



Department for
Business, Energy
& Industrial Strategy

Consultation on Proposals regarding Smart Appliances

March 2018

Consultation on Proposals regarding Smart Appliances

The consultation and consultation stage Impact Assessment can be found on the BEIS section of GOV.UK: <https://www.gov.uk/beis>

© Crown copyright 2018

You may re-use this information (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence.

To view this licence, visit www.nationalarchives.gov.uk/doc/open-Government-licence/ or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or email: psi@nationalarchives.gsi.gov.uk.

Any enquiries regarding this publication should be sent to us at smartenergy@beis.gov.uk.

Contents

General information	3
Purpose of this consultation	3
How to respond	3
Confidentiality and data protection	4
Quality assurance	4
Executive Summary	5
Standards for Smart Appliances	7
Context	7
Defining a ‘smart appliance’	9
Rationale for Government intervention	9
Options for Government action	11
Appliances subject to Standards	12
Consumer Engagement and Labelling	14
Consultation Questions	14
Principles Underlying Standards	16
Context	16
Applicability of Principles in Standards	17
Interoperability	17
Grid-Stability and Cyber-Security	18
Data Privacy	19
Consumer Protection	20
Indicative Functionalities for Smart Appliances	21
Consultation Questions	23
Catalogue of consultation questions	24
Consultation Questions	24

General information

Purpose of this consultation

The Department for Business, Energy and Industrial Strategy (BEIS) is consulting on seeking powers to set standards for smart appliances.

Issued: 16/03/2018

Respond by: 08/06/2018

Enquiries to:

Electricity Systems Team,
Department for Business, Energy & Industrial Strategy,
3rd Floor,
1 Victoria Street,
London, SW1H 0ET
Tel: 0207 215 5000
Email: smartenergy@beis.gov.uk

Consultation reference: Consultation on Proposals regarding Smart Appliances

Territorial extent:

United Kingdom

How to respond

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.

Where possible, responses should be submitted electronically via the e-consultation available at <https://beisgovuk.citizenspace.com/energy-strategy-networks-markets/smart-appliances>

Responses emailed to and hardcopy responses sent to the BEIS postal address will also be accepted.

Additional copies:

You may make copies of this document without seeking permission. An electronic version can be found at <http://www.gov.uk/beis>

Confidentiality and data protection

Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information legislation (primarily the Freedom of Information Act 2000, the Data Protection Act 1998 and the Environmental Information Regulations 2004).

If you want information that you provide to be treated as confidential please say so clearly in writing when you send your response to the consultation. It would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded by us as a confidentiality request.

We will summarise all responses and place this summary on the [GOV.UK website](#). This summary may 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 consultation process (as opposed to comments about the issues which are the subject of the consultation) please address them to:

Email: beis.bru@beis.gov.uk

Executive Summary

The Government has a challenging and critical set of objectives in the energy sector: ensuring security of energy supply, keeping bills as low as possible for households and businesses, and decarbonising both cost-effectively and in a way that enables us to reap the economic benefits of this transition through our Industrial Strategy. As part of this, the Government's Clean Growth Strategy set out a suite of policies to decarbonise the economy, of which smart energy is a key element.

Smart, flexible energy can help drive the transition towards a future low carbon energy system, whilst bringing significant benefits for consumers, the energy network and the wider economy. A study for the Government estimates the benefits of a smart energy system to be £17-40 billion to 2050¹. These benefits come from avoided or deferred network reinforcements and generation build, avoided curtailment of low-carbon generation, and more efficient use of the energy system.

In November 2016, the Department for Business, Energy and Industrial Strategy (BEIS) and Ofgem launched a joint Call for Evidence to seek stakeholders' views on the transition to a smarter, flexible energy system². In response to this, the Smart Systems and Flexibility Plan³ was published. The Smart Homes and Businesses section outlined a series of actions relating mainly to demand-side response (DSR).

DSR is the way in which consumers can engage with the energy system, turning up or down their consumption, in response to signals, such as price. This benefits the overall system by helping to balance supply and demand, and helps consumers to manage their bills in combination with smart offers, such as time of use tariffs, which allow consumers to benefit from the variance in electricity price throughout the day.

Smart appliances are key enablers of DSR for consumers. For the purposes of this policy, we use the term 'smart appliances' to mean those which are connected and are able to modulate their electricity consumption in response to signals, such as price. In order to achieve DSR benefits, we are focusing first on those appliances which have the greatest opportunity for DSR, i.e. those which consume high levels of electricity and which are most suitable for flexible consumer use. At present, we consider these to include cold and wet appliances, heating (including air and ground source heat pumps, electric storage heaters, and heating controls) ventilation, air conditioning and battery storage.

As this document outlines, there are currently barriers to the deployment of smart appliances. There are also potential risks to consider, for example, relating to data protection and cyber-security.

¹https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/568982/An_analysis_of_electricity_flexibility_for_Great_Britain.pdf

²https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/576367/Smart_Flexibility_Energy_-_Call_for_Evidence1.pdf

³https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633442/upgrading-our-energy-system-july-2017.pdf

In the Call for Evidence, responses indicated support for regulating smart appliances, based on the principles of interoperability, data protection, grid- and cyber-security, with a label to indicate compliance with these standards. Government is keen to ensure that consumer protection provisions are robust.

This consultation sets out the Government's proposals to mandate standards for smart appliances, based on these principles. Throughout this document, we refer to 'standards'. By this, we mean the principles, and associated functionalities, outlined in the Smart Systems and Flexibility Plan (interoperability, data protection, grid-stability and cyber-security). This is different to 'technical standards' by which compliance with principles (and functionalities) can be assessed, and when we refer to these, it will be made clear by referring to them as 'technical standards', as opposed to 'standards'.

The Government proposes to work with industry to set standards for smart appliances, based on the principles set out above, and their associated functionalities which are outlined in the second part of this consultation. We propose to take primary powers (when Parliamentary time allows) to mandate these standards for certain smart appliances:

- Those which are communications enabled and able to modulate their electricity consumption in response to signals; and
- Those which offer the greatest opportunity for DSR (as outlined above: cold and wet appliances, heating, ventilation, air conditioning and battery storage).

Whether to extend the standards to apply to all appliances that could be smart will be considered by the Government in due course. The Government is seeking stakeholder views on the principles on which these standards should be based, collating evidence and views on how to put this policy into practice. We are also working with industry to identify and, as necessary, develop technical standards for smart appliances. Technical standards provide one way of demonstrating compliance with the standards (i.e. principles and functionalities) set by the Government.

The first part of this consultation outlines the rationale for Government intervention for smart appliances, describes the preferred policy approach of mandating standards for certain smart appliances, as defined in this document, and seeks stakeholder agreement to take powers in primary legislation to do so. The second part of this consultation goes into more detail of the principles on which the standards will be based, and seeks stakeholders' views on whether these are appropriate.

This document is intended to be read alongside the consultation stage Impact Assessment^{4,5}. The Impact Assessment is a document which provides a preliminary analysis of the costs and benefits associated with options for standards for smart appliances.

⁴ In order to assist in consideration of the case for regulation on smart appliances, this consultation Impact Assessment considers the work undertaken so far by the EU and the possible future direction of EU regulation. This analysis does not preclude alignment with other global standards, as and when these are developed. The UK's relationship with EU standards, including this area, is a matter for ongoing negotiations and the analysis presented is without prejudice to the UK's future relationship with the EU after the UK has left in March 2019.

⁵ <https://www.gov.uk/government/consultations/proposals-regarding-setting-standards-for-smart-appliances>

Standards for Smart Appliances

A smart appliance enables consumers to participate in demand-side response, and is a key element of the transition to a smart energy system. We consider that standards for smart appliances would both support the uptake and use of these devices, and protect consumers from potential risks.

Context

The Government has a challenging and critical set of objectives in the energy sector: ensuring security of energy supply, keeping bills as low as possible for households and businesses, and decarbonising both cost-effectively and in a way that enables us to reap the economic benefits of this transition through our Industrial Strategy.

Our energy system is changing and there are substantial challenges ahead in delivering these objectives, including increasing peak demand driven by greater electrification of heat and transport (particularly from the 2030s) and an increase in the amount of decentralised and intermittent low-carbon generation. New smart technologies such as electricity storage and demand-side response (DSR) are emerging, which allow for greater flexibility in the electricity system. New business models are being developed; for example, rewarding consumers for using electricity when supply exceeds demand on the grid.

Smart energy can bring significant benefits for consumers, the system and the wider economy. A study for the Government estimates the benefits of a smart and flexible energy system to be £17-40 billion to 2050⁶. These benefits come from avoided or deferred network reinforcements and generation build, avoided curtailment of low-carbon generation, and more efficient use of the system.

The Government is working to enable this smarter energy system in order to realise these benefits. In November 2016, the Government and Ofgem launched a joint call for evidence on a smart, flexible energy system⁷ (henceforth the 'Call for Evidence') to seek stakeholders' views on this transition. In response to this Call for Evidence, the Department for Business, Energy and Industrial Strategy (BEIS) and Ofgem published Upgrading Our Energy System: Smart Systems and Flexibility Plan⁸ (henceforth the 'Smart Systems and Flexibility Plan') in July 2017. This contains 29 actions for the Government and Ofgem to take to facilitate the

⁶https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/568982/An_analysis_of_electricity_flexibility_for_Great_Britain.pdf

⁷https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/576367/Smart_Flexibility_Energy_-_Call_for_Evidence1.pdf

⁸https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/633442/upgrading-our-energy-system-july-2017.pdf

move towards a smarter and more flexible energy system, and is divided into three sections: removing barriers to smart technologies; smart homes and businesses; and markets which work for flexibility.

The smart homes and businesses section essentially relates to demand-side response (DSR), which refers to how loads (such as appliances), in response to a signal, change the amount of electricity they consume at a particular time. DSR is already happening in the industrial and commercial sectors, where it is provided by a range of companies; 1.2GW of DSR won agreements in the recent four-year-ahead Capacity Market auction for delivery in 2021/22. There is currently less opportunity for DSR among domestic and smaller non-domestic consumers as the enabling infrastructure, such as smart meters and half-hourly settlement⁹, is still in progress¹⁰. DSR can provide substantial benefits in the domestic and smaller non-domestic sector by managing the demand peaks caused by, amongst other things, greater electrification of heat and transport. With DSR, this demand could be smoothed at low or no cost to the system; for example, by exposing consumers to price signals through smart tariffs. Trials indicate that consumers could shift significant electricity consumption in response to price signals¹¹, leading to savings on their energy bills. Smart appliances are key enablers of this: evidence suggests that the automation that these devices enable can substantially increase the amount that is shifted; some studies have suggested that this can be up to three times that of non-automated appliances¹².

However, the current limited availability and uptake of smart appliances means consumers cannot easily realise energy bill savings by providing DSR. Therefore, in the Smart Systems and Flexibility Plan, the Government undertook to consult on seeking powers to set standards for smart appliances¹³. We consider that standards should ensure interoperability of appliances (and so avoid proprietary standards), maintain data privacy and support grid-stability and cyber-security. The Government will work with industry to develop these standards. We recognise that standards will need to allow for innovation, and the Government will work with industry, the EU and other countries to provide for consistency as far as possible.

The objectives of setting minimum standards for smart appliances are to:

⁹ The electricity settlement process places incentives on suppliers to buy energy to meet their customers' demand in each half hour of the day. At present, most consumers do not have meters capable of recording half-hourly consumption data. Instead, they are settled using estimates of their usage in each half hour. Smart meters can record the amount of energy consumed within every half-hour period and provide this data to energy suppliers remotely, and 'half-hourly settlement' refers to the use of this data for settlement purposes. This presents an opportunity to improve the accuracy and timeliness of the settlement process, and could encourage innovation and efficient use of energy.

¹⁰ Tariffs such as Economy 7 do offer DSR services to consumers, but these offerings are limited thus far.

¹¹ Up to 2.5GW: Baringa Redpoint / Element Energy (Aug 2012) Electricity System Analysis – future system benefits from selected DSR scenarios – Final report pack

¹² Frontier Economics & Sustainability First (2012) Demand Side Response in the domestic sector- a literature review of major trials – final report

¹³ We will be focusing on appliances which can be comms-enabled and therefore able to modulate their energy consumption in response to signals. In order to achieve DSR benefits, we are first focusing on those appliances which have the greatest opportunity for DSR, i.e. those which consume high levels of energy and which are most suitable for flexible consumer use. At present, we consider these to include cold and wet appliances, heating, ventilation, air conditioning and battery storage. This is explained in more detail below.

1. Provide certainty in the burgeoning smart appliance sector to support investment to develop smart appliances for the market, enabling electricity system benefits and consumer rewards;
2. Ensure minimum standards of function of smart appliances to protect consumers and the system; and
3. Enable the UK to be at the forefront of an emerging sector.

Together these should help drive faster levels of product development as well as higher uptake and use of smart appliances.

Defining a ‘smart appliance’

Our focus here is on demand-side response-related products, which impact on energy consumption when in use (generally by using it, although in the case of batteries, for example, they can supply energy too)¹⁴.

Such energy-related products can be considered to be smart appliances, for the purpose of this policy, when they are:

- Communications-enabled; and
- Able to respond automatically to price and/or other signals by modulating their electricity consumption. These changes to consumption patterns are what we call the ‘flexibility’ of the smart appliance.

We recognise that there are other types of consumer appliance that are often called ‘smart’, such as heating controls which regulate temperature based on occupancy, however, these are not the focus of this consultation.

Rationale for Government intervention

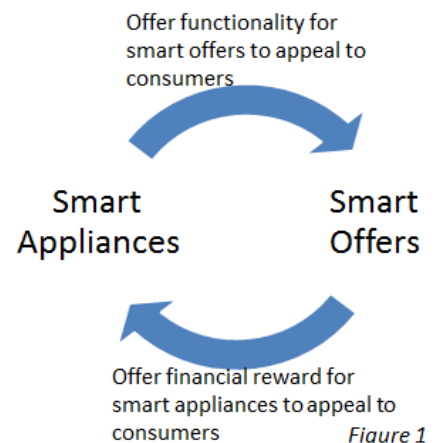
The Government considers that the regulation of smart appliances will be needed in order to maximise the opportunities for DSR in homes and businesses, while managing any risks associated with smart appliances, and to ensure appropriate consumer protections.

Overcoming Barriers to Smart Appliances to maximise DSR

Regulation of smart appliances will help to provide a clear framework in which the burgeoning sector can develop.

¹⁴ A more detailed definition can be found in the Ecodesign Directive (2009/125/EC): <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:285:0010:0035:en:PDF>; for the purposes of this Directive “energy-related product” means “any good that has an impact on energy consumption during use which is placed on the market and/or put into service, and includes parts intended to be incorporated into energy-related products covered by this Directive which are placed on the market and/or put into service as individual parts for end-users and of which the environmental performance can be assessed independently”.

A lack of certainty and coherence within the smart appliance sector constitutes a **potential market failure**, which hinders both manufacturers investing in research and development to create smart appliances for fear of **first mover disadvantage**, and consumer uptake and use of smart appliances. This is explained in Figure 1. In short, without smart offers¹⁵ being available, smart appliances could potentially have limited consumer appeal as they could appear to offer little or no financial reward for DSR; yet without smart appliances, financial benefits from many smart offers cannot be realised fully by consumers. The smart meter roll-out and transition towards half-hourly settlement are creating a platform for more cost-reflective energy pricing, which is expected to incentivise suppliers to develop smart offers to be taken up by consumers. However, if consumers are unable to realise the benefits of these offers, due to the inability to automate their consumption, there is likely to be limited demand and fewer offers. Limited consumer demand for smart appliances could also be caused by **information asymmetries**, where consumers may not be fully informed about the nature, and functionality, of a smart appliance, either through a lack of information for consumers or media stories focused solely on risks. A **lack of interoperability** could lead consumers to be locked into a particular communication ecosystem, potentially limiting consumer choice of appliance. Standards can provide certainty to manufacturers, ensure interoperability, provide clarity to consumers and, by creating a more certain framework for developers, reduce first mover disadvantage.



Potential Risks from Smart Appliances

Regulation provides clear minimum requirements for smart appliances and a basis for enforcement. This allows for robust protections against risks associated with smart appliances to be put in place.

We expect there to be an increase in connected devices in the coming years, including smart appliances as we have defined them here. These bring **cyber risks**¹⁶ both to **individual appliance owners** and on a **system level** to the grid. If a smart appliance were to be accessed and controlled by an unauthorised person, removing the owners' control over the appliance, this is inconvenient and potentially dangerous (for example, an appliance may become overheated if switched onto full power for a prolonged period of time). This could discourage use of smart appliances. Further, if one smart appliance can be accessed in an unauthorised way, so could others to which it is connected. There is potential for cyber attacks to take place, which could lead to problems in operating the electricity networks. Therefore, we consider it to be important to have standards to protect appliances from cyber attacks.

¹⁵ A smart offer could include anything from a smart tariff to a package deal. For example, a smart appliance may be able to be provided at a discount in exchange for DSR control over the appliance.

¹⁶ We recognise that the cyber risk goes beyond purely smart appliances, as we define them here, to connected devices more generally. The Government is working to assess and react to this risk: <https://www.gov.uk/government/publications/national-cyber-security-strategy-2016-to-2021>; https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/686089/Secure_by_Design_Report_.pdf. BEIS is undertaking work to review cyber security risks, as set out in the Smart Systems and Flexibility Plan.

As devices are connected and generate new data which can be accessed remotely (such as at what times consumers operate their appliances), **data protection** must also be considered. For example, consumers must be in control of any data arising from the appliances that are exchanged with third parties. There must be clear consent procedures that will ensure they are able to make informed decisions regarding data sharing, particularly as we expect more players to enter the energy market as it evolves, such as aggregators developing new business models.

As with all electrical appliances, there are associated risks linked to **consumer protection**. The Government takes this seriously and will consider whether safety precautions, additional to existing provisions in this sphere, are required for smart appliances which are likely to be active when consumers are not present or monitoring the appliance.

Alignment with International Developments

Alignment with international standards provides greater opportunities for manufacturers, greater choice for consumers, and avoids the UK becoming a dumping ground for substandard appliances.

Consultants on behalf of the European Commission have undertaken an Ecodesign Preparatory Study on smart appliances¹⁷. The Government will continue to engage with and feed into this policy review process.

In response to our Call for Evidence, industry views indicated support for common standards across EU Member States. We would expect EU standards to be robust.

Given the range of possible scenarios that could arise with regard to the UK's future relationship with the EU, it is prudent to begin our own work on the development of standards for smart appliances. This work is expected to help the UK influence and take part in processes to develop such standards at an international level, including in the EU. This will in turn help to ensure international alignment in this sphere as far as possible. We will take into account developments elsewhere, such as in the United States¹⁸, where they are similarly reviewing standards for connected devices to encourage interoperability and to ensure devices have appropriate protection from cyber risks.

In addition, we expect that appropriate alignment with smart appliance policy outside of the UK will minimise the risk that the UK could be a 'dumping ground' for smart appliances that do not meet foreign standards which may be more stringent than those in UK. Alignment also facilitates trade across a wider area, with appliances not needing to meet bespoke national standards.

Options for Government action

We sought views on different regulatory approaches in the Call for Evidence:

¹⁷ More detail on this project can be found at: <http://www.eco-smartappliances.eu/Pages/documents.aspx>

¹⁸ For example, the Department for Homeland Security published principles with regard cybersecurity and the Internet of Things: <https://www.dhs.gov/news/2016/11/15/dhs-releases-strategic-principles-securing-internet-things>

- a) Smart appliance labelling;
- b) Regulation of smart appliances; and
- c) Requirements for appliances to be smart.

We set out in our response that our preferred option is to regulate smart appliances by setting standards for them, with an option to introduce labelling to indicate compliance with these standards. This aligned with stakeholder responses. This was the preferred option because it provides uniform and enforceable requirements for smart appliances, so best achieves the policy's aims: providing a clear framework for industry players to develop and deliver smart appliances, and implementing consumer protections such as data protection and cyber-security. This approach is also consistent with the recommendations of the Ecodesign Preparatory Study. Therefore, in the Smart Systems and Flexibility Plan, we undertook to consult on taking powers to set standards for smart appliances.

Requiring all appliances to be smart at this stage was not supported in most Call for Evidence responses. The Government agrees that at this time, as the smart appliances market is at very early stages of development, it is currently too early to mandate appliances to be smart and so foreclose the non-smart appliance market.

When standards are set for smart appliances through regulation, stakeholders will be required to indicate compliance with those standards. As set out in the Executive Summary, technical standards offer a route by which compliance can be systematically assessed. We are working with the British Standards Institution (BSI) to review the current landscape of technical standards relating to smart appliances, as it stands. Following this, we will collaborate with industry to develop appropriate technical standards, as necessary, in relation to the principles described below.

The Government is seeking views through this consultation on the introduction of a smart appliance label, which provides a visible sign of compliance with standards. We also expect that this will encourage consumer awareness. Appliances that do not meet the standards would not be able to use the label.

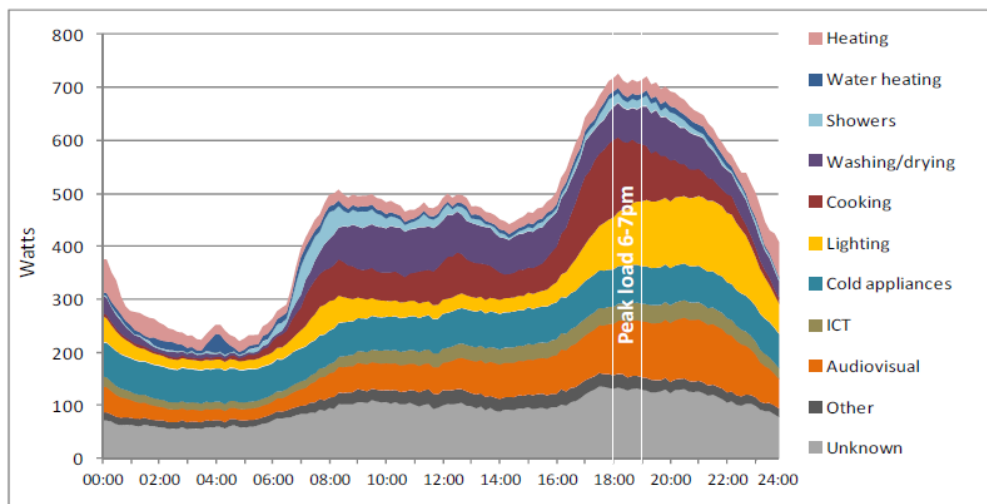
Appliances subject to Standards

Taking into account stakeholder responses, we announced in the Smart Systems and Flexibility Plan that we will be focusing on appliances which have the greatest opportunity for DSR (i.e. those which consume high levels of electricity and which are most suitable for flexible consumer use)¹⁹. As mentioned in the Context section above, DSR is taking place already in the industrial and commercial sectors. Therefore, homes and small businesses are the primary focus of the policy aims here. We recognise that some (although not all) of these technologies, such as heating and fridges, are used in all of these settings.

In order to identify smart appliances most beneficial to DSR in this context, we first considered appliances which make up the current domestic peak demand on the electricity system, illustrated in the Figure below:

¹⁹ Giorgio AD, Pimpinella L. 2012. An event driven smart home controller enabling consumer economic saving and automated demand side management. *Appl Energy*. 96:92–103.

Average 24-hour profile for 250 homes



Source:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/275484/electricity_survey_2_tuning_in_to_energy_saving.pdf

Although lighting and cooking can be seen to make up a significant portion of the evening demand peak, these are less flexible in their use. The appliances that offer most flexibility include cold and wet appliances²⁰, heating (including air and ground source heat pumps, electric storage heaters, and heating controls) ventilation and air conditioning (HVAC), and battery storage.

Analysis suggests that wet appliances in domestic premises have a maximum technical potential of 3.8GW, and cold appliances 1.1GW²¹ during a winter energy consumption peak²² in Great Britain in 2030. HVAC (excluding figures relating to heat pumps) could provide 0.2GW of DSR by 2020, and 0.3GW by 2030, based on figures from the Ecodesign Preparatory study²³. Actual reductions will be dependent on how much electrification of heat takes place. Similarly, the full potential of small-scale batteries is uncertain. Savings from small-scale batteries will be modelled in the final stage Impact Assessment post-consultation, but the potential could be significant if technology prices continue to fall and uptake by consumers increases.

²⁰ Cold appliances such as fridges and freezers; and wet appliances such as washing machines and dryers.

²¹ Frontier Economics/LCP (2015) Future potential for DSR in GB: https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/467024/rpt-frontier-DECC_DSR_phase_2_report-rev3-PDF-021015.pdf . While these figures are estimates for winter peak in 2030 we consider that current peak load from these appliances is likely to be of a similar order of magnitude. See also Drysdale, Wi, and Jenkins (2014), Flexible demand in the GB domestic electricity sector in 2030, which is cited in the Frontier work: <https://orca.cf.ac.uk/68342/1/OA-20142015-71.pdf>

²² Frontier Economics/LCP (2015) Future potential for DSR in GB: https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/467024/rpt-frontier-DECC_DSR_phase_2_report-rev3-PDF-021015.pdf . While these figures are estimates for winter peak in 2030 we consider that current peak load from these appliances is likely to be of a similar order of magnitude. See also Drysdale, Wi, and Jenkins (2014), Flexible demand in the GB domestic electricity sector in 2030, which is cited in the Frontier work: <https://orca.cf.ac.uk/68342/1/OA-20142015-71.pdf>

²³ <http://www.eco-smartappliances.eu/>

In addition to these technologies, electric vehicles (EVs) also offer significant potential for DSR. National Grid estimates that electric vehicles could increase peak demand by 18GW by 2050, but DSR use could decrease this to only an additional 6GW²⁴. Proposals to take powers to require standards for smart EV charge points are already being taken forward by the Office for Low Emission Vehicles (OLEV) through the Automated and Electric Vehicles Bill, which is currently before Parliament. We are working closely with OLEV on the detail of standards which could apply to both smart appliances and smart EV charge points, particularly on cyber-security.

A preliminary analysis of the costs and benefits of setting standards for smart appliances is in the consultation stage Impact Assessment, published alongside this document²⁵.

In a similar vein, although these are currently the categories of appliance suitable for DSR, as electricity consumption and systems change in the future, we may consider extending the scope of this policy to other appliances. We will continue to engage with industry as this progresses.

Consumer Engagement and Labelling

As we laid out in the Smart Systems and Flexibility Plan, consumers are very much the focus of our work here. Smart appliances are key enablers, particularly for domestic consumers to participate in DSR. A label to indicate compliance with smart standards can be a good way to engage consumers in a smart energy system. Consumers are familiar with product labelling, and an initial review of the impacts of labels indicates that once consumers recognise a label, they tend to be loyal and pay attention to it.

Reviews of existing labels indicate that they are most effective in encouraging consumer uptake when the label is targeted and engaging, by being clear and easy to understand. Evaluation of compliance with the relevant standards by an independent body supports trust that consumers have in the label. Simple, bold colours, with minimal but clear text, are most engaging to consumers. The Government is proposing to work with stakeholders to develop an appropriate label for this purpose to engage consumers in smart appliances. We also welcome views on additional ways of engaging consumers with smart appliance technologies.

Consultation Questions

- | | |
|----|--|
| 1. | Do you agree that the Government should take powers to allow for regulation on standards for smart appliances? |
|----|--|

²⁴ <http://fes.nationalgrid.com/media/1253/final-fes-2017-updated-interactive-pdf-44-amended.pdf>

²⁵ <https://www.gov.uk/government/consultations/proposals-regarding-setting-standards-for-smart-appliances>

2.	<p>Do you agree that a label is a good way to engage consumers with smart appliances? Please include your views and experiences with key aspects of labels which are most effective at engaging consumers, including analysis on uptake of the relevant device.</p>
3.	<p>The consultation stage Impact Assessment published alongside this consultation document explores the costs and benefits of the options considered for this policy. It indicates that mandating standards for smart appliances provides the greatest net benefits, compared to voluntary standards. Do you agree with our analysis? In particular, please consider the following, and provide analysis to back up your views:</p> <ul style="list-style-type: none">a) Likely consumer uptake of smart appliances, including which type of consumers and anticipated time frame;b) Consumer use of the smart function provided by smart appliances in relation to different types of tariffs, including fixed and variable;c) Potential financial benefits to consumers through smart appliance usage in combination with smart tariffs and offers;d) Monetised and non-monetised costs for industry to comply with standards, including consumer businesses, smart appliance manufacturing businesses, smart appliance service providers, supply chains and the electricity industry (such as Distribution Network Operators);e) Potential impact on the price of smart appliances which comply with standards compared with non-smart appliances.

Principles Underlying Standards

We intend to work closely with stakeholders to develop appropriate standards. Our focus is on achieving an increase in uptake and use of smart appliances, and ensuring consumers are protected from associated potential risks. This section sets out the principles we consider would best achieve these goals.

Context

With a view to removing barriers to smart appliance uptake and use, and minimising associated risks, the Government has developed a set of principles on which we consider standards for smart appliances should be based. Respondents to our Call for Evidence agreed that regulation should focus on the principles of interoperability, data privacy, and grid- and cyber-security. Initially energy consumption was also suggested as a principle, but this was not taken forward as energy efficiency standards will ensure that appliances do not consume excessive energy in any case²⁶.

The Smart Systems and Flexibility Plan puts the consumer at the centre of the smart energy system: without consumer participation, the full benefits of flexibility cannot be realised for the consumer or for the electricity system. With the new opportunities also come risks. Therefore, it is important that the consumer is protected.

In order to overcome the barriers and risks outlined in the first chapter, we consider that the following principles are key to greater uptake and use of smart appliances:

- Interoperability;
- Grid-stability and cyber-security; and
- Data privacy.

Consumer Protection, including product safety and end-of-life care, is important in this burgeoning sector.

Industry has a detailed technical knowledge of the smart appliance sector, and so the Government will work with industry to identify and develop technical standards which could indicate compliance with the principles set out by Government. As a first step, the Government has sought a review of the current technical standards landscape in accordance with the principles above. We will engage with industry on how to move forward with this.

²⁶ For further detail on this rationale, see response to Call for Evidence: https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/631656/smart-energy-systems-summaries-responses.pdf

Applicability of Principles in Standards

The flexibility of smart appliances varies by nature: wet appliances tend to be on or off, so are 'binary', whilst cold appliances and heating, ventilation and air conditioning (HVAC) can perform frequency response (by which we mean they can be turned up or down for short periods of time). Therefore, the application of standards might be more suited vertically (bespoke to each type of appliance) as opposed to horizontally (applicable to all sorts of smart appliances). A third option is a 'hybrid approach', where a 'horizontal approach' is recommended for most principles for ease of application of the standards and uniformity, but a 'vertical approach' is adopted for other aspects which are more suitable for bespoke application depending on the appliance. For example, if an appliance is required to be 'making optimal use of price variability', this varies between wet appliances, which pick a time when it is cheapest to be on or off, rather than, say, thermal heaters, which must factor in other considerations such as consumer comfort.

Given the nature of the principles underlying the standards and functionalities described below, we propose to proceed on a horizontal basis for common applicability and ease of application of the standards. However, if it becomes appropriate to develop functional requirements specific to certain appliances, we propose a hybrid approach.

Interoperability

Interoperability²⁷ is essential for a competitive market, so that consumers can freely choose different brands of appliance without the concern that one brand of appliance cannot properly communicate with another. Therefore, communication between appliances themselves, and between appliances and their controllers are both important.

Responses to the Call for Evidence indicated support for open standards²⁸ for interoperability because it allows the market to develop more freely as it is not constrained to one communication method, and consumers have a greater choice of different appliances that work together.

Interoperability can be achieved by different methods: for example, a 'common data model' (so instructions are the same regardless of the technological language used) or a 'common communication protocol' (so all appliances would 'speak' the same language). It should be noted that these two examples are not mutually exclusive. The former allows for a greater level

²⁷ The ability for grid capacity signals to be communicated to, from and between smart appliances in households.

²⁸ The Smart Energy Code (<https://smartenergycodecompany.co.uk/the-smart-energy-code-2/>) defines open standards as follows: *The following are the minimal characteristics that a specification and its attendant documents must have in order to be considered an open standard:*

- i The standard is adopted and will be maintained by a not-for-profit organisation, and its ongoing development occurs on the basis of an open decision-making procedure available to all interested parties (consensus or majority decision etc.);*
- ii The standard has been published and the standard specification document is available either freely or at a nominal charge. It must be permissible to all to copy, distribute and use it for no fee or at a nominal fee;*
- iii The intellectual property - i.e. patents possibly present - of (parts of) the standard is made available: irrevocably on a royalty free basis; or, on a reasonable and non-discriminatory (RAND) basis; and*
- iv There are no constraints on the re-use of the standard.*

of flexibility and choice for smart appliance market participants. There are various methods by which smart appliances can communicate, for example, through the cloud, via telecommunications, or through a smart meter. As it allows for greater flexibility by manufacturers, a common data model, whereby communications can be translated directly between appliances, is preferred by Government to support interoperability.

We also propose that the scope of this principle of interoperability should cover communications in all directions to and from the device, up to the the DSR operator's system (for example, the cloud), because each of these communication channels are required for a appliance to function in a smart way.

As an initial and indicative list, which we are keen to develop with industry's input, we consider the key elements for interoperability to be:

- Open standards;
- A common data model; and
- Coverage of communications associated with smart appliances in all directions.

Grid-Stability and Cyber-Security

Smart appliances could support grid-stability, as they are designed to shift electricity consumption away from existing peaks (generally when electricity is expensive) to times when it is cheaper, and more available, in response to signals. However, if all appliances do this at once, this has the potential to create a sudden spike or drop in electricity consumption by appliances which could cause issues in the smooth operation of the electricity networks. There are different ways to deal with this, for example staggering signals to defined appliances, or randomisation of response to signals at the appliance level.

Robust cyber protection is vital to ensure that smart appliances do not increase risks to the stability of the grid as a whole, and to protect consumers from unauthorised parties taking control of the appliance.

As outlined above, cyber attacks can constitute a threat by the hacking of either individual devices or their control systems (and thereby multiple smart appliances). As such, cyber-security can be dealt with in different ways.

Government advocates a 'secure by design' approach to internet-connected devices and services, alongside a focus on providing accessible information regarding security features and practices to the consumer. This is an approach which is applicable across sectors, and we will work with industry partners and the National Cyber Security Centre (as the UK's technical authority on cyber-security) to mitigate the risks posed by internet-connected products and associated services.

In support of a 'secure by design' approach Government has published a draft Code Of Practice, intended to encourage good practice to help protect consumer Internet of Things (IoT) devices from vulnerabilities²⁹.

²⁹https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/686089/Secure_by_Design_Report.pdf

To provide for cyber protections in smart appliances, the security of the device and the industrial control system, as well as the communications between them, are important, as these are all potential access points for hackers. The common weaknesses that have previously led to cyber attacks are where parties with access to the device deliberately misuse it, or there are gaps in software protection. Therefore, in addition to the key principles laid out in the Code of Practice published by the Government³⁰, it is important to provide for security training and monitoring of those with access to devices and their controllers. Regular cyber security assessments, such as penetration testing, and appropriate processes for dealing with any vulnerabilities found should be in place to provide protection against cyber risks.

The consumer is key to smart appliance policy, and so the device must be capable of functioning as a device even if a cyber attack were to take place. Therefore, manual override options are important. This preserves the ability of the consumer to choose when and how they use their devices. However, awareness of cyber threats is a first step and so manufacturers should ensure that security is built into connected products and services from the start, and advise consumers of any risks that could arise and recommended actions if such an attack were to take place.

Functionalities such as those highlighted above are expected to help to provide for a secure device, appropriate software, and protected communications and control systems. Therefore, it is expected these should help to protect against major cyber risks.

As an initial and indicative list, which we are keen to develop with industry's input, we consider the key elements for cyber protections to be:

- Device security, including, for example, minimal access points;
- Software security, including regular and reliable software and firmware updates that are ideally applied to devices automatically with minimal user intervention;
- Communications and control systems that provide an appropriate level of protection and security; and
- Underpinning this, regular penetration testing and processes to rectify or minimise the repercussions associated with weaknesses found.

Data Privacy

Data will be created by, and potentially stored in, smart appliances. Consumers must also be in control of any data exchanged with third parties arising from the appliances, with clear consent procedures that will ensure they are able to make informed decisions regarding data sharing. Existing regulation on data privacy will continue to apply, in particular the Data Protection Act 1998 and Data Protection Bill (when enacted). We expect existing standards to be appropriate for data protection in the smart appliance sector at this time.

³⁰https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/686089/Secure_by_Design_Report.pdf

Consumer Protection

Existing consumer protection law and guidelines will apply to smart appliances as with other goods, for example, warranties, return periods and quality of goods requirements. The Government will work with stakeholders, including through the development of standards, to identify ways to ensure these protections are properly applied to smart appliances.

In addition, smart appliances should be straightforward to use. Therefore, we consider it to be important that smart appliances are sold in a 'plug and play' mode where possible. We recognise that some appliances may not be suited to this mode, such as non-portable heaters or home batteries which require specialist installation. This is an example of a vertically applicable principle.

We are aware of potential distributional impacts that could be associated with smart appliances. For example, there is a risk that upfront costs could impede uptake by those less able to afford higher cost appliances (see consultation stage Impact Assessment³¹, published alongside this document, for more detail). On the other hand, as deployment increases, we expect that costs should reduce, increasing accessibility for more consumers. The application of standards will support cost reduction by setting a uniform minimum functionality whilst ensuring consumer protection. The benefits to the energy system – for example, from lower peak demand – should benefit all consumers in terms of lower generation and network costs. The Government is interested in stakeholder views on how the benefits of smart appliances can work for all consumers, and is working with Ofgem to assess the distributional impacts that may be associated with smart appliances.

Product Safety

Stakeholders, in response to the Call for Evidence, indicated a general concern regarding safety associated with smart appliances and raised particular concerns about wet appliances and fire risks. As with any product, we expect manufacturers of smart appliances to ensure their products are safe before they are placed on the market, as required by law. In January 2018, the Government announced the creation of a national Office for Product Safety and Standards to enhance protections for consumers and the environment and drive increased productivity, growth and business confidence. This was one of the key recommendations of the Working Group on Product Recalls and Safety which was tasked to look at improving the safety of white goods and other consumer products. The Office has been established to provide dedicated expertise to lead on national product safety challenges. This includes advice and support to ensure manufacturers, importers and retailers meet their responsibilities to place only safe products on the market. The Office is working closely with key stakeholders to ensure that we continue to maintain the safety of consumer goods.

We are also working with the storage industry and expert bodies to assess the health and safety framework for battery storage. This links closely to Each Home Counts³², an industry-led review now in its implementation phase, which is focused on improving quality, standards and advice provision across the repair, maintenance and improvement sector that will include battery storage. That work sits outside of this consultation.

³¹ <https://www.gov.uk/government/consultations/proposals-regarding-setting-standards-for-smart-appliances>

³² <http://www.eachhomecounts.com/>

End-of-Life care

Smart appliances will be generating and communicating personal data, through new data streams. This data may be stored on the device. The Government will continue to monitor and engage in discussions about data handling including the applicability and role of data regulation to disposal, recycling or reuse of smart appliances.

Indicative Functionalities for Smart Appliances

We have outlined above some of the key functionalities which will underpin the principles for smart appliance standards. This is an indicative and non-exhaustive list, that will be developed further in conjunction with stakeholders and through the development of standards. As set out in the Executive Summary, this is different to a technical standard, which provides a method of indicating compliance with standards set by the Government.

Principle	Functionality	Further Detail
Interoperability	Open standards	Standards are developed collaboratively and available for use indiscriminately to allow for competitive market development (see section above for full definition of open standard).
	Common data model	Whereby instructions are directly translatable between device language protocols.
	Applicable to device communications to and from device	To provide for communications to and from smart appliances which allows for their effective smart use.
Grid-stability and cyber-security	Randomised Offset Function	This allows for devices to provide a staggered response to signals from control systems, and so will avoid sudden spikes or dips in demand.
	Secure Device	<ul style="list-style-type: none"> - Detect, but not automatically connect to, devices in network: minimising exposed ports; - Guidance and awareness of risks and mitigating actions made available to consumers; - Manual overrides available to consumers so device remains functional without smart control.
	Secure Device Software and Firmware	<ul style="list-style-type: none"> - Default passwords are not used by manufacturers, and any password provided is not hard-coded; - Secure and automatic updates as a default setting on the device continuing over a reasonably-expected lifespan of the device in question; - Software used is appropriately secure: from a recognised source and provides protection; - Guidance to consumers on how to update software.

	Communications and control systems	<ul style="list-style-type: none"> - Communications are encrypted to an appropriate degree; - Ensure only authorised parties have access to the devices and their communications, with appropriate agreements in place to do so, and complying with all legal requirements.
	Controlled access to device and regular protection testing	<ul style="list-style-type: none"> - Regular penetration testing for vulnerabilities to take place, at device, communication and control system level; - Processes to mitigate risks if found, and appropriate and timely information provided to consumers in this scenario; - Employees with access to devices are provided with appropriate training and monitored for security.
Data Privacy	Data on the device, and that which is communicated is protected from misuse by all and access by unauthorised parties	<p>Standards which indicate compliance with data privacy laws will continue to apply and will be recognised in the smart appliance standards.</p> <p>Data must be securely stored when on the device or with any controlling party, and securely removed when the device is recycled, reused or disposed of.</p>
Consumer Protection	Consumer protection laws will continue to apply	Standards which indicate compliance with consumer protection laws will continue to apply and will be recognised in the smart appliance standards.
	Device is easy to set up and use in 'smart mode'	<p>Plug and play mode is used as far as reasonably possible, for devices which do not need specialist installation, such as portable heaters or fridges for example.</p> <p>Information required for consumers to be driven to engage with the smart system, and potentially gain benefits such as reduced bills, is easily accessible through the device. For example, pricing information.</p> <p>It is easy for consumers to shift demand through devices. For example, there is an ability to shift demand by remote access, whether through the consumer's 'app' or through an aggregator. Another way in which this could be done is that the device is programmable in advance so that the device performs its function within a certain timeframe which most benefits the system (for example, the consumer could programme a smart washing machine to wash clothes when electricity is cheapest to be completed by a certain time).</p>

Consultation Questions

4.	<p>In this document, we have proposed minimum functionalities for each principle. Do you agree with these functionalities? What functionalities should be considered in addition to those listed above? Please divide your responses according to:</p> <ul style="list-style-type: none">i) Interoperability;ii) Grid-stability and cyber-security;iii) Data Privacy;iv) Consumer Protection.
5.	<p>Do you consider that we have correctly outlined above the risks associated with smart appliances? Are there any that are missing and need to be addressed? Please provide evidence.</p>
6.	<p>Consumer protection is important to the Government, and we will continue to monitor and engage with this to ensure consumers are protected in a smart energy system. This work will include assessment of distributional impacts of smart appliances and consideration of product safety provisions. Do you consider there to be major principles of protection which have not been covered above which will be developed into standards for smart appliances?</p>
7.	<p>Do you agree that the standards should be applied as uniformly as possible across smart appliances, for example, horizontally, and should be catered to individual appliances only where necessary?</p>

Catalogue of consultation questions

Consultation Questions

1.	Do you agree that the Government should take powers to allow for regulation on standards for smart appliances?
2.	Do you agree that a label is a good way to engage consumers with smart appliances? Please include your views and experiences with key aspects of labels which are most effective at engaging consumers, including analysis on uptake of the relevant device.
3.	<p>The consultation stage Impact Assessment published alongside this consultation document explores the costs and benefits of the options considered for this policy. It indicates that mandating standards for smart appliances provides the greatest net benefits, compared to voluntary standards. Do you agree with our analysis? In particular, please consider the following, and provide analysis to back up your views:</p> <ul style="list-style-type: none"> a) Likely consumer uptake of smart appliances, including which type of consumers and anticipated time frame; b) Consumer use of the smart function provided by smart appliances in relation to different types of tariffs, including fixed and variable; c) Potential financial benefits to consumers through smart appliance usage in combination with smart tariffs and offers; d) Monetised and non-monetised costs for industry to comply with standards, including consumer businesses, smart appliance manufacturing businesses, smart appliance service providers, supply chains and the electricity industry (such as Distribution Network Operators); e) Potential impact on the price of smart appliances which comply with standards compared with non-smart appliances.
4.	<p>In this document, we have proposed minimum functionalities for each principle. Do you agree with these functionalities? What functionalities should be considered in addition to those listed above? Please divide your responses according to:</p> <ul style="list-style-type: none"> i) Interoperability;

	<ul style="list-style-type: none">ii) Grid-stability and cyber-security;iii) Data Privacy;iv) Consumer Protection.
5.	Do you consider that we have correctly outlined above the risks associated with smart appliances? Are there any that are missing and need to be addressed? Please provide evidence.
6.	Consumer protection is important to the Government, and we will continue to monitor and engage with this to ensure consumers are protected in a smart energy system. This work will include assessment of distributional impacts of smart appliances and consideration of product safety provisions. Do you consider there to be major principles of protection which have not been covered above which will be developed into standards for smart appliances?
7.	Do you agree that the standards should be applied as uniformly as possible across smart appliances, for example, horizontally, and should be catered to individual appliances only where necessary?

