insights-and-media/insights/brochures/pas-1879-energy-smart-appliances-demand-side-response-operation/ (viewed on 11 March 2024)

two approaches explored 'outcome-based regulatory requirements' and 'presumption of conformity' through either an approved standards approach (Option 1), or a mandated approach (Option 2).

Option 1: Outcome-based regulatory requirements and 'presumption of conformity' through approved standards – ESAs must meet outcomes established in regulation and are presumed to be compliant if they use a standard approved by government or the regulator (sometimes referred to a 'designated' or 'deemed' standard). Other routes can be used to meet the required outcomes that do not require use of an approved standard. However, organisations who do not use approved standards may need to meet other regulatory requirements to demonstrate that the ESA meets the specified outcomes in a fair and robust way.

Option 2: Mandated standards – ESAs must use a standard that is specifically mandated in legislation or other documentation, such as guidance or an industry code.

As set out in the government response, stakeholders clearly supported government intervention to ensure use of ESA standards. The government response also noted the need for the chosen approach to balance innovation, flexibility, and international alignment (which was felt by stakeholders better supported by Option 1) with increased certainty and confidence of conformity (which was felt by stakeholders better supported by Option 2).

Regulatory Approach: Approved Standards

Given industry feedback, our current lead option is to adopt an approved standards regulatory approach, in which there may be more than one designated standard that ESA manufacturers can adhere to for compliance. This is subject to development of the overarching Technical Architecture Design to demonstrate how interoperability can be achieved through the use of potentially more than one standard. Our working assumption is that the updated future iteration of PAS 1878 will be an approved standard for Explicit DSR, but this will be formally decided upon completion of the revision process. We are also open to working with industry on the development of further, complementary standards that could work alongside PAS1878 and provide alternate routes to compliance.

Before making a final decision on adopting an approved standards approach, we want to use this consultation to help gather evidence on outstanding questions regarding the design and implementation, and to ensure that it will enable government to deliver on its objectives.

In an approved standards regime, it will be essential that there are strict controls on which standards gain approved status to ensure that our policy goals are met, both on an individual standard basis and as part of the wider ecosystem. For example, when scrutinising a new proposed standard for approved status, it would be important to review how its inclusion could impact cyber security and interoperability, both of which are affected by having multiple approaches.

With the above in mind, government proposes that it would be the arbiter of which standards are approved for the SSES framework; this decision will be based on advice from industry, including the technical governance group set out in Chapter 7. Following a process similar to Designated Standards, we propose that manufacturers that adhere to an approved standard could claim 'presumption of conformity' (which can be countered by evidence) with the

corresponding essential requirements set out in legislation, but that manufacturers retain full responsibility for ensuring the applicable GB law is met.

The content of the approved standard would remain the responsibility of the associated standardisation body, for example, British Standards Institute (BSI) for PAS 1878, and there would need to be periodic reviews to ensure that the standards remain fit for purpose for inclusion in the approved standards list. As per Chapter 7, the assessment of the standards on the approved list will be conducted by the Technical Governance Group.

Using the Designated Standards process[44] as a guide, a stakeholder wishing to have a new standard added to the Approved Standards List would need the standard to be assessed by a suitable third party (for instance, an independent technical working group established under future governance arrangements) and the responsible government department or agency. The standard would need to be assessed for quality, technical adequacy, and whether it met the requirements set out in legislation. Assessment would also need to consider whether the standard added new or additional functionality beyond that provided by existing standards and would need to consider the appetite of all important stakeholders, including consumer groups and DSRSPs, given that the addition of new standards would add complexity to the landscape for consumers and service providers too.

38. **Do you agree with using the Designated Standards approach as the basis for government to design the Approved Standards framework for the SSES programme?**

39. **Do you have any comments, suggestions or changes to the initial view described above for how Approved Standards could work; especially for the proposed manner of assessing potential new approved standards?**

An important element in considering an Approved Standards approach versus a Mandated Standards approach is the expected number of standards that will gain approved status. The more standards that are approved, the greater the cost to DSRSPs, which are required to update their systems to be able to interact with the different technical approaches in order to ensure our objective of interoperability is met, and the larger the impact on interoperability and cyber security which will need to be mitigated.

The standardisation within PAS 1878 focuses on Explicit DSR, but we recognise that a significant proportion of the domestic DSR sector involves Implicit DSR (also called Routine DSR). Whilst Explicit DSR is the modulation of an ESA's energy use to provide a service to a network operator, Implicit DSR is modulation of an ESA's energy use to provide a benefit to either the consumer (through lower energy bills) or to a third party (such as being a tool in managing an energy supplier's imbalance position). We also recognise that some stakeholders have called for the standardisation of Implicit DSR and this is something that government will

40. **Are there any areas where you foresee the need for additional standardisation beyond PAS1878? If so, in what areas and over what timeframes would you expect new standards to develop?**

41. **Do you believe that there is a need for standardisation of Implicit (also called Routine) DSR in order to meet the government's interoperability objective? If so,**

[44] GOV.UK, 'Guidance - Designated standards' (2023), https://www.gov.uk/guidance/designated-standards (viewed on 8 March 2023)

what aspects do you consider would need to be standardised, and are there any existing technical standards that you believe could be used?

We have explored how an Approved Standards approach could impact the delivery of the SSES policy principles below:

Interoperability

Ensuring that consumers can change their DSR service provider easily and without the need for a premises visit is a core principle of the SSES programme as it encourages competition within the market. To ensure interoperability, DSRSPs would have to be able to interact with different devices, regardless of technology-type and manufacturer.

For both an Approved Standards and Mandated Standards approach, the DSRSP will be compelled by their license to be able to interact with the standards specified by legislation. The key difference is the number of standards, but we expect the number of approved standards to be low. This low number of expected approved standards is due to both the aspiration to adopt a minimum level of standardisation that allows innovation to be built on top and to assess the impact of the wider ecosystem (for example, cost to DSRSPs) as part of deciding to add another standard to the approved list.

There will also need to be consideration of the impact of interoperability as new standards are added to the Approved Standards list. DSRSPs will need appropriate lead times to update their systems to interact with the new standard during which interoperability will be reduced. This impact can be mitigated by close coordination with the DSRSPs during the approved standard review process.

DSRSPs may also decide for commercial reasons not to offer customer propositions that are linked to specific types of ESA. We do not see this as a problem and instead believe it is an example of the market maturing and product differentiation. However, a DSRSP would need to be able to accommodate any standards that the ESA used (for example, if a DSRSP offered a service for charge points, they would need to be able to accommodate any approved standard used by charge point manufacturers in the GB market).

42. **How should an approved standards approach be designed to ensure that DSRSP interoperability is maintained?**

43. **How complex would it be for DSRSPs to update their system to have the functionality to interact with an ESA that uses a new approved standard? What would the likely timeframes be and how could the technical challenges be managed?**

44. **What criteria should be applied to ensure that any proposed standard is fit for purpose, and to avoid an excess of standards adding undesirable complexity?**

45. **Should DSRSPs be required to ensure that services they offer are interoperable with all ESA types that they offer that service to? (for example, a service for EV drivers should be compatible with any approved standards for EV charge points).**

Cyber security / Grid stability / Data privacy

Ensuring the robustness of cyber security for both devices and the grid is a key objective of the SSES programme. In Chapter 4, we provide an update on the policy development in creating

the cyber requirements that will be placed on devices in the First Phase Regulations and highlighted that we are undertaking trust modelling as part of understanding the end-to-end security requirements for the Second Phase Regulations. A new approved standards approach would have to demonstrate that it is able to provide at least the same level of cyber security as set out in Phase 2 requirements and will also be assessed on how it impacts the system risk level.

In Chapter 7, we propose that a security governance group will be responsible for the maintenance of the security requirements for the programme in the second phase. This group would then need to assess security implications as both the sector and the standards evolve, with the amount of work needed then linked to the number of approved standards. The group would also need to clearly set out the criteria for new standards to be measured against for cyber security.

Grid stability requirements are still in development for First Phase Regulations and are currently provided in PAS 1878 primarily through a randomised delay function. Similar to cyber security, a new proposed approved standard would have to demonstrate that it provides at least the equivalent level of grid stability as Phase 2 requirements and the Security Working Group would need to provide clearer requirements as to what this criterion is in the long term.

Finally, a potential new approved standard would need to demonstrate that it provides an equivalent level of data protection (including UK GDPR) as the Phase 2 requirements.

If we adopt an Approved Standards approach, we intend to provide a clear steer of the Phase 2 requirements that all potential new approved standards will be judged against to allow industry to design and create new standards.

46. How should an approved standards approach be designed to ensure that the SSES cyber security, grid stability and data privacy objectives for devices can be met?

47. What information of the cyber security, data protection and grid stability criteria would industry need to be able to design a new approved standard?

Update on the PAS 1878 revision

The July 2022 consultation accepted that amendments or additions to PAS 1878 are likely to be required before widespread adoption. We confirmed that to deliver these changes an independent facilitator will be required, to facilitate consensus, coordinate the standardisation process and ensure alignment with other standards and the SSES Programme objectives, and that the British Standards Institution (BSI) was well suited for this role, as the national standards body of the United Kingdom.

We have since engaged with BSI and agreed that government will sponsor BSI to deliver the revision of PAS 1878 following the process and principles (industry-led, consensus-based) set out in the BSI standard PAS 0.[45] In the future, BSI may decide that PAS 1878 should be developed into a national standard, for example as a British Standard. The UK in the future

[45] British Standards Institution, 'PAS 0:2022 – BSI Standards Publication' (2022), https://www.bsigroup.com/globalassets/localfiles/en-gb/pas/pas-0-2022.pdf (viewed on 8 March 2024)

could propose the standard to international standardisation committees at the ISO, ITU, and IEC or at European standards committees, such as CEN and CENELEC, to form the basis of an international standard. The governance described in Chapter 7 will need to ensure that however the standard is modified in the future it remains fit for purpose within our regulations.

Industry will have multiple opportunities to contribute to the development of the next iteration of PAS 1878 through the Steering Group, review panel and public consultation of the PAS development process. Upon commencement of the PAS development process, BSI will engage industry and technical experts to help form the review panel and the Steering Group. Alongside these groups, the draft standard will also be open to scrutiny from stakeholders through public consultation led by BSI. The PAS 1878 revision is due to begin in 2024 and is expected to take approximately 12 months.

To support the development and demonstration of ESAs for the delivery of interoperable DSR, the government launched the IDSR programme[46] and the ESA Technical Working Group, both of which considered possible additions and/or amendments to PAS 1878 to enable mass adoption. The IDSR programme, looks at, amongst other things, how devices that are designed, built, and tested to PAS 1878 specifications interoperate with different DSRPs across a variety of use cases. In doing so it has led to the creation of a Query Log which contains queries from developers and independent testing contractors, and their resolutions, relevant to PAS 1878 details which need a level of amendment, addition, or clarification in the PAS. Examples include queries related to registration, authentication and de-registration, OpenADR cyber security details, timing and messages, as well as the OpenADR information model and other clarification-type queries. The Query Log produced 138 queries which have been answered with the support of technical experts and IDSR project experts. The Query Log will provide feedback to the revision of PAS 1878 as it offers resolutions and suggestions for all the issues to implementation that were highlighted during the IDSR programme, bearing in mind that the Steering Group will agree amendments through a consensus-based approach.

The ESA Technical Working Group aims to support the development of technical frameworks required to deliver smart, secure, and interoperable energy smart appliances and DSR services. The membership consists of industry representatives with appropriate skills and experience in technical and business process matters relating to ESAs and DSR, and from organisations impacted by the proposed regulations (such as ESA manufacturers, ESA operators, energy suppliers, aggregators and DSRSPs, amongst others). As part of its role, the ESA Technical Working Group reviewed PAS 1878 with a view to identifying any “bigger picture” gaps and omissions.

The output of the ESA Technical Working Group, which will be submitted into the BSI PAS revision process, was five policy papers, as well as the subsequent analysis of the papers from appropriate trade associations and the DESNZ Security Working Group[47]. Each paper focused on a different suggested amendment to PAS 1878 and government will provide this evidence, alongside the IDSR change log, into the BSI led PAS revision process. The topics that the papers explored included:

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[46] GOV.UK, ‘Interoperable Demand Side Response programme’ (2022), https://www.gov.uk/government/collections/interoperable-demand-side-response-programme (viewed on 8 March 2024)

[47] The Security Working Group is a DESNZ-led working group comprised of industry experts that has the scope to investigate the security elements of the Smart Secure Electricity Systems programme scope.

- standardisation of the device – logical entity[48] interface to allow greater levels of interoperability and another route for the DSRSP to interact with the ESA
- clarifying the possible role of HEMS within PAS architecture
- alternatives to the randomised offset functionality to maintain grid stability, with an investigation of ramp rates as an alternative
- alternative data architectures, with a focus on allowing DSRSPs to send power profiles to the ESA
- alternative defined minimum communication protocols, which considered if there are alternatives to OpenADR
- standardisation of communication between EV supply equipment and the vehicle
- bringing EVs into scope of PAS 1878 as an ESA

The papers explore potential different ways to provide DSR and each paper argues how the proposed amendment or addition to PAS 1878 will still meet government's policy principles of interoperability, data protection, cyber security, and grid stability. Government acknowledges that there are numerous ways to technically provide DSR and the PAS 1878 is designed to standardise the minimum functionality required to deliver policy objectives whilst still enabling innovation. As discussed in Chapter 7, any technical standard used in regulation will be periodically reviewed to ensure that it is still fit-for-purpose and the outputs of the ESA Technical Working Group will contribute to this as evidence to the BSI PAS 1878 Steering Group.

Intellectual property

Updates to PAS 1878 raise the possibility of requiring additional technical specifications that could increase the functionality or interoperability of the ESA. This may include using intellectual property developed by third parties and where access to this intellectual property is needed to meet the required technical standard.

As the sponsor of PAS 1878, government will need to provide a steer to BSI on the use of intellectual property within the PAS. There are three options on the use of intellectual property within the PAS:

1. Require the owner of any such intellectual property included in the standard to give this at no cost under an "open" licence. This is the requirement in the current standard and limits the definition of interfaces and data structures to available standards that are "open", such as OpenADR.
2. To allow the charging of reasonable licence fees for any included intellectual property, but only on a "fair and equitable" basis. This approach is taken by some standards bodies developing electronic goods (e.g. the 3G Partnership Project). This would allow a developer to get fair return on their investment in developing their intellectual property,

[48] In the technical standard PAS 1878 the logical entity is called the Customer Energy Manager. For more information on the logical entity in PAS 1878 please see: British Standards Institution, 'PAS 1878 – Energy smart appliances' (2021), https://knowledge.bsigroup.com/products/energy-smart-appliances-system-functionality-and-architecture-specification?version=standard (viewed on 8 March 2024)

and promotes its future upkeep and support, but prevents unfair commercial exploitation of the intellectual property when used to meet government regulations.
3. Allow any intellectual property to be included in future versions of the standard without any restriction.

48. What template of "open" or "fair and equitable" licence should government require before allowing technical specifications that require this intellectual property into the standard?

Further development of the technical framework

The technical framework, developed to deliver the policy goals of a smart and secure electricity system will not be static but rather will evolve with the market, technology and changing regulation. This evolution will include updates to both existing instruments within the framework, such as the revision of PAS 1878, and potentially the addition of new instruments; be that in the form of standards, guidance documents, or other documentation.

How these different components of the technical framework are maintained and how the governance operates is explored in Chapter 7, but the assumption is that, at least initially, government will lead on developing the technical framework in coordination with industry and the regulator. To achieve this, we will work closely with industry via technical working groups (new and existing) to understand the changing needs of the sector and how the technical framework will need to evolve to meet this change. Any change to the technical framework will need to demonstrate how it meets our policy goals – interoperability, data privacy, cyber security and grid stability – and wider objectives, such as enabling innovation and ensuring international alignment. One area of exploration that has come from industry engagement is around the possibility of including Home Energy Management Systems (HEMS) within the SSES technical framework.

The electrification of heat and transport will mean that more homes in the future are expected to have a range of devices, such as electric vehicle chargers, domestic battery energy storage systems, heat pumps, solar photovoltaics (PV). Consumers will have different requirements of these devices across the day and to manage the energy storage/generation/consumption of the whole property will require the balancing of the usage of all the devices. A lack of coordination of devices in a house could potentially lead to the sub-optimal use of energy, lowering the benefits to the consumer of the transition to a smart and flexible energy system – for example, when considering the whole premise energy usage, the charging of an EV could be delayed to coincide with solar PV generation.

Currently, the above is not believed to be an actual problem due to the low numbers of homes with multiple ESAs; but given the upcoming ban on the sale of new internal combustion engine vehicles, the falling cost of technologies such as solar PV and domestic battery storage, and the ambitious heat pump installation targets, there could be a significant number of homes with multiple ESAs in the 2030s.

One proposed solution to managing the energy use of multiple devices within a home is a HEMS. Our current working definition of a HEMS is that it may potentially control and configure devices' energy usage or production, in order to optimise usage against other devices in the premises, local generation (such as solar PV generation) and other incentive signals such as tariffs and carbon intensity, as well as possibly managing peak load in the home.

HEMS is not yet widely deployed and is not a standardised technology, with industry proposing a range of different functionalities with no clear consensus on the operation details. Moreover, interacting with the diversity of products, models and brands of ESAs is a challenging task, and HEMS could prove difficult to standardise. Industry is developing several technical interface standards that could be potentially used to remotely control HEMS devices such as MATTER (a Connectivity Standards Alliance standard)[49] and EEBUS (a European standard (EN), EN 50631)[50]. Nevertheless, our understanding is that there remains significant development needed within the HEMS space as none of the HEMS standards are yet completed.

The potential problems of managing multiple devices in homes could also be solved by other indirect policy development. For example, improving visibility of larger loads on the low voltage networks will help in their management and this is being pursued through the Automatic Asset Registration (AAR) programme under the Flexibility Innovation Programme[51]. The AAR programme aims to simplify the registration process for small-scale energy assets (for example, heat pumps, EV charge points, solar PV and in-home batteries) through an automatic, automated, standardised and secure data exchange process.

49. **Given the additional detail provided in this chapter, do you believe that the proposed 24-month period between when the first and second phase regulations come into force is appropriate?**

50. **Are there any documents (such as specific standards, protocols, guidance, code, specifications) that should be explored for inclusion into the SSES technical framework? Please can you provide within your answer why their inclusion would help meet the SSES policy objectives and why the SSES technical framework is the best delivery mechanism.**

51. **Do you believe that in the future, homes with multiple devices will have problems (such as sub-optimal energy management, grid stability concerns, etc) if there is not an active management of the devices at a premises level?**

52. **What is your definition of a Home Energy Management System (HEMS) and what, if any, role do you see HEMS having within the SSES technical framework?**

[49] Connectivity Standards Alliance, https://csa-iot.org/all-solutions/matter/ (viewed on 11 March 2024)

[50] EEBUS, 'European Standard EN 50631-4-1' (2023), https://cdn.standards.iteh.ai/samples/72560/d94a63c8788e417fbdedf01d73aea8ce/SIST-EN-50631-4-1-2023.pdf (viewed on 11 March 2024)

[51] GOV.UK, 'Flexibility Innovation Programme', https://www.gov.uk/government/publications/flexibility-innovation (viewed on 8 March 2024)

7. Second Phase Regulation: Governance and Delivery Frameworks

The purpose of this Chapter is to set out how the technical and cyber security frameworks discussed in Chapters 4 and 6 of this consultation and elements of the licensing consultation will be delivered in the transition and delivery phases of the programme.

It seeks views on the approach to governance and cost recovery during these different phases. We expect to consult in further detail on these proposals later in 2024.

Background

In the July 2022 SSES consultation, we provided a high-level description of the different elements for designing the required governance for the SSES programme. This included dividing the governance into three different phases:

- '**Development**' phase – the period immediately following the July 2022 consultation, during which future governance arrangements and plans are being designed and mobilised
- '**Transition**' phase – the period before the manufacture and sale of compliant ESAs, during which ESA specifications, assurance schemes, central services and contractual arrangements will be established in full. The transition stage goes to 2028 and includes both first phase and second phase regulations
- '**Delivery**' phase – the long-term arrangements during and after the manufacture and sale of compliant ESAs, during which standards and contractual arrangements need to be maintained. ESAs need to demonstrate compliance and common systems may need to be used and maintained

The previous consultation started considering what the governance requirements are for each stage, how they could be managed and delivered, and if there was the need for a central organisation to play a co-ordination role. Industry feedback to the 2022 consultation was that governance should accommodate innovation, prioritise the consumer, be delivered efficiently, and involve the appropriate level of expertise and seniority. Industry also wanted government to provide a clear road map through the different phases of transitional governance.

Government committed to providing further detail on our governance approach, which this Chapter will cover. At this stage, we are seeking views to assist us in establishing what functions are needed, who should be involved and, subject to these points, how relevant costs should be recovered. We will revisit in a future consultation how the governance arrangements will be formalised and whether it would be better to deliver these through an existing or new body (or bodies). An initial roadmap for delivery can be found at the end of the Chapter; government will provide a more complete version when we next consult on this topic.

Transition Phase

Ahead of the Programme reaching 'Delivery' phase, government will establish rules and processes for the ongoing management of the technical, cyber security and grid stability risk management, and potentially operational and corporate functions. In other words, the delivery frameworks.

The sections below provide a summary of the technical and security functions that may be required in this transition phase.

Technical Governance

In Chapter 6, we outlined the expectation that the technical framework will potentially comprise multiple instruments including standards and guidance documents. The Chapter also refers to the changing role of government, with industry playing a lead role in the maintenance of the technical framework in the enduring state.

A system of governance is required to ensure that the technical framework is maintained in a way that continues to meet the evolving needs of industry and government's policy objectives, and to aid in the coordination of industry, government, regulators or their agents.

A multi-instrument technical framework in which regulation follows an approved standard approach, as mentioned in Chapter 6, could require the review and maintenance of multiple standards and technical documents. There may be the need for different approaches for the different types of documents and the governance will also need to interact with the different bodies responsible for the instruments within the technical framework, such as engaging with BSI on PAS 1878.

The key functions the technical governance may need to deliver include:

1. Reviewing existing instruments within the technical framework – ensuring that the instruments remain aligned with the Policy Principles set by government, suggesting modifications where this may no longer be the case, and reviewing the outcomes of revision processes to ensure that the development of the instruments continue to meet government objectives.
2. Considering the addition to the technical framework of new instruments – this could be through a gap analysis within the technical framework as the sector evolves, or through the assessment of newly developed instruments (such as new technical standards). Once decided that an instrument should be included within the technical framework, the governance system will need to work with government to make the case for the instrument to be added to regulations.
3. Providing a format for industry engagement – this could be through: participation by industry representatives in the governance itself; through stakeholder engagement exercises; and through the production of guidance documents and other supporting materials for the technical framework.
4. Maintaining the Design Documents – this will include the Business Architecture Design and Technical Architecture Design. The former is a key tool for assessing how current and future technical and security requirements will impact organisations and their business models, whilst the Technical Architecture Design is detailed in Chapter 6. Both documents will need to be kept up to date through periodic review and modification processes.
5. Maintaining assurance regimes – examples could include device assurance for interoperability and security requirements, as well as the design and potential operation of dispute resolution for any alleged non-compliance. Assurance requirements will be further developed in future consultations,

including the potential role of a labelling scheme to promote consumer update and the adoption of ESA standards.

6. Monitoring and advice – (where appropriate) suggesting mitigations for any emerging threats or security vulnerabilities in ESAs, and reporting this to the relevant authority for device assurance and / standards (as applicable). Providing expert advice in driving and supporting any amendments to standards and security controls.

53. Does this list capture all the required functions to maintain the technical frameworks necessary to facilitate load control? Are other functions needed?

Proposed model of governance

To help industry engagement, we have proposed below what the governance could look like (noting this is subject to further development following feedback from this consultation).

The proposal is that governance of the technical framework could be provided by a Technical Governance Group. We expect that the Technical Governance Group membership would consist of the following parties:

- government would maintain an enduring role as the policy owner and ultimate risk owner
- regulators would have oversight to ensure standards, assurance and consumer protections are appropriately maintained and their interests are represented
- industry (represented primarily by trade bodies covering a range of appropriate stakeholder groups) would constitute most of the group's membership, as the subject matter experts

There would be formalised terms of reference to govern the group; for example, by setting term limits. Industry participation in this group would be on a voluntary basis, as the incentive to influence regulation should encourage industry parties to be involved, and representatives can vote to change the terms of reference as needed. Alongside the representatives, there could be a paid role for a chair (and potentially technical experts). Alternatively, government could provide the role of chair. Both options would give the group a degree of independence (both technological and sector) and we propose that the process of hiring and removing the chair would be reserved for government. Finally, we would need this governance body to be established and available to perform its functions by 2028. How costs of the group, if applicable, might be recovered is found later within this Chapter.

54. Do you agree with the overall model of technical governance? Can you suggest any existing governance that would be well suited to take on this function?

Security Governance

Chapter 4 of this consultation sets out policy positions on the first phase security and grid stability requirements applicable for ESAs. It also mentions that there is ongoing work to establish enduring security requirements on completion of trust modelling and end-end security architectures in 2024. The licensing consultation discusses the requirements applicable to Load Controllers.

A holistic and strategic approach to governance is needed to coordinate, and potentially undertake, monitoring and reporting of sector compliance, and deliver the ongoing security risk management functions.

The key functions the security governance may need to deliver include:

1. Document development and maintenance
   - maintaining and developing security documentation, including risk assessments, threat assessments, trust models, security architecture and security requirements
2. Overseeing security assurance for load control licensees
   - periodically reviewing security obligations and assurance arrangements to ensure they remain fit-for-purpose
   - if required, procuring and managing an independent security assessor. The assessor would provide security auditing services for all organisations that needed to satisfy a licensing condition
   - if required, reviewing security assurance audits and assessing an organisation's compliance with regulations or standards
3. Monitoring and advice
   - coordination of incident response and recovery through a crisis management function. Including monitoring (and where appropriate suggesting mitigations) for any emerging threats or vulnerabilities in ESAs, and reporting this to the relevant technical governance function responsible for device assurance and / standards (as applicable)
   - providing expert advice, driving and supporting amendments to standards and security controls
4. Overseeing any common systems that may be needed
   - it is possible that common systems will be needed to deliver security and grid stability of ESAs and licensed load control services. The requirements will become clearer after the security architecture work is completed. Below is a summary of the potential centralised functions that may be needed:

     - **Public Key Infrastructure (PKI) – A PKI system may be needed to encrypt and authenticate communication signals to and from ESAs and licenced Load Controllers**

     - **Anomaly Detection – An anomaly detection system may be needed to check communication signals and identify unusual or suspicious patterns**

55. Does this list capture all the necessary functions to deliver security governance? Are other functions needed?

Proposed model for security governance

Government is considering different options for how these activities should be managed and enforced. Different governance approaches may be appropriate for different stages of the programme. To help industry engagement, we have proposed below what the governance could look like, noting that this is subject to further development following feedback from this consultation.

The proposal is that governance of the security framework could be provided by a Security Governance Group. We expect that the Security Governance Group membership would consist of the following parties:

- government would maintain an enduring role as the policy owner and ultimate risk owner

- regulators would have oversight to ensure standards, assurance, and consumer protections are appropriately maintained and their interests are represented
- industry (independent security experts from a range of appropriate stakeholder groups) would constitute most of the group's membership, as the subject matter experts
- government is considering whether the new National Energy System Operator (NESO) should also be part of the Group's permanent membership. When the NESO goes live it will be responsible for co-ordinating and ensuring strategic planning across the electricity sector and providing a whole system view for energy resilience. Having a representative from the NESO may be desirable as they will have a holistic view of how the domestic-scale DSR risks fit into the larger electricity system, allowing them to identify potential ripple effects and interconnected risks that others may overlook

The chair of the Security Governance Group would have a significant influence on the direction and decisions the group takes. During the transition phase, government will chair the Group, overseeing the risks and making sure there is policy alignment. This would be desirable as government is ultimately accountable for risks that impact Critical National Infrastructure (CNI). As chair, government can ensure that the Group operates in-line with departmental policy objectives. Industry groups (such as load controllers, charge point operators, device manufacturers, energy suppliers, network operators and owners, and the NESO) would be allocated a certain number of seats to ensure that business impacts are appropriately considered. Ofgem would also be given a seat in the Group to ensure that the consumer voice is adequately represented and be satisfied there is an ongoing effective delivery of assurance and compliance functions.

As the programme moves into the delivery phase, government may want to transfer more control to industry, allowing them to manage appointments (including of the chair) to the Group, and therefore determine its strategic direction. A greater level of industry control could be desirable as they have a deep understanding of the specific risks and challenges within their sector. Government and Ofgem would remain permanent members of the group and would expect to retain certain powers in terms of mitigating CNI or national security risk and ensuring public interests are adequately protected.

56. Do you agree with the overall model of security governance? Can you suggest any existing governance that would be well suited to take on this function?

Cost Recovery

The government's position on cost recovery continues to be that the costs of activities required to deliver SSES policy objectives should be recovered from those benefitting from these arrangements, accountable for their successful delivery and incentivised to obtain value-for-money.

This would include direct beneficiaries, such as ESA vendors in the UK domestic market, and load control licensees. Other beneficiaries we are considering charging are transmission and distribution licence holders (networks) as these licensees benefit from a growing market for DSR services and avoid costs of system reinforcement from increased flexibility. The July 2022 SSES consultation outlined activities for which costs would be recovered, and these are shown in the table below.

Table 5. Potential charging groups for the recovery of SSES programme costs.

Phase	Potential costs to be recovered	Potential Charging Groups
Development	• Establishing and supporting working groups	• Government and industry
Transition	• ESA standards development and testing • Test specification development • Assurance scheme set-up • Procurement and implementation of any common systems • Delivery of any central governance arrangements	• Industry
Delivery	• Maintenance of ESA standards (and other documents) • Maintenance of governance arrangements • Delivery of assurance schemes (including ESA testing) • Delivery of central systems	• Industry

In the government response to the July 2022 SSES consultation, we committed to considering options in more detail following further development of the technical frameworks and governance arrangements.

A majority of stakeholder responses to the consultation highlighted that the cost recovery process should ensure that those benefitting the most from the proposed requirements should incur most of the immediate cost. Several responses highlighted concerns that smaller organisations could be disincentivised from participating in the market if costs are too high, or that costs passed on via ESAs or DSR services could disincentivise uptake. A few responses also raised concerns about recovering costs from consumers who do not directly benefit from flexibility.

We have used this feedback to develop our cost recovery position and are considering socialising costs through charging networks. The section below provides an update on our latest thinking on cost recovery. We will provide further information when we have a better understanding of the costs to deliver the functions.

Principles

We propose applying the following principles to the design of any cost recovery scheme for the SSES programme:

- **proportionality** – making sure the costs for the activity do not fall unduly on one party. The level of charge should be reasonable when considering the nature of the entity upon which the charge will fall. For example, recovering large costs from a small number of small market actors would be disproportionate
- **no distortionary effects** – design of cost recovery should avoid creating perverse incentives in the market

- **alignment** – scheme (or schemes) need to be designed in accordance with other (existing or upcoming) government schemes to avoid creating unacceptable incentives in the market
- **value or cost reflectivity** – costs should be recovered from those that participate in the arrangements based on either the cost of using the services / systems or the value they receive from the services / systems. For example, Load Controllers would directly benefit from any centralised organisation assurance arrangements and so costs of assurance should be recovered from them
- **simplicity** – the complexity of the charging arrangements should be proportionate given the cost of the service / system and number of participants. We are assuming that a more complex arrangement would cost more and would take longer to implement
- **deliverability or timely implementation** – design and implementation of the scheme should be achievable in the required timeline
- **ultimate cost distribution** – the charging methodology should result in an appropriate distribution of costs among end consumers

Approach to Cost Recovery

Government wants to test our thinking around potential scenarios now so we can build in appropriate delivery timelines. The scale and type of costs remain uncertain at this stage of policy development. We will look to share more information ahead of a charging scheme being implemented.

We anticipate that there will be costs associated with:

- delivering the technical and cyber security frameworks mentioned in the sections above
- administering a licensing scheme for load control activities detailed in the licensing consultation

The sections below provide details on what groups may be charged, and when we might expect these charges to apply.

Costs for delivering the technical and security frameworks

Government expects those who benefit from the arrangements to bear the costs. This includes direct beneficiaries, such as ESA vendors in the UK domestic market, and load control licensees. We are also considering charging other beneficiaries such as electricity network operators and owners.

The technical and security functions mentioned above create benefits for transmission and distribution licensees and all electricity consumers. The services and systems are necessary to establish a secure and robust set of arrangements for UK domestic load control that maintains energy security and avoids unnecessary network reinforcement. A secure and flexible electricity system would help transmission and distribution licensees to maximise the use of their existing capacity, and therefore avoid network reinforcement costs, and the costs of building additional generators. Indeed, many of the services provided by load controllers are likely to be in response to demands from network licence holders for the management of constraints. Network reinforcement and generation costs are passed down to electricity

consumers; therefore, all consumers benefit from these arrangements through relatively lower bills.

Government will consider the charging population and charging design in more detail following further development of the technical frameworks and governance arrangements. Some of the potential charging groups are (or will be) licensed entities. The table below reflects our current thinking:

Table 6. Potential groups who costs may be recovered from.

Phase	Potential costs to be recovered	Who benefits	Potential charging groups
Transition (2026)	• Technical Governance Group Costs • Cyber Security Governance Group Costs • ESA standards development and testing • Test specification development • Assurance scheme set up • Procurement and implementation of any common systems • Delivery of any central governance arrangements	• Vendors of domestic ESAs (can sell compliant devices) • Licenced load controllers (can participate in UK DSR market) • Consumers (can access interoperable and secure devices and/or services) • Network operators and owners (can maximise electricity generated, avoiding costs to reinforce the network or build more generation capacity) • UK general public (security of CNI)	• ESA manufacturers • Load control licensees • Electricity System / Network operators and owners
Delivery (2028)	• Maintenance of governance arrangements • Maintenance of ESA standards (and other documents) • Delivery of assurance and testing schemes • Delivery of any central systems	• Vendors of domestic ESAs (can sell compliant devices) • Licenced load controllers (can participate in UK DSR market) • Consumers (can access interoperable and secure devices and/or services) • Network operators and owners (can maximise electricity generated, avoiding costs to reinforce the network or build more generation capacity) • UK general public (security of CNI)	• ESA manufacturers • Load control licensees • Electricity System / Network operators and owners

We are considering recovering certain costs for setting up and maintaining technical and security frameworks during the Transitional Phase primarily from electricity network licence

holders, ahead of completion of licensing of load controllers and regulation of ESAs for the Delivery Phase (when we would expect to broaden out the charging base).

57. **Do you agree that electricity network licence holders are best placed to meet certain costs of setting up and maintaining technical and security frameworks during the Transition Phase? Please explain your answer.**

Costs for administering a licensing scheme for load control activities

Government intends that, in line with other competitive licences in the energy sector, (for example, for supply and generation) that costs associated with Ofgem's resource for regulating the load control licence would be recovered through a mix of fees for load control licensees themselves and Ofgem's general levy on other licensees (such as network operators and owners).

As part of this consultation package, we have asked stakeholders of the expected costs associated with compliance with the proposed requirements in the load control licence. Using this feedback and further stakeholder engagement, we will be able to further understand the costs to businesses, especially small businesses, associated with the new licence. We will also seek to further understand how many businesses intend to apply for a licence. Understanding the costs to businesses and the expected number of businesses in scope of the licence will allow government and Ofgem to make a better judgement on how to distribute the costs across charges on load control licensees and other more mature licensees in the energy sector – like network operators and owners.

58. **Do you agree with the proposed approach for recovering the costs of administering a licensing regime? Please explain your answer.**

Next Steps for Governance

Table 7. Next steps for the development of the governance approach and cost recovery proposals.

	Public consultation (late 2024/ early 2025)	Statutory consultation (if needed) 2025	
Transition Governance	Consulting on: • Functions (including testing, assurance and if common systems are needed) • Delivery: How these arrangements will be delivered • Membership • Control • Change management	Consult on legal text of governance arrangements Consult and agree budget for FY 2026 /2027	Arrangements 'go live' 2026
Cost Recovery	Consulting on: • Activities and estimated costs	Consult on amendments to licensing conditions (if required)	

	• Charging formula • Charging groups • Share: Impact analysis of decisions		

Consultation questions

1. Do you have a view on the lead time industry will require to implement the first phase regulations as proposed in this document?

2. Do you agree with our plan to proceed on the basis of phasing ESA device regulations as set out above whilst committing to keep this approach under review?

3. Do you have a view on when the smart mandate for heating appliances should be implemented? Please provide evidence to support your answer.

4. Would you support the introduction of a metering accuracy requirement to the effect that all ESAs should have a means to measure their import/export consumption to up to or better than 2% nominal accuracy?

5. If you are a manufacturer, would requiring a nominal 2% accuracy requirement impact your business or products? If yes, please outline the impacts and the costs and benefits with as much detail as possible.

6. Do you agree that the scope of the smart mandate should be extended to include hot water storage and generation (indirect electric hot water storage cylinders, standalone direct electric hot water cylinders, and hot water heat pumps)? If not, please provide supporting evidence.

7. Do you agree that the scope of the smart mandate should be extended to include the whole hybrid heat pump system (rather than just the heat pump within a hybrid), with requirements placed on the common controller? If not, please provide supporting evidence.

8. Do you have a view on whether standalone domestic battery energy storage systems (BESS) should be included in future legislation in order to be subject to the smart mandate requirements associated with the first phase regulations? Please provide evidence to support your answer.

9. Do you have any data on what proportion of installed domestic battery energy storage systems (BESS) have smart functionality? Smart functionality is defined as being communications-enabled and able to respond to price and/or other signals by shifting and/or modulating their electricity consumption.

10. Do you have evidence on the extent to which domestic battery energy storage systems (BESS) with smart functionality already meet the minimum requirements set out in Table 1? Please provide evidence to support your answer.

11. Do you agree with government's proposal that electric heating appliances must be able to modulate output and/or change the time at which electricity is consumed in response to signals, including price and other signals that facilitate DSR?

12. Do you agree with the proposal that electric heating appliances within the scope of the mandate must provide two-way communication in order to receive and act upon direct control signals, and to send signals on the device status?

13. Do you agree with the proposal that electric heating appliances within the scope of the mandate must be designed to be interoperable so that devices do not cease to have smart functionality if the owner changes electricity supplier?

14. Do you agree with the proposal that, as part of the first phase ESA regulations, electric heating appliances within the scope of the mandate must be designed to utilise open standard communication protocols for the application interface to remove a barrier to interoperability with DRSRPs?

15. Do you agree with the proposal that the mandate should require electric heating appliances to prioritise safe operation over responding to information or user input?

16. Do you agree that the mandate should require electric heating appliances to be able to continue to function to provide heating and/or hot water services when network connection is lost?

17. Do you agree with government's proposal that the mandate should not require a maximum turn/shut down time or minimum speed of response?

18. Do you agree with government's proposal that the mandate should not require specific control strategies to be installed with electric heating appliances?

19. Do you agree with government's proposal that hybrid heat pumps operated by a common controller must be able to receive and act upon fuel tariff data and be able to utilise the alternative heat source to meet heat demand during a DSR instruction?

20. Do you agree with government's proposal that all electric heating appliances within scope must provide a user interface?

21. Do you agree with government's proposal that electric heating appliances must be able to estimate their power consumption, with the manufacturer free to choose the estimating (calculating or measuring) approach?

22. Do you see any difficulty with the position that government is proposing? Please provide evidence to support your answer.

23. Do you agree with government's proposal that electric heating appliances will not be required to collect data on their thermal output?

24. Do you agree with government's proposal that all electric heating appliances, on set up, should require users to set their heating preferences, that DSR and TOUT operations to be enabled by default, and for functions that can be undertaken outside of peak hours to be pre-set to do so?

25. Are there any other requirements that you believe should be included in the minimum requirements for the smart mandate?

26. Do you agree with government's proposal to require the appliance manufacturer to provide appliances with integrated or 'add-on' ESA functionality?

27. Do you agree with government's proposal to require sellers to ensure that an electric heating appliance (or system of appliances) is sold with either integrated or add-on ESA functionality?

28. Do you agree with government's proposal not to place any legal obligations on installers of smart heating appliances?

29. Do you have a view, and supporting evidence, on how government ensures that installers have the awareness and ability to successfully install smart heating appliances?

30. Do you agree that open data standards are required to enable EV charge point interoperability with energy suppliers and DSRSPs?

31. What are the barriers to implementing such open data standards?

32. From your experience does EV-EVSCP interface communication regarding battery state of charge pose a barrier to access to the full range of EV tariffs and DSR services?

33. What other technical and commercial barriers have you experienced to EV drivers accessing a full range of available tariffs and DSR services?

34. Do you foresee any issues with adoption of ETSI EN 303 645 for Phase 1 requirements for all ESAs? If so, how could these issues be mitigated?

35. To what extent would requiring cyber security testing of ESAs prior to them being sold or distributed in GB impact ESA supply chains? What other approaches could be used to provide sufficient assurance that cyber security requirements were being met?

36. Do you have any suggested alternative solutions to the random offset function which would mitigate the risk of large-scale synchronised changes in load?

37. Please comment on the assumptions and methodology used in the cost appraisal of the analytical annex. Can you provide estimates of the costs of providing consumer interfaces and monitoring?

38. Do you agree with using the Designated Standards approach as the basis for government to design the Approved Standards framework for the SSES programme?

39. Do you have any comments, suggestions or changes to the initial view described above for how Approved Standards could work; especially for the proposed manner of assessing potential new approved standards?

40. Are there any areas where you foresee the need for additional standardisation beyond PAS1878? If so, in what areas and over what timeframes would you expect new standards to develop?

41. Do you believe that there is a need for standardisation of Implicit (also called Routine) DSR in order to meet the government's interoperability objective? If so, what aspects do you consider would need to be standardised, and are there any existing technical standards that you believe could be used?

42. How should an approved standards approach be designed to ensure that DSRSP interoperability is maintained?

43. How complex would it be for DSRSPs to update their system to have the functionality to interact with an ESA that uses a new approved standard? What would the likely timeframes be and how could the technical challenges be managed?

44. What criteria should be applied to ensure that any proposed standard is fit for purpose, and to avoid an excess of standards adding undesirable complexity?

45. Should DSRSPs be required to ensure that services they offer are interoperable with all ESA types that they offer that service to? (for example, a service for EV drivers should be compatible with any approved standards for EV charge points).

46. How should an approved standards approach be designed to ensure that the SSES cyber security, grid stability and data privacy objectives for devices can be met?

47. What information of the cyber security, data protection and grid stability criteria would industry need to be able to design a new approved standard?

48. What template of "open" or "fair and equitable" licence should government require before allowing technical specifications that require this intellectual property into the standard?

49. Given the additional detail provided in this chapter, do you believe that the proposed 24-month period between when the first and second phase regulations come into force is appropriate?

50. Are there any documents (such as specific standards, protocols, guidance, code, specifications) that should be explored for inclusion into the SSES technical framework? Please can you provide within your answer why their inclusion would help meet the SSES policy objectives and why the SSES technical framework is the best delivery mechanism.

51. Do you believe that in the future, homes with multiple devices will have problems (such as sub-optimal energy management, grid stability concerns, etc) if there is not an active management of the devices at a premises level?

52. What is your definition of a Home Energy Management System (HEMS) and what, if any, role do you see HEMS having within the SSES technical framework?

53. Does this list capture all the required functions to maintain the technical frameworks necessary to facilitate load control? Are other functions needed?

54. Do you agree with the overall model of technical governance? Can you suggest any existing governance that would be well suited to take on this function?

55. Does this list capture all the necessary functions to deliver security governance? Are other functions needed?

56. Do you agree with the overall model of security governance? Can you suggest any existing governance that would be well suited to take on this function?

57. Do you agree that electricity network licence holders are best placed to meet certain costs of setting up and maintaining technical and security frameworks during the Transition Phase? Please explain your answer.

58. Do you agree with the proposed approach for recovering the costs of administering a licensing regime? Please explain your answer.

This consultation is available from: www.gov.uk/government/consultations/delivering-a-smart-and-secure-electricity-system-implementation

If you need a version of this document in a more accessible format, please email alt.formats@energysecurity.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.