Department for
Business, Energy
& Industrial Strategy

Energy-Related Products Policy Framework

November 2021

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Executive Summary

Energy-related products account for around 55% of the UK's total non-transport energy use and are a significant contributor to carbon emissions. These include both domestic and non-domestic products, which can either directly consume energy, such as washing machines, lighting, heating appliances, water pumps etc. or products which have an indirect impact on energy consumption during use such as taps and non-electric showers.

Policies to reduce energy use from these products have been successful and are one of the most cost-effective ways to reduce emissions and energy bills. We estimate that in 2021, minimum energy performance standards (MEPS) alone are providing annual savings of £75 for the average dual-fuel household on energy bills and lead to greenhouse gas emissions savings of 8 million tonnes of CO2 equivalent (MtCO2e). In addition, these policies are saving 11% for the average commercial business user's electricity bill and saving 3% for the average industrial user.

From 1 January 2021, the UK gained full autonomy over its energy-related product standards, subject to the terms of the Northern Ireland Protocol. The Government published a Call for Evidence in June 2020 seeking views on how energy-related products (ErP) policy could be improved to maximise the benefits of energy and resource efficient products in the UK. We have also undertaken research to help inform future priorities for ErPs based on carbon saving potential and other environmental criteria.

The purpose of this framework document is to set out how ErP policy can contribute to our Carbon Budgets and support the transition to Net Zero cost effectively, including the policy levers we will use and principles for setting future policy over the coming years.

This framework sets out not only how we intend to reduce operational energy usage, but also how we can reduce upstream emissions relating to production: the embodied emissions of energy-related products. By applying circular economy principles to product design that support repairability, durability and recyclability we can reduce emissions and impacts over the lifecycle of products.

Recently introduced Ecodesign measures include, for the first time, requirements that will enhance the repairability, durability and recyclability of certain energy-related products. This approach brings multiple environmental benefits across the product lifecycle, reducing carbon emissions, contributing to Net Zero targets, and pressures on the global environment associated with production through to end-of-life treatment and disposal. Extending the lifetimes of products and enabling recycling as well as extraction of critical raw materials also increases our resource security.

By designing products that are more suitable for repair, remanufacturing and recycling, a significant numbers of jobs can be supported in these sectors. A recent study suggests that by creating the right conditions for a more circular economy, up to 450,000 jobs in reuse,

repair, remanufacturing, and recycling could be supported across the economy, with a substantial proportion of these relating to ErPs.[1]

Based on preliminary analysis we estimate that future ErP policies relating to in-use energy efficiency could contribute as much as 10 – 24 MtCO2e to Carbon Budget 5 (2028 – 2032), and 14 – 35 MTCO2e to Carbon Budget 6 (2033-2037), based on illustrative proposals outlined in this document.

When developing and deciding future policies we will seek to strike a balance between achieving our environmental goals, and realising benefits for consumers, businesses and other groups. We will also consider how best to manage impacts on those that might be disproportionately affected by our proposals. This framework establishes the objectives and principles which we will follow.

Objectives

Reducing emissions by transforming how products use energy while minimising the disruption to consumers and businesses.

Reducing the lifetime running costs of products to increase energy bill savings for consumers, businesses and the public sector.

Building a circular economy in which products are more repairable, durable and recyclable, ensuring maximum retention of value in the economy for as long as possible.

Driving innovation by optimising smart technology use and instilling incentives for manufacturers to research and develop more efficient technologies.

[1] Green Alliance, 2021, Levelling up through circular economy jobs. Available at: https://green-alliance.org.uk/Levelling_up_through_circular_economy_jobs.php

Principles

Open and responsive policy making to continue to drive action in energy and resource efficiency and achieve cost-effective decarbonisation outcomes.

Building and preparing markets and infrastructure as technology advances and consumer behaviour changes, while continuing to offer fair value to consumers.

Enhancing consumer experience by offering consumers meaningful choice and providing effective information and intuitive guidance regarding energy and resource efficiency for products.

Maintaining or enhancing product performance by ensuring appropriate functionality or performance standards underpin requirements.

Better regulation to deliver better outcomes for the economy, society and the environment, ensuring regulation is proportionate, targeted, fair and transparent.

The framework also establishes the suite of policy tools we intend to use to achieve our objectives. Historically, MEPS and labelling programmes have been extremely successful in achieving cost-effective improvements in energy efficiency and empowering consumers to purchase more efficient products. These are, however, not the only way to achieve improvements in product efficiency and we are considering, on a product-by-product basis which policy levers provide the most efficient route to achieving objectives.

Following the Energy-Related Products Call for Evidence and the Energy-Related Products Policy Study we have developed some potential illustrative proposals for how we can achieve further carbon savings and reduce the resources used by products. These measures cover the suite of policy tools including potential improvements to minimum energy performance standards for a range of products as well as options on how we can better help consumers and businesses to make more informed decisions when purchasing products.

Policy levers: How will we achieve products policy objectives?

Improving regulatory standards through robust metrics and test standards, and effective and pragmatic enforcement & implementation.

Expanding consumer information to stimulate and guide the purchasing of more efficient products.

Building Higher Energy Performance standards to help maximise the value of the investments detailed in the Clean Growth Strategy and the Ten Point Plan for a Green Industrial Revolution

Voluntary agreements to achieve policy objectives more quickly or at less expense than regulatory requirements.

International initiatives to learn from international best practice and accelerate the pace of raising energy efficiency of products through our leadership.

Financial Incentives to encourage the uptake of the highest efficiency products.

This framework and the measures set out in it provide a starting point for our engagement with stakeholders to begin developing and refining proposals before consultation in 2022 and eventual implementation of some of these policies from 2025. Following publication, we will carry out a programme of workshops to test and refine these proposals and gather further information. To support policy development, we will also undertake further research to ensure final proposals for consultation are based on the best available evidence.

Contents

Chapter 1: Introduction

1.1.1 The Prime Minister's 10 Point Plan for a Green Industrial Revolution committed to publishing a world class Energy-related Products policy framework in 2021.[2] Given that energy-related products (ErPs) account for approximately 55% of the UK's total non-transport in-use energy consumption, improving their efficiency provides an opportunity to cut energy bills, reduce carbon emissions, and facilitate the energy transition to achieve the government's commitment to reduce carbon emissions to Net Zero by 2050.

1.1.2 As well as helping to meet Carbon Budgets, more resource efficient ErPs, which last longer and consume fewer natural resources, do less harm to the natural environment, and contribute to our resource security.

1.1.3 ErP policy has been developed over time in the UK to comprise of both regulatory and voluntary or participatory elements, such as:

- Minimum energy performance standards (MEPS) and other ecodesign requirements, which remove the least energy and resource efficient products from the market;
- Mandatory product labelling, which empowers consumers to purchase the most energy efficient products over the worst performing products from the market and other ecodesign requirements for products;
- The Energy Technology List (ETL),[3] which drives demand from businesses and the public sector for the most energy efficient products; and
- Voluntary Agreements, which are industry-led, self-regulatory initiatives to reduce energy use and lower environmental impacts of products, providing an alternative to ecodesign regulation.

1.1.4 To date ErP policies have been one of the most cost-effective ways to reduce carbon emissions, energy costs and energy demand.[4] These policies can help to drive innovation and bring down energy consumption, whilst also driving down product purchase prices for better performing goods.

1.1.5 In addition, there are industry-led voluntary initiatives aimed at encouraging greater product sustainability and greener consumer choices, such as the Unified Water Label

[2] BEIS, 2020, Prime Minister's Office and 10 Downing Street, The Ten Point Plan for a Green Industrial Revolution. Available at: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution
[3] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/
[4] IEA, 2021, Achievements of appliance energy efficiency standards and labelling programs. Available at: https://www.iea.org/reports/achievements-of-energy-efficiency-appliance-and-equipment-standards-and-labelling-programmes

which provides consumers with information about a product's water and energy efficiency.[5]

1.1.6 In the UK, we estimate that in 2021, MEPS alone provide annual energy bill savings of £75 for the average dual-fuel household and lead to greenhouse gas emission savings of 8 million tonnes of CO2 equivalent (MtCO2e), with a Net Present Value of £1.8bn. In addition, these policies are saving 11% for the average commercial business user's electricity bill and saving 3% for the average industrial user's electricity bill.

1.1.7 To date, increases in the upfront cost of products because of higher energy efficiency have been offset by lower lifetime running costs, meaning that in effect, the energy savings have paid for themselves. As we push products to become even more energy and resource efficient in the future, we will look to test whether this cost recuperation can be reproduced. In any event, higher energy efficiency products should reliably lead to lower energy bills compared to their less efficient counterparts. Furthermore, historically the cost of higher energy efficiency products has come down over time due to innovation, competition, and economies of scale, which has made it easier for consumers to recoup costs through lower lifetime running costs.

1.1.8 Without efficiency improvements achieved since 2000, both energy use and CO2 emissions in 2016 would have been about 12% higher globally. In the UK, energy efficiency for final consumers has improved by around 30% between 2000 and 2018, or around 1.6% per year.[6]

1.1.9 Further, ErP policies have a strong track record of maintaining or enhancing product performance whilst driving up energy efficiency, meaning that end-users have benefitted from products that deliver the same functionality and experience whilst also being cheaper to run and better for the environment. This is a principle that we will maintain as we make future ErP policy, supported by functionality and performance standards to give consumers confidence that energy efficient products are equally, if not more, effective than others.

1.1.10 In addition to energy and carbon savings, future ErP policies can contribute to significant resource savings through encouraging better product design and improvements to air quality. Existing measures in the UK are estimated to lead to a quantified value of £190m in air quality improvements in 2021.

1.1.11 According to the International Energy Agency's (IEA) Sustainable Development Scenario, energy efficiency could deliver more than 40% of the reduction in energy-related greenhouse gas emissions globally over the next 20 years.[7]

1.1.12 The UK has been a strong leader in this space through international engagement and pushing for ambitious yet realistic MEPS and labelling measures, formerly set at the

[5] Unified Water Label. Available at: https://uwla.eu/
[6] Odyssee-Mure Project, 2021, United Kingdom Profile. Available at: https://www.odyssee-mure.eu/publications/efficiency-trends-policies-profiles/united-kingdom.html
[7] IEA, 2020, Energy Efficiency 2020. Available at: https://www.iea.org/reports/energy-efficiency-2020

European Union level through the Ecodesign and Energy Labelling legislative framework.[8,9] Recently, the UK and IEA also launched a Call to Action ahead of COP26, with a key aim 'to drive international ambition which is consistent with the aim of doubling the efficiency of key products sold globally by 2030'.[10]

1.1.13 From 1 January 2021, the UK gained autonomy over its energy-related product standards, subject to the terms of the Northern Ireland Protocol. We used these powers for the first time earlier this year by implementing a new package of ecodesign and energy labelling measures to improve both the energy efficiency and resource efficiency of certain appliances.[11]

1.1.14 Since our exit from the EU, we have been exploring how we can use this autonomy to maximise the benefits of ErP policy by ensuring that products arriving in the UK meet high environmental standards, which do not create unnecessary burdens on business and are cost effective in driving down energy consumption and demand on materials and resources.

1.1.15 The following evidence-gathering exercises have informed our thinking so far about the future of ErP policy in the UK, including the policy levers, potential measures and other proposals set out in this Policy Framework:

- **The Energy-Related Products Call for Evidence (June 2020)**[12] explored how we could improve and expand on ecodesign and energy labelling requirements to save more energy, carbon and resources.
- **The UK Energy-Related Products Policy Study (ErP Policy study)**[13] sought to identify ErPs which have the greatest environmental impact and have the most potential to improve their environmental performance, considering their contribution to carbon emissions and resource depletion.
- **The Waste Prevention Programme for England Consultation 2021**[14] invited views on policies we could explore to incentivise more repair and reuse, as well as driving more resource efficient product design.

[8] Ecodesign Directive (EC) No 2009/125. Available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32009L0125
[9] Commission Regulation (EU) No 2017/1369. Available at: https://eur-lex.europa.eu/eli/reg/2017/1369/oj
[10] HM Government and IEA, 2020, Call to Action Presentation. Available at: https://iea.blob.core.windows.net/assets/92ae8c98-4d66-49c1-aa3b-f4aedf1a5f9d/DrKevinLane%2CInternationalEnergyAgency.pdf
[11] Electronic displays, welding equipment, electric motors, household washing machines/washer-dryers, household refrigeration, household dishwashers, commercial refrigeration, and lighting products.
[12] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence
[13] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[14] Defra, 2021, Waste prevention programme for England 2021. Available at: https://www.gov.uk/government/consultations/waste-prevention-programme-for-england-2021

1.1.16 To increase the efficiency of material usage, as stated in our 2018 Resources and Waste Strategy,[15] we are reviewing the Waste Electronic and Electrical equipment (WEEE) producer responsibility regime to incentivise more sustainable product design and to increase recycling. This will serve as a further opportunity to inform and develop resource efficiency focussed ecodesign and consumer information policies.

1.1.17 To shift the market towards circular economy-orientated product design, a new power is being sought in the landmark Environment Bill which will enable Government to require the provision of product information to consumers.

[15] Defra, 2018, Resources and Waste Strategy for England. Available at: https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england

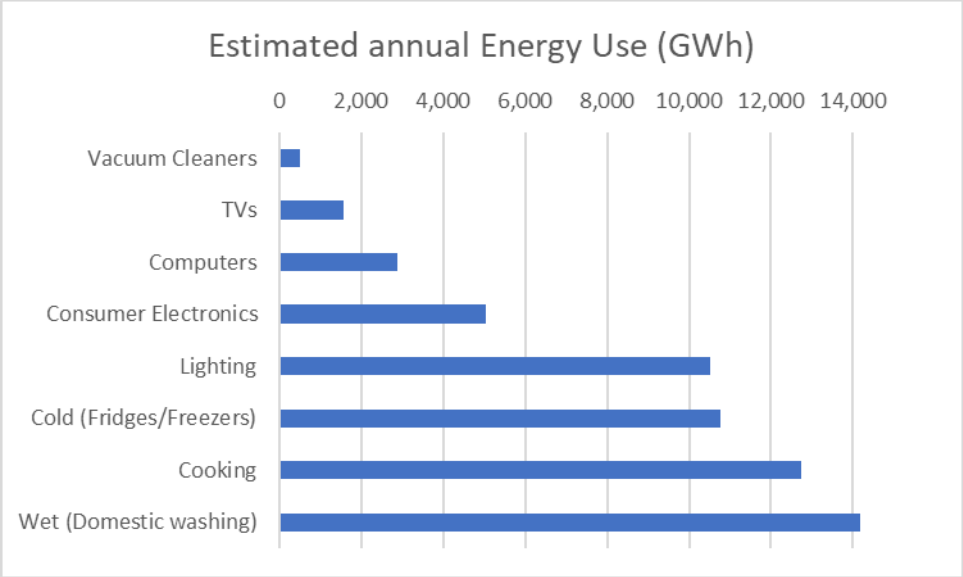
Chapter 2: Objectives

Through developing the policy framework for energy-related products (ErPs), we have determined that our policy must support both the demand and supply of low-carbon and highly efficient products and be guided by several objectives: reducing emissions across the product lifecycle, delivering consumer savings, reducing wider environmental harms by building a more resource efficient and circular economy, and driving innovation.

Chapter 2.1: Reducing in-use emissions

2.1.1 ErPs account for around 55% of total (non-transport) energy use in the UK – approximately 125 million tonnes of CO2 equivalent (MtCO2e) in 2020. Direct emissions from homes and commercial and public sector buildings, where most emissions from ErPs are generated, make up 19% of total UK greenhouse gas emissions. This makes buildings the second largest source of emissions after transport. Products also indirectly contribute to emissions in the power and fuel supply and distribution networks.

Figure 1: Estimated UK population annual energy usage by a selection of product categories, 2019



2.1.2 Delivering our Net Zero target means largely eliminating emissions from products, and from the domestic and commercial buildings where they are used, by 2050. Government has set the Sixth Carbon Budget at 965 MtCO2e,[16] implying a 78% reduction in emissions from 1990 to 2035 and requiring a faster reduction in emissions

[16] The legal limit for UK net emissions of greenhouse gases over the years 2033-37.

compared to existing carbon budgets (fourth and fifth, covering 2023-27 and 2028-32).[17]

2.1.3 Existing minimum energy performance standards (MEPS) for a range of products saved 45 MtCO2e in the UK between 2010 and 2019 and was estimated to have saved 8 MtCO2e in 2020 – the equivalent of the average yearly carbon emissions from the electricity use of 12 million homes.

2.1.4 Energy and resource efficiency will be a critical part of our policy approach across sectors to reduce emissions and manage pressures for decarbonisation in other sectors. Our challenge is to transform how products use energy in line with our Net Zero target. We need to minimise the disruption to consumers and businesses as we go through this change and keep bills affordable, while safeguarding the quality of the environment.

2.1.5 While industry has already made significant progress in this area, our recently published Industrial Decarbonisation Strategy sets out how energy and resource efficiency measures will reduce the level of energy and materials used in production and keep industrial products and materials in use for longer.[18] In addition, the Net Zero Strategy sets out a suite of policies and proposals to reduce emissions across various sector and reach Net Zero.[19] Increasing the energy and resource efficiency of products themselves will be crucial to support industry to reach Net Zero and will reduce the overall cost of decarbonisation by reducing energy consumption and lowering the amount of energy production that needs to be converted to cleaner sources.

2.1.6 The Heat and Buildings Strategy sets out how the UK will decarbonise our homes, and our commercial, industrial and public sector buildings.[20] ErP policy can support reductions in emissions from buildings and reduce demands on the electricity network. With the integration of high volumes of low- carbon power, and increased electricity demand from heat and transport electrification, products will also need to be 'smarter' to help balance this demand. Analysis from the Smart Systems and Flexibility Plan suggests that increased flexibility reduces cumulative system costs by around £30bn in the low demand scenario, and around £70bn in the high demand scenario (2012 prices, discounted) by 2050.[21] The Government will support the uptake of energy smart appliances and enable appliances of different types and from different

[17] BEIS, 2021, Guidance on Carbon Budgets. Available at: https://www.gov.uk/guidance/carbon-budgets#policies-and-proposals-to-meet-carbon-budgets
[18] BEIS, 2021, Industrial Decarbonisation Strategy. Available at: https://www.gov.uk/government/publications/industrial-decarbonisation-strategy
[19] BEIS, 2021, Net Zero Strategy: Build Back Greener. Available at: https://www.gov.uk/government/publications/net-zero-strategy
[20] BEIS, 2021, Heat and Buildings Strategy. Available at https://www.gov.uk/government/publications/heat-and-buildings-strategy
[21] BEIS and Ofgem, 2021, Transitioning to a net zero energy system: smart systems and flexibility plan 2021. Available at: https://www.gov.uk/government/publications/transitioning-to-a-net-zero-energy-system-smart-systems-and-flexibility-plan-2021

manufacturers to interact with each other to increase market penetration of energy smart appliances.

Chapter 2.2: Achieving benefits for consumers, businesses, and the public sector

2.2.1 Energy efficiency improvements to date have significantly reduced the lifetime cost of many products, realising benefits for consumers, businesses, and the public sector.[22] Existing minimum energy performance standards (MEPS) for a range of products are estimated to save £75 on the average household energy bill in 2021.

2.2.2 Historically, the reduction in running costs achieved by MEPS has offset increases in the upfront cost of higher energy efficiency products; and this has led, in effect, to the energy savings paying for themselves. The recent update to ecodesign and energy labelling requirements for household dishwashers demonstrates the role that MEPS can play in reducing consumer energy bills, while recuperating any additional costs associated with purchasing more energy efficient products. As a result of this legislation, we forecast an annual energy saving of 13 KWh per appliance will be achieved, translating into lower energy bills that will ensure the additional cost of purchasing the more efficient products will be recuperated after 9 years on average.

2.2.3 As we push products to become even more energy and resource efficient in the future, we will look to test whether this cost recuperation can be reproduced. For some proposals, running costs will also be determined by other factors such as the relative price of electricity compared to other fuel sources. As outlined in the Heat and Buildings Strategy, we will look at options to shift or rebalance energy levies (such as the Renewables Obligation and Feed-in-Tariffs) and obligations (such as the Energy Company Obligation) away from electricity to gas over this decade.[23] This will include looking at options to expand carbon pricing and remove costs from electricity bills while ensuring that we continue to limit any impact on bills overall. We will continue to review running costs as proposals develop.

2.2.4 Nevertheless, the purchase of higher energy efficiency products should reliably lead to lower energy bills compared to their less efficient counterparts. Further, historically the cost of higher energy efficiency products has come down over time due to innovation, competition, and economies of scale, which has made it easier for consumers to recoup costs through lower running costs. We expect this to hold true when introducing more ambitious energy-related product (ErP) policies in the future, although running costs are also influenced by the price of electricity.

[22] The lifetime cost is made up of the upfront cost you pay in addition to the ongoing cost of energy, as well as other costs, to use a product.
[23] BEIS, 2021, Heat and Buildings Strategy. Available at: https://www.gov.uk/government/publications/heat-and-buildings-strategy

2.2.5 For example, when LED lighting first appeared, the upfront cost compared unfavourably to the alternative products consumers were familiar with. However, as the technology has become more established, prices have fallen fast and, as LED bulbs are expected to last far longer than incandescent or halogen, and use a fraction of the energy, the savings grow year on year. Recent updates to MEPS for lighting and the further proposals included in this framework will all together save £2-3 each year on the average household bill.

2.2.6 We believe there is still potential to lower lifetime costs through improved energy efficiency, in addition to extending the lifespan of appliances, by promoting repairability and durability whilst maintaining competition and consumer choice.

2.2.7 ErP policies are also key to achieving our ambition to support businesses to improve their energy efficiency by at least 20% by 2030. This could deliver up to £6bn in annual cost savings in the commercial and industrial sectors in 2030.[24] Public sector organisations are also successfully reducing energy bills by investing in efficient energy-related products.

2.2.8 Future policy will ensure cost-effective decarbonisation across the system through achieving energy bill reductions, carbon savings and driving innovation to bring down the purchase cost of more efficient products.

2.2.9 Lastly, while the transition to a clean energy system will incur costs, fairness will be at the heart of our approach and energy efficiency will be a key driver in reducing these costs, as set out in the Net Zero Strategy.[25]

[24] BEIS, 2017, Clean Growth Strategy. Available at: https://www.gov.uk/government/publications/clean-growth-strategy

[25] BEIS, 2021, Net Zero Strategy: Build Back Greener. Available at: https://www.gov.uk/government/publications/net-zero-strategy

Investing in energy efficiency to save in the public sector

1. Kent County Council has invested in energy efficient products by converting streetlights to energy efficient Light Emitting Diodes (LEDs). Since 2015, they have converted almost 120,000 lights to LED, reducing energy consumption by 28 megawatt hours (MWh), and reducing carbon emissions by 18,000 tonnes over this period. The new LEDs, along with a central management system, also means that the timing of lights can be controlled, energy use can be monitored, and lighting levels can be optimised.

2. Oxford City Council upgraded its air conditioning systems to save 161tCO2/year and repaid its £45,000 spend in 1.2 years through reduced energy costs.

3. The University of Reading created cost and energy savings by procuring high performing products through the Energy Technology List (ETL). It installed 72 high-efficiency hand dryers, selected directly from products listed on the ETL. These products have delivered attractive financial paybacks in terms of the energy saved. It is estimated that the 72 dryers are delivering total energy savings of £8,000 annually – calculated using Salix Finance's hand dryer calculation tool. These estimated savings represent normal use, rather than based on occupancy during Covid restrictions.

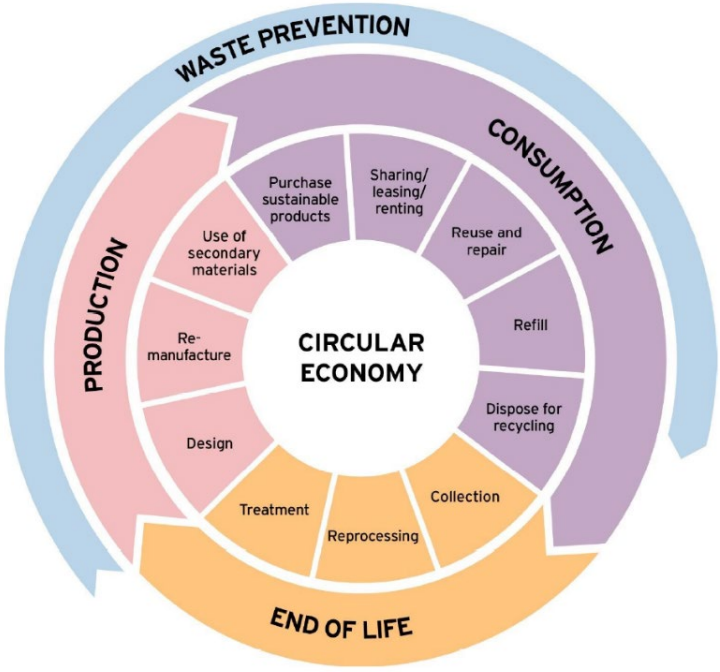
Chapter 2.3: Reduce embodied emissions and wider environmental impacts by building a more circular economy

2.3.1 The UK is committed to moving towards a more resource efficient and circular economy in which products are more durable, repairable, and recyclable. This will optimise the use of material resources by lengthening product lifetimes and ensuring a product's constituent materials can be productively recovered and reused at end of life. In effect, this will reduce waste and its associated environmental impacts; create value in the 'end of life' stage; and benefit consumers through products lasting longer. Taking these steps for energy-related products will:

- Reduce greenhouse gas emissions
- Reduce the pressure on our natural environment
- Help safeguard our resource security
- Increase growth in new sectors
- Enhance competitiveness by keeping products and materials in circulation
- Create jobs at all skill levels

- Give consumers more confidence in the durability and repairability of products they buy, including those that have been remanufactured or refurbished.

Figure 2: Circular Economy Product Lifecycle



2.3.2 New and updated ecodesign measures introduced in Summer 2021 have for the first time included requirements for manufacturers to make spare parts available and replaceable with commonly available tools, as well as to provide information to professional repairers to assist with repairs.[26] These new requirements cover several white and industrial goods and display equipment. The measures will help to establish a 'right to repair' for consumers as part of a more resource efficient economy.

2.3.3 Future products policy will look to optimise the balance of benefits from increasing the energy efficiency of products in use and the benefits drawn from longer product lifetimes which can reduce the replacement rate for products and slow the uptake of more efficient products.

Chapter 2.4: Driving innovation

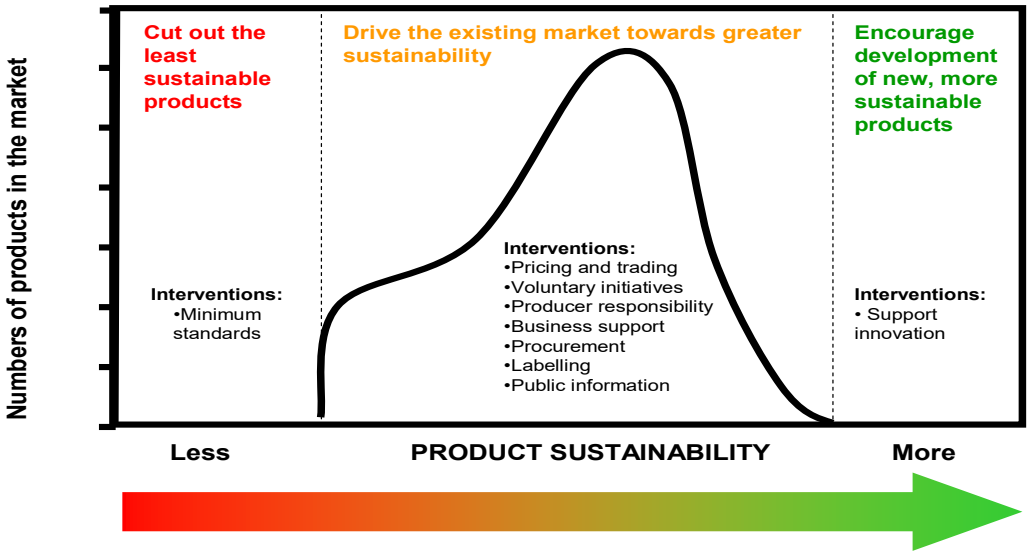
2.4.1 Energy-related products (ErP) policies can help to raise awareness of the savings potential and environmental benefits of purchasing more energy and resource efficient products. Minimum energy performance standards (MEPS) and energy labelling have helped to remove the worst performing products from the market and driven demand for more efficient products. Meanwhile, the Energy Technology List (ETL),[27] a government-approved list of products in the top 25% in terms of energy efficiency, has instilled incentives for manufacturers to research and develop more efficient products

[26] The Ecodesign for Energy-Related Products and Energy Information Regulations 2021, No. 745. Available at: https://www.legislation.gov.uk/uksi/2021/745/contents/made
[27] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/

and to accelerate their entry into the market.[28] Together, these interventions have transformed the market for ErPs, resulting in a higher median energy efficiency. Further, the ETL has provided a testbed for the introduction of energy performance standards for unregulated ErPs, which has a positive spill-over effect in supporting improvements in energy efficiency for the remainder of the market

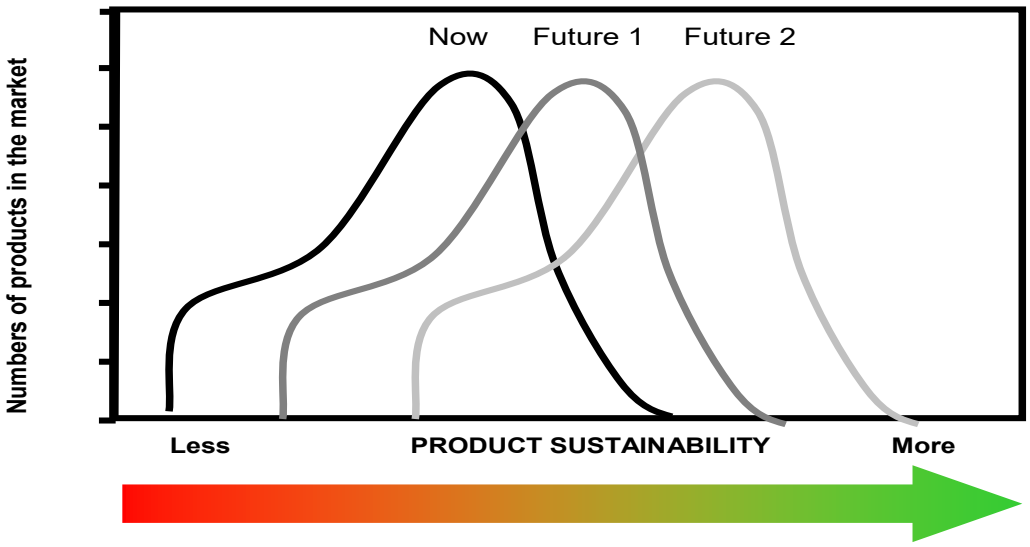
2.4.2 The reductions achieved in running costs and environmental impact of products provides evidence of the diffusion of technological innovations. Existing MEPS for a range of products saved 45 million tonnes of CO2 equivalent (MtCO2e) in the UK between 2010 and 2019 and are estimated to save 8 MtCO2e in 2021. The average dual-fuel household will save £75 on their annual energy bills in 2021 as a result of ErP policies. This 'market transformation' approach is summarised in Figures 3 and 4 below.

Figure 3: Diagram showing the ways in which ErP policies can help to transform product markets.



[28] ECOFYS, 2014, Findings of patent analysis showed role of Ecodesign and Energy Labelling is to promote acceleration of the market diffusion of high-efficiency technologies. European Commission, Impact of Ecodesign and Energy/Tyre Labelling on R&D and Technological Innovation. Available at: https://ec.europa.eu/energy/sites/ener/files/documents/201405_ieel_product_innovation.pdf

Figure 4: Diagram showing the effect of ErP policies on market transformation over time.



2.4.3 Energy efficiency is also changing, with new digital technologies enabling greater control, performance optimisation and analytics. Through technologies that gather and analyse data to make changes to the physical environment and reduce system costs, digitalisation offers the potential to increase the energy efficiency of many products such as heating and cooling in homes. Smart meters, for example, are the key enabler of large-scale domestic demand shifting. The roll out of smart meters and the implementation of market-wide half-hourly settlement enable more granular measurement of energy usage and create opportunities for the increased provision of Time of Use Tariffs. [29] Smart tariffs can unlock the value of smart appliances, which are connected devices that can provide flexible demand by responding to signals and modulating their energy consumptions accordingly. They can unlock the ability of consumers to save money on bills by automatically shifting their demand away from peak periods.

2.4.4 We will seek to support improvements in energy efficiency and system flexibility by focussing on outcomes of cost-effective decarbonisation without restricting the routes to innovation by specifying or choosing suitable technologies.

[29] Ofgem, 2021, Electricity Retail Market-wide Half-hourly Settlement. Available at: https://www.ofgem.gov.uk/publications-and-updates/electricity-retail-market-wide-half-hourly-settlement-decision-and-full-business-case

Chapter 3: Principles

Following our departure from the EU, the UK Government has the opportunity to establish its own process for developing policy and regulation for energy-related products (ErPs), subject to the terms of the Northern Ireland Protocol. As we do this, we will be guided by several principles: open and responsive policymaking, building and preparing markets and infrastructure, enhancing consumer experience, and better regulation. Further, we will consider the potential to embed circular economy principles within ErP policies, including regarding product safety and the presence of hazardous substances which can hinder reuse, repair and recycling.

Chapter 3.1: Open and responsive policymaking

3.1.1 The Government has been clear that it has world leading ambitions on climate and the environment following our departure from the EU, and we have no intention of weakening our current high efficiency standards and environmental protections as an independent actor in this space. We have a long history of environmental protection supported by a strong legal framework which pre-dates membership of the EU, and we will safeguard and improve upon this record.

3.1.2 Beyond our active participation in the development of Ecodesign and Energy Labelling policies, the longstanding and reinvigorated Energy Technology List (ETL), in addition to recent and current economic stimulus schemes are testament to our commitment and ambition to drive innovation and push purchasing behaviour towards more efficient and sustainable products.[30]

3.1.3 Outside the EU, the UK has the opportunity to use independence in policy making to achieve cost-effective decarbonisation outcomes, in line with our own Carbon Budget and Net Zero goals, whilst keeping energy bills low through the transition. Independence in policy making will provide opportunities to tailor and simplify our approach towards those products which offer the best combination of emissions and cost reductions to support our Net Zero Strategy.[31]

3.1.4 Regulatory autonomy increases our capacity to provide certainty to industry and support the supply chain, adapt to developments in technology or consumer behaviour, and ensure we respond quickly and flexibly to reduce emissions and energy bills.

3.1.5 Policies will be developed in partnership with consumer and industry stakeholders and informed by our international relationships to build evidence, demonstrate, and learn from international best practice, and seek to agree international standards where

[30] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/
[31] BEIS, 2021, Net Zero Strategy: Build Back Greener. Available at: https://www.gov.uk/government/publications/net-zero-strategy

possible to avoid regulatory barriers to trade. We will develop requirements and testing standards in cooperation with industry and international partners. More detail on the process for developing policy, legislation, and consulting on this is set out in Chapter 3.5.

Chapter 3.2: Building and preparing markets and infrastructure

3.2.1 Preparing and developing markets for an energy and resource efficient economy is vital and we will need to provide appropriate lead-in time for markets to prepare for new measures to come into force as we develop both the regulatory and voluntary or participatory elements of our policy framework.

3.2.2 The energy system is evolving rapidly as technology advances and consumer behaviour changes. To ensure that the growth in technological innovation goes from strength to strength, we need to ensure markets provide consumers with access to the products and services they want and at fair value.

3.2.3 With the emergence of energy smart appliances and low-carbon heating systems, consumers can engage in the energy market in new and beneficial ways. Within the electricity system, the relative importance of these appliances, in particular higher load devices such as heat pumps and electric vehicle (EV) charge points is expected to grow significantly. Our policy approach will support digitalisation in energy-related products (ErPs) and uptake of smart technologies and systems to further unlock the system-wide benefits of greater flexibility and energy efficiency.

3.2.4 The World Economic Forum estimated that by 2025 a circular approach could benefit the global economy annually by some $1 trillion dollars. Analysis at a national level is more challenging, but Imperial College London recently estimated that embedding circular economy methods could increase the UK's Gross Domestic Product (GDP) by £29bn, or 1.8%, and support 175,000 jobs.[32]

3.2.5 The Government's ambition is to double resource productivity by 2050.[33] To achieve this, manufacturers, the wider supply chain, and the public sector will need to work together to manage the full lifecycle of products and consider how new business models can meet consumers' needs in more environmentally friendly ways. For example, exploring the potential benefits of business models such as those based on leasing or delivering services rather than selling products could improve access to the latest, most energy efficient technology as well as increase resource efficiency by incentivising the durability and repairability of products for longer lifetimes.

[32] All-Party Parliamentary Sustainable Resource Group, 2016, Driving Resource Efficiency across Supply Chains. Available at: https://www.policyconnect.org.uk/research/link-link-driving-resource-efficiency-across-supply-chains
[33] Resource productivity is a measure of the value (in terms of GDP) we generate per unit of raw materials we use in the economy.

Chapter 3.3: Enhancing consumer experience

3.3.1 Alongside reducing carbon emissions and cutting energy bills, supporting a positive consumer experience through meaningful choice of products in the broadest sense is a guiding principle of our approach. This involves allowing markets to meet a range of preferences and providing effective information and intuitive guidance regarding energy and resource efficiency for products.

3.3.2 Consumer information, for example through labelling, can improve understanding and confidence so that consumers feel empowered in their purchasing behaviour. This is likely to increase demand for more efficient products and in turn lead to greater energy, carbon, and bill savings.

3.3.3 Our approach also aims to minimise disruption and inconvenience in the consumer journey towards greater energy efficiency and system flexibility. ErP policies regulate product markets, which means that they focus on what products can or cannot be placed on the market and on other interventions to influence consumer behaviour at the point of purchase. This means that consumers and businesses only engage with these policies at the point of buying a new product or replacing an existing one.

3.3.4 This transformation of energy use in our homes will only accelerate over the coming decade. We will develop policy which is underpinned by consumer research, and which is sensitive to the diverse range of circumstances, preferences, and needs.

3.3.5 ErP policies have a strong track record of maintaining or enhancing product performance whilst driving-up energy efficiency, meaning that end-users have benefitted from products that deliver the same functionality and experience whilst also being cheaper to run and better for the environment. This is a principle that we will maintain as we make future ErP policy, supported by functionality and performance standards to give consumers confidence that energy efficient products are equally, if not more, effective than others.

Chapter 3.4: Better regulation

3.4.1 The Better Regulation Framework is intended to ensure that Government regulation is proportionate and is only used where alternative non-regulatory approaches would not achieve the desired outcomes .[34] The framework enables ministerial decisions to be based on robust analysis of the costs and benefits of different options and means that decision making is clear and transparent.

3.4.2 Regulating business through requirements for product energy and resource efficiency, can help drive productivity and deliver better outcomes for the economy, society and the environment when designed correctly. Minimum standards, labelling or information

[34] BEIS, 2018, Better Regulation Framework. Available at: https://www.gov.uk/government/publications/better-regulation-framework

requirements and other regulatory stipulations in future will be designed in cooperation with consumer and industry stakeholders and be as simple as possible.

3.4.3 Backed by high quality evidence, government continues to promote more efficient regulation and support transparency and accountability for the costs and benefits to business and wider society. This requires a balance of both formal and informal consultation to allow timely input from stakeholders and to facilitate open dialogue between government, industry, and consumers.

3.4.4 We strive to ensure that regulatory interventions are proportionate, targeted, fair, and transparent. We will ensure that alternatives to regulation (such as voluntary standards or incentives) are considered before regulation is introduced, and that regulation is regularly reviewed to minimise unnecessary burden to business.

3.4.5 Where regulation is deemed the most appropriate form of intervention, we will consider the impacts on business and consumers and look to mitigate any disproportionate impacts on particular sectors as well as groups protected under the Equality Act 2010. When making a product specific measure under the ecodesign or energy labelling regimes, there are additional technical requirements including obligations to consult stakeholders, prepare an impact assessment and avoid significant negative impacts on consumers, industry, and product functionality.[35] We will also comply with international agreements including on technical barriers to trade and transparency.

Chapter 3.5: Policy development process

3.5.1 The above principles will inform the process by which we take policy proposals forward, following the publication of this framework. Figures 5 and 6 below outline the high-level process from framework through to policy delivery. Policy proposals which do not require legislation will likely move more quickly from ‘initial policy decision and business preparation’ to application (although this will vary from case to case, depending on complexity).

3.5.2 The process map in figure 5 illustrates the iterative nature of developing ambitious yet credible policy proposals, which will require ongoing and regular engagement between Government and industry, as well as environmental organisations and consumer groups. The publication of this framework will initiate this programme of stakeholder engagement and further research over the remainder of 2021, which will inform the refinement of our illustrative proposals and build up to consultations on final policy options in 2022 and 2023.

[35] Regulation 22 of the Ecodesign for Energy-Related Products Regulations 2010 SI 2010/2617 and Article 11 and 11A of Regulation 2017/1369 setting a framework for energy labelling (Retained EU Legislation).

3.5.3 The process of developing legislation (where this is required) to implement these proposals will be similarly iterative, as shown in figure 6, and will rely on these same strong relationships between Government and stakeholders.

3.5.4 Once the initial policy decision has been taken, Government will then issue a standardisation request (where required), which will define which standards will be required to support the new policy. This standardisation request will initiate a parallel process of standard development, involving the British Standards Institute (BSI), industry representatives and technical experts. We will also explore how best to ensure that stakeholders with a focus on sustainability, environment and consumers are included in this process. The development of any new or updated standard will be an iterative process and will need to interact with the development of the legislation to ensure that the two accurately reflect one another.

Figure 5: Process-map - from the Energy-Related Products Framework to initial policy decision

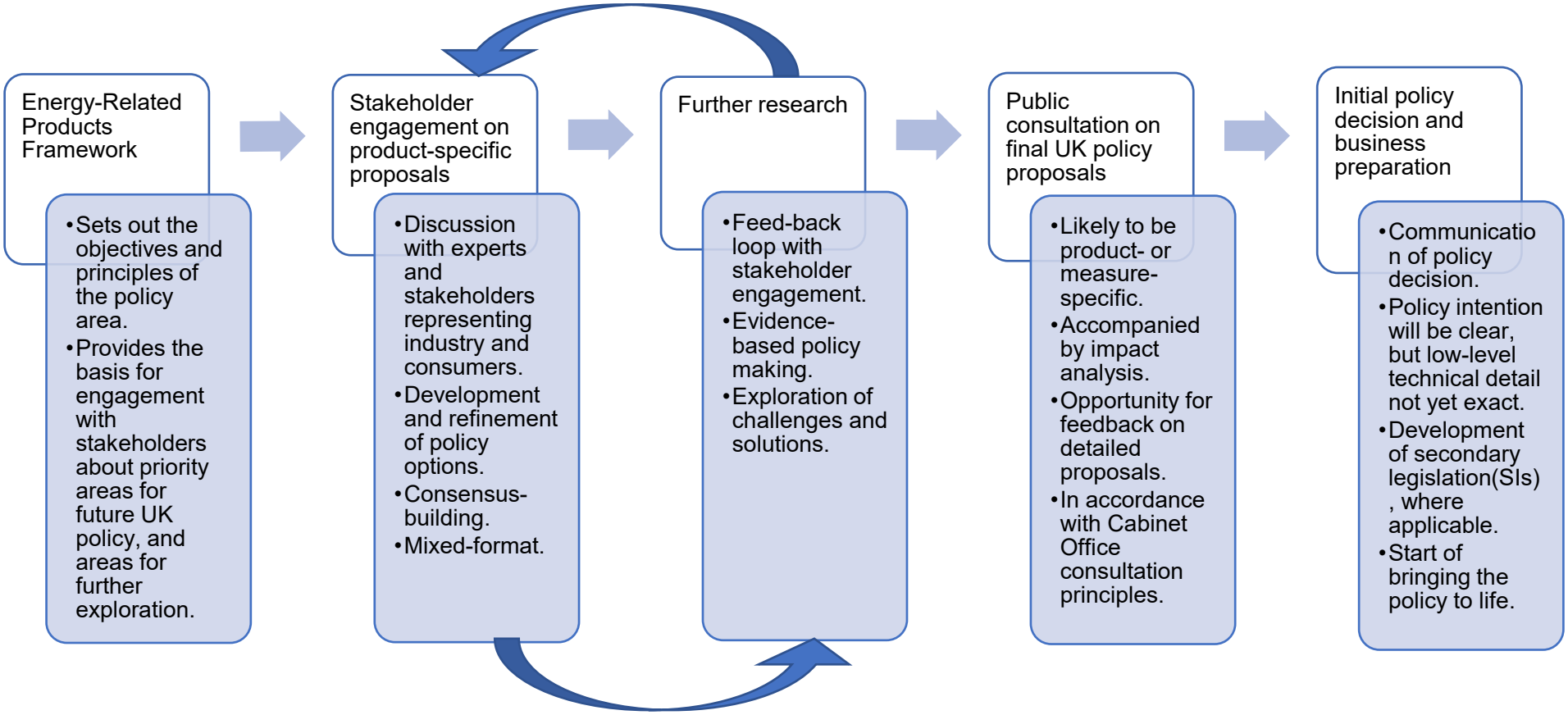
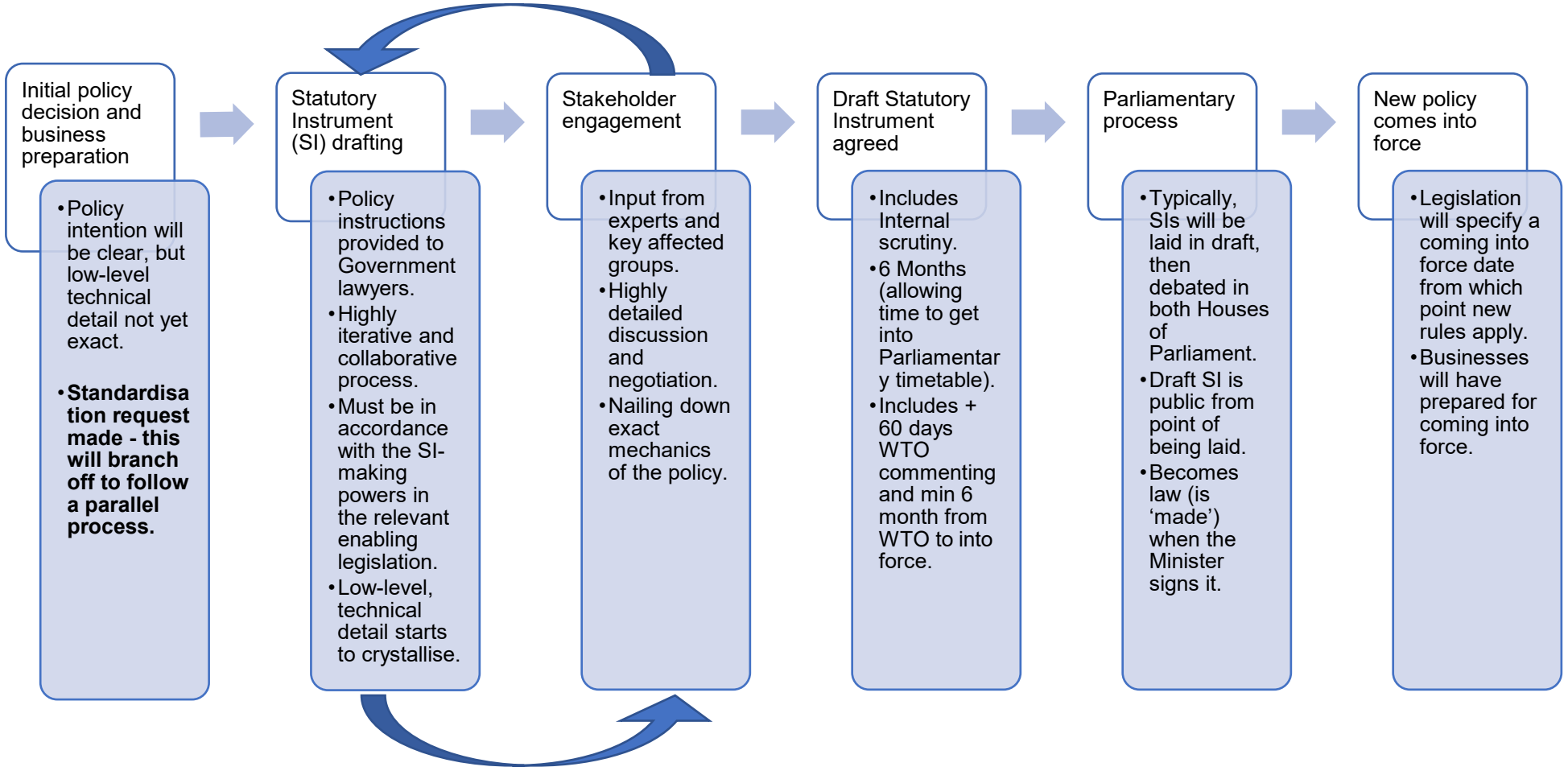


Figure 6: Process map – from initial policy decision to coming into force (legislative policy)



Chapter 4: Policy Levers: How will we achieve products policy objectives?

This section provides an overview of the types of policy levers we will look to use and how they can help to drive improvements in product efficiency and encourage the uptake of more efficient products.

Chapter 4.1: Improving regulatory standards

4.1.1 Ecodesign policy has, to date, set minimum energy performance standards (MEPS) which products must meet when placed on the market from a certain date in order to phase out the least efficient energy-related products on the market. Energy labelling regulation has supported MEPS by helping consumers and businesses to identify the most efficient products.

4.1.2 In addition to energy efficiency, ecodesign requirements can facilitate progress towards a more circular economy by setting requirements relating to a product's resource efficiency at any point in its lifecycle from production to end-of-life. These include materials used, emissions, and waste generation in the production process; durability and repairability during its lifetime; and recyclability and ease of remanufacture as well as material recovery at end-of-life. Ecodesign for energy efficiency as well as resource efficiency represents one of the most cost-effective ways to reduce energy bills and carbon emissions, reduce costs of products to the consumer over their lifetime, and will help the UK in its transition to a low-carbon society.

4.1.3 Where regulation upholds the principles of better regulation and supports cost-effective decarbonisation, it will continue to form an important part of our policy approach and will be underpinned by the following:

Robust metrics and test standards

4.1.4 MEPS and labelling requirements require a technical understanding and approach to products to establish measures which can be implemented consistently. In the past, we have seen how standards which do not reflect the range of product functionality and real-world conditions can result in unintended outcomes. It is therefore, important that measures are underpinned by test methodologies and standards which reflect, as far as is possible, real-life conditions and usage whilst balancing the principles of accuracy, reliability, and reproducibility. Products must also be categorised in an appropriate way for setting thresholds of performance and establishing energy labels. We will look to use relevant international standards as a basis for technical regulations and conformity assessment procedures except where they would be an ineffective or inappropriate means to fulfil legitimate objectives. We will work with the British

Standards Institute (BSI) and stakeholders to develop appropriate standards where none exist which meet the needs of UK policy objectives.

4.1.5 Holding products to functional or performance measurement standards helps to ensure that their effectiveness is not compromised in the process of improving energy efficiency.

Effective and pragmatic enforcement

4.1.6 Once the technical foundations are established, policy can only be truly effective if market surveillance and effective enforcement are carried out. A credible, proportionate, and transparent enforcement regime is a vital part of realising the full benefits of energy-related product (ErP) policies. It ensures a level playing field and gives industry confidence that efforts to support reduced emissions and lifetime costs for consumers are not undermined by non-compliant actors.

4.1.7 The Office for Product Safety and Standards (OPSS) is responsible for enforcing the ecodesign and energy labelling requirements placed on manufacturers and importers across the UK. Trading Standards and the Department for the Economy (NI) enforce the energy labelling requirements placed on retailers in Great Britain and Northern Ireland, respectively. The Advertising Standards Authority (ASA) is responsible for ensuring marketers' UK-wide advertising of energy labelling across various forms of media is in accordance with UK advertising codes.

4.1.8 We are working to create a regulatory environment in which businesses have the confidence to invest and grow and citizens and communities are properly protected. The UK's market surveillance authorities do this by taking a risk-based, intelligence led and responsive approach to all enforcement activities.

Fit for the future

4.1.9 Ecodesign and energy labelling has expanded its scope over time to cover additional product groups with untapped efficiency gains. To deliver effective and efficient regulation we will consider the suitability of the existing regulatory framework to achieve efficient gains at a systems level.

4.1.10 Consideration of some product groups, for example, building automation and controls, water pumps and smart appliances has highlighted the limits of looking only at energy efficiency of standalone devices. Additional energy efficiency potential lies in focusing on the accumulation of energy consumption across several products operating in a system. This can often require consideration beyond the manufacturing stage but also setting rules around installation (or "putting into service") of systems.

4.1.11 Whilst the current regulatory framework has the scope to extend to system level requirements, we will keep the scope of the Ecodesign and Energy Labelling frameworks under review and consider whether any changes are required to achieve

future objectives with respect to systems and other avenues to increase the energy efficiency of products used in domestic and non-domestic environments in the UK. We will also consider whether policy objectives can be better met through other regulatory frameworks such as Building Regulations.

4.1.12 In addition to the resource efficiency information power that is sought in the Environment Bill, which will cover both energy-related and non-energy related products, a separate power is also sought that will enable ecodesign requirements to be set via secondary legislation for non-energy related products. These two powers, along with the ability to set up new extended producer responsibility schemes, facilitate an integrated three-fold approach to product policy for non-energy related products, in which Government will be able to:

- Set product requirements where this is a necessary step in tackling, for example, premature obsolescence and enabling ease of repair.
- Use consumer information schemes to enable consumers to identify resource efficient products and purchase more sustainably.
- Use Extended Producer Responsibility (EPR) schemes to ensure that producers cover the cost of recovery for reuse and recycling, encouraging products to be designed in such a way that minimises these costs.

Achieving products ambition across the whole of the UK

4.1.13 Regulating ErPs offers the potential to make significant greenhouse gas savings that will help limit climate change. There is an urgent need to act now. We will strive to realise the benefits of our approach to energy-related products policy across the whole UK where we can, responding positively to future opportunities. We remain committed to Northern Ireland's unfettered access to the rest of the UK market. Any divergence between the UK and the EU will be managed in accordance with the principle of maximising opportunities for the UK and based on open and transparent communication.

4.1.14 The Northern Ireland Protocol as it currently operates is presenting very significant challenges for people and businesses in Northern Ireland. The Government is seeking to find a new balance in the Protocol to place it on a more sustainable footing. This includes proposals to establish a dual regulatory regime, to ensure that consumers in Northern Ireland do not face barriers in accessing goods from Great Britain, which would enable goods made to UK rules or goods made to EU rules to circulate and be placed on the market in Northern Ireland. The EU has since published proposals in response and we are studying them constructively and positively. Officials are working closely with their EU counterparts and Lord Frost remains in close contact with Vice President Sefcovic.

Chapter 4.2: Expanding consumer information

4.2.1 Supplying consumers and businesses with information in a suitable format increases their knowledge and understanding of the financial and environmental benefits of more efficient and sustainable products. This helps to correct market failures and can stimulate and guide energy and resource efficient purchasing. This, in turn, can encourage the market to shift towards higher levels of efficiency.

4.2.2 To reach net zero, everyone will need to play their part. Efforts will be needed to enable and encourage consumers to make better decisions, which align with reducing emissions and wider environmental impacts. Provision of information about a product's energy or resource efficiency can trigger positive behaviour change.

4.2.3 The energy label is an existing mechanism to provide consumers with easy-to-understand information about a product's energy efficiency at the point of sale and will remain an important part of our policy approach. We will consider improvements to existing labels and whether to expand the range of products covered by energy labelling to further increase uptake of energy efficient products and drive market transformation. We will also consider in due course how product information or labelling could be used to enable informed purchasing decisions regarding resource efficiency, for example repairability.

4.2.4 Other initiatives to promote and communicate the benefits of energy and resource efficiency also exist. As part of this framework, we will explore the effectiveness of other tools to raise awareness and educate consumers, such as Government and retail-led guidance and targeted communications campaigns.

Chapter 4.3: Building High Energy Performance Standards (HEPS)

4.3.1 HEPS can provide a very effective way to encourage investment in energy efficient equipment. HEPS have been a longstanding policy tool in the UK set through the energy saving criteria of the Energy Technology List (ETL) which was launched in 2001 and is a government endorsed list of some of the most energy efficient plant and machinery for businesses and the public sector.[36] Products must meet these criteria to qualify as an ETL listed product.

4.3.2 Currently the ETL sets criteria for 56 technologies with approximately 10,000 products listed and offers an easy-to-use procurement tool and low-carbon information source for energy managers, procurement professionals, facilities managers and a wide variety of other professions and organisations. It gives the added reassurance to purchasers of measured and verified energy performance and can help to maximise

[36] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/

the value of business and public sector procurement. The recently added Application Programming Interface (API) functionality widens the opportunity for procurers to source products from the ETL, and for organisations to integrate with the ETL dataset within their procurement processes. Professional Food Service Equipment will be added to the ETL along with 4 other sub-categories of products, expanding the ETL's offering to cover more products.

4.3.3 The ETL can play an important role in helping to achieve ambition to improve the energy efficiency of businesses by at least 20% by 2030, and deliver emissions and bill savings for businesses and the public sector.[37] If, for the included technologies, only products on the list were purchased, this would achieve energy savings of 21 terawatt hours (TWh) and emissions savings of 5 million tonnes of CO2 equivalent (MtCO2e) in 2021, equivalent to the carbon emissions from electricity use of over seven million homes. Depending on the level of uptake of the ETL, we estimate that the scheme could deliver between 0.7 and 1.8 MtCO2e during Carbon Budget 5.

Chapter 4.4: Voluntary agreements

4.4.1 Self-regulation is a possibility when manufacturers of particular products can agree to act to collectively improve the energy and resource efficiency of their products. Self-regulation has the potential to achieve policy objectives more quickly or at less expense than mandatory requirements. It can also be an effective precursor to regulation and enable efficiency improvements in new and growing product markets to be realised ahead of potential future regulation.

4.4.2 This notion was embraced by the EU policy approach with the first voluntary agreements for products now recognised. Having left the EU we now have the opportunity to go further and we will continue to explore opportunities to secure further agreements. Industry sectors may also propose voluntary agreements (VAs) as alternatives to potential regulations and we will develop and review evidence of the emissions, wider environmental impacts and cost saving potential of such agreements.

4.4.3 The participation of a wide range of stakeholders including governments, non-governmental organisations, businesses, and consumer organisations will be essential for the successful design, implementation, monitoring and enforcement of voluntary schemes. To ensure voluntary agreements are effectively designed and implemented, we propose that they follow certain principles outlined below. These are principles which apply to existing VAs, and we believe they provide a sensible model to follow;

[37] BEIS, 2017, Clean Growth Strategy. Available at: https://www.gov.uk/government/publications/clean-growth-strategy

- Openness of participation;
- Added value;
- Representativeness or market share of participants;
- Quantified objectives with interim stages;
- Involvement of civil society;
- Monitoring and reporting;
- Cost-effectiveness of administering a self-regulatory initiative;
- Consistency with sustainability; and
- Compatibility of incentives.

4.4.4 Where there is potential for carbon savings, environmental improvements, and consumer rewards we will look to voluntary agreements as an option to raise standards across product markets. We invite manufacturers, trade associations and other stakeholders to come forward and work with us to put these in place.

4.4.5 Voluntary initiatives could also be an effective lever to encourage other key influencers of the procurement and use of energy-related products to opt for highly energy and resource efficient products – for example, architects, building owners, installers, or facilities maintenance companies.

Chapter 4.5: International initiatives

4.5.1 The UK has always taken a leading role in policies to protect the climate and environment but recognises that addressing the climate crisis will require more than national governments. Our vision is to learn from international best practice and accelerate the pace of raising energy and resource efficiency of products in other countries by the power of our example and leadership, in line with technical potential. This can rapidly increase the average efficiency of products sold.

4.5.2 As COP26 President, the UK wants to drive international action on product energy efficiency policy. Ahead of COP26, the UK and International Energy Agency (IEA) have launched a call to action to strengthen the Super-efficient Equipment and Appliance Deployment (SEAD) initiative to support countries in achieving raised ambition more quickly, easily and at a lower cost. Beyond COP26, we would like to work together with other countries to achieve a harmonised approach to developing, setting and raising standards for the highest energy consuming products, and we already participate in the Energy Efficient End-use Equipment (4E) platform to support this aim.

4.5.3 In a world of limited resources and climate change, where energy consumption is expected to increase by 10% by 2030, there has never been a greater need for such efficiency improvements.[38] By working toward ambitious global efficiency requirements, for example if the current most stringent MEPS had been implemented globally from 2020, then annual gross energy savings of 14% (7,600 terawatt hours (TWh)) could still be achieved by 2030 compared to a business-as-usual scenario. This would be equivalent to 5-6% of total global final energy consumption in 2030.[39]

4.5.4 In addition to promoting emissions and consumer savings from products internationally through the power of our example and effective diplomacy, climate finance and aid also have roles to play. Through the $5.4 billion Clean Technology Fund (CTF) for which the UK is a funding partner, we are empowering transformation in developing countries by providing resources to scale up technologies with significant potential for long-term greenhouse gas emissions savings, renewable energy, energy efficiency, and clean transport. This is expected to leverage another $47 billion in co-financing from other sources. The short timescale for payback which energy efficiency investments such as highly efficient products offer has been key in leveraging co-financing.

Chapter 4.6: Financial and fiscal incentives

4.6.1 Responses to the energy-related products (ErP) Call for Evidence showed support for financial and fiscal incentives to drive investment in energy efficient products and encourage consumers to purchase more energy efficient products.[40] As highlighted in the ErP Policy Study,[41] these types of incentives only work either when there are “clear winners” or when there is a way to distinguish the efficiency of products for example through energy labels or endorsement schemes such as the Energy Technology List (ETL).[42]

4.6.2 Government will continue to keep the case for targeted incentives under review to encourage the adoption of the highest performing products, in the context of upcoming fiscal events.

4.6.3 We will also consider the case for innovation funding to support market transformation, in line with higher performance standards. For example, if we decide to set ambitious minimum energy performance standards for space heating, we could consider targeted

[38] IEA, 2020, World Energy Outlook 2020: Stated Policies Scenario. Available at: https://www.iea.org/reports/world-energy-outlook-2020
[39] European Commission, 2015, Cost of Non-World Study. Available at: https://ec.europa.eu/energy/sites/default/files/documents/Cost%20of%20Non-World%20-%20Final%20Report.pdf
[40] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence
[41] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[42] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/

innovation support to help deepen the range of commercially available products that meet these standards.

Chapter 5: Potential measures – product-specific illustrative proposals

This section sets out illustrative proposals for specific products. These are not final proposals but are a starting point for engaging with relevant stakeholders before proposals are refined further and subjected to consultation.[43]

Chapter 5.1: Hydronic Space Heating (Domestic)

Context

5.1.1 Heating buildings accounts for 79% of building emissions and 23% of total UK emissions.[44] To reach Net Zero, we need to virtually eliminate all carbon associated with heating our buildings. There are currently around 1.7 million fossil fuel boiler installations every year,[45] and as set out in the Heat and Buildings Strategy we intend to phase out the installation of new gas boilers from 2035 once costs of low-carbon alternatives have fallen.[46] A mix of technologies will be required to decarbonise heat including heat pumps, heat networks and potentially hydrogen.

5.1.2 The Heat and Buildings Strategy sets out the immediate actions we will take for reducing emissions from buildings.[47] We want to give households, suppliers, installers, and equipment manufacturers long lead times to prepare for this transition. We will target the point of least disruption to consumers by looking to use natural trigger points, such as the replacement cycle for existing heating systems.

5.1.3 In any scenario, we know heat pumps will have a major role to play in heating our buildings in 2050. The Prime Minister's Ten Point Plan for a Green Industrial Revolution therefore set out our ambition to reach 600,000 heat pump installations per

[43] Where values are referenced to the ErP Policy Study, note that due to the large number of products assessed during the study, these are high-level estimates based on limited evidence and simple assumptions. This reduced the robustness of the analysis, which can be considered a limitation to the study. Further research is recommended to fully evidence technology specific policy options.
[44] BEIS, 2021, 'Final UK greenhouse gas emissions national statistics: 1990 to 2019' (https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2019) and BEIS, 2020, 'Energy Consumption in the UK' (https://www.gov.uk/government/statistics/energy-consumption-in-the-uk). This figure includes indirect and direct emissions but excludes international aviation and shipping.
[45] BSRIA, 2020, UK Domestic boilers market analysis. Available at https://www.bsria.com/uk/product/nEjGED/domestic_boilers_world_market_for_heating_boilers_2020r2019_8a707622/
[46] BEIS, 2021, Heat and Buildings Strategy. Available at https://www.gov.uk/government/publications/heat-and-buildings-strategy
[47] BEIS, 2021, Heat and Buildings Strategy. Available at: https://www.gov.uk/government/publications/heat-and-buildings-strategy

year by 2028.[48] In addition, the UK Hydrogen Strategy, published in August 2021, set out our plan to both develop a thriving low-carbon hydrogen sector in the UK and to take strategic decisions on the role of hydrogen for heating by 2026.[49]

5.1.4 However, in the coming decade, we still expect the installation of over 10 million boilers that will be burning natural gas when fitted into homes. It is therefore right that we consider appropriate measures to ensure these installations will save consumers money and reduce carbon emissions where possible and support the overall transition to low-carbon technologies.

5.1.5 We aim to shortly consult on proposals related to the future of boiler and heating system efficiency and explore the best ways to reduce carbon emissions from our gas heating systems over the next decade. This consultation will also consider the case for enabling, or requiring, new natural gas boilers to be easily convertible to use hydrogen ('hydrogen-ready') by 2026. This document considers how product standards might be used as part of this overall effort.

All hydronic space heating systems

Energy label

5.1.6 The current regulation requires individual appliances to be energy-rated on a scale from A++ to G. [50] New gas boilers are rated A or below, while technologies such as standalone heat pumps are rated A+ to A++.

5.1.7 As set out in chapter 6.2, we are keen to explore whether rescaling energy label classes to better reflect the relative efficiency of products could be a way to improve the effectiveness of labels. For the space heating label, this might include reducing the overall number of rating classes, removing classes for products below established minimum standards and resetting the top class to start at A. This would mean the most efficient systems – such as some heat pumps – score an A whilst other less efficient technologies would achieve a lower rating. Modern condensing gas boilers, which today are typically given an "A" rating, would therefore achieve a lower rating under the re-scaled system.

5.1.8 A simplified rating system starting with "A" as the highest rating could be less confusing to consumers. Similarly, reducing the rating of traditional technologies may aid public communication regarding the overall contribution of heating systems to our carbon emissions, and the need for action. BEIS' 'Transforming heat: public attitudes research' (2020) found that there was a slight disconnect between knowledge and

[48]BEIS, 2020, Prime Minister's Office and 10 Downing Street, The Ten Point Plan for a Green Industrial Revolution. Available at: https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution

[49] BEIS, 2021, UK hydrogen strategy. Available at https://www.gov.uk/government/publications/uk-hydrogen-strategy

[50] Commission Delegated Regulation (EU) No 811/2013. Available at https://www.legislation.gov.uk/eur/2013/811.

actions required to decarbonise heat. The public was consistently supportive of policies aimed at reducing carbon emissions and viewed the UK achieving a substantial reduction in carbon emissions as important. However, self-reported knowledge/awareness, when focused specifically on heating technologies especially, was relatively low.[51] Making the difference between the efficiencies of the products clearer could support an improvement in consumer understanding.

5.1.9 We would also be interested in understanding whether displaying more information on labels could make them more helpful for consumers and installers. This could include requiring that the full modulation range of space heating appliances be included on the label, which could support the boiler being set up appropriately to deliver against the appropriate space heating demand of homes.

Testing regime

5.1.10 The overarching aim of the testing regime must be to provide useful information about the likely real-life performance of the tested products. We are aware there may be potential to improve the current regime so that it gives better indications regarding real-world use.

5.1.11 Current boiler testing regimes test the boiler at full and part load, yielding a picture of how the boiler performs on average across these conditions. However, in-home use may often not reflect these conditions. This might be due to boiler sizing, patterns of energy use and the integration of the appliance within the full heating system and controls.

5.1.12 We are keen to explore options for improvements to the testing regime, to make tested outcomes more reflective of the likely real-world efficiency. This would require the testing regime to better link to in-home parameters. We would be interested to hear stakeholder views on how this might be achieved – including through variations to the range of test conditions and variables.

Real time performance monitoring

5.1.13 Regardless of potential improvements to the testing regime, there will always be limits in the extent to which controlled testing can reflect the real-world performance of a given system in each home.

5.1.14 Real time information can be vital in helping customers understand how their system is operating, and in supporting consumers and technicians respond to

[51] BEIS, 2020, Transforming heat: public attitudes research. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/913541/transforming-heat-public-attitudes-research-report.pdf

underperformance. In aggregate, the gathered data may also support the review and adaptation of tools and processes such as the testing regime.

5.1.15 We are exploring the option of requiring all new heating appliances/control systems to make real time information on the efficiency of the systems readily available to consumers, and crucially, the percentage of energy input into the appliance that is converted into useful heat. We would like to explore the appropriate inputs to calculating such efficiency measures; the appropriate technological solutions for collecting and displaying this information to consumers; the appropriate time periods over which such information should be required to be calculated – for example, by day, month, and year, and how long such information should be stored and be accessible for.

5.1.16 Equally we are exploring the role manufacturers might play in collecting such information and any appropriate means for sharing this with Government and other stakeholders in aggregate form (and in accordance with all relevant data protection provisions).

Heat pumps

5.1.17 Heat pumps are subject to a minimum Energy-related Product (ErP) efficiency limit under Ecodesign regulation.[52] This ErP metric expresses energy efficiency in primary energy terms, allowing comparison of different technologies using different energy sources. Since 2017, air source heat pumps and ground source heat pumps have had to meet a minimum ErP of 110% or 125% for space heating applications, depending on whether it is a high or low temperature heat pump. These limits are comparable to a Seasonal Coefficient of Performance (SCOP) of 2.9 and 3.1.

5.1.18 Our ErP Call for Evidence asked respondents if better measures could be set to improve product design and whether different product standards are required for high or low temperature heat pumps.[53] Several respondents felt better minimum energy efficiency standards (MEPS) would be possible and effective but felt system issues such as grid capacity and local network resilience would need to be considered as well. Most respondents also disagreed with the suggestion that different product standards should be applied to higher temperature heat pumps, which may be used in hard-to-treat homes.

5.1.19 Globally, the International Energy Agency (IEA) indicate that the typical seasonal performance factor of heat pumps – an indicator of average annual energy performance – has increased steadily since 2010 to nearly 4.0 today for most space heating applications. [54] It is common to reach factors of 4.5 or higher, especially in relatively mild climates such as the Mediterranean region and central and southern

[52] Commission Regulation (EU) No 813/2013. Available at https://www.legislation.gov.uk/eur/2013/813/contents.
[53] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence
[54] IEA, 2020, Heat Pumps. Available at https://www.iea.org/reports/heat-pumps.

China. Conversely, in extremely cold climates such as northern Canada, low outside temperatures reduce the energy performance of currently available technologies to around 3.0-3.5 on average over the winter season.

5.1.20 In the UK, performance will be impacted by a variety of different conditions. Responses to the ErP Call for Evidence mentioned that average heat pump efficiency in the UK for space heating is higher than the current MEPS.[55] In addition, the ErP Policy Study highlighted that there is potential to improve product efficiency and achieve up to 40% savings for heat pumps through expanding and optimising the systems and lowering the maximum flow temperature of the heating distribution system.[56] Not all these efficiency improvements will be possible through raising MEPS but given the average heat pump efficiency in the UK is above the current Ecodesign MEPS, we will explore the feasibility of raising MEPS further and consider implications on affordability of heat pumps.

5.1.21 Responses to the ErP Call for Evidence also highlighted the importance of using test standards which reflect real-world usage and the efficiency of the system. Currently heat pumps are tested according to BS EN14825:2016 for compliance with the Ecodesign regulation. We will consider which are the most appropriate standards to use to measure the efficiency of products including whether BS EN15316-4-2:2017 would be appropriate, as this takes into account UK climatic data and the heat loss of the building.

5.1.22 The proposal below is illustrative and for simplicity the limits are based on the existing regulation's primary energy factor of 2.5.[57] When deciding on actual limits, we will need to consider how we revise this factor to allow comparison between heat pumps and space heaters that use other fuel sources. Whilst we recognise that the illustrative proposal below may not be achievable for all types of sub-technologies and there may be a need to distinguish between technologies when setting MEPS, responses to the ErP Call for Evidence also emphasised the need to maintain a level playing field for heat pumps. We will need to ensure there is evidence supporting the delivery of carbon savings and consumer benefits.

[55] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence
[56] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[57] Commission Regulation (EU) No 813/2013. Available at: https://www.legislation.gov.uk/eur/2013/813/contents.

Illustrative proposal

We will explore the feasibility of raising MEPS for heat pumps to 130% ErP in 2025, rising to 160% ErP by 2030,[58] equivalent to a SCOP of 3.5 – 3.9.[59]

Table 1: Illustrative proposal for improving heat pump efficiency from 2025

Improvement in real-world system efficiency	Estimated CB5 electricity savings (GWH)	Estimated CB5 saving (MTCO2e)
10%	8,700	1.0
20%	17,300	2.0
30%	26,000	3.0

Boilers

'Hydrogen-ready'

5.1.23 'Hydrogen-ready' refers to appliances that are designed to run on hydrogen, but initially configured to run on natural gas and may have a supportive role in preparing homes for a potential future transition to hydrogen for heating. These appliances are likely to require a minimum number of components to be changed at the point of switchover but will have been specifically developed to facilitate this process. Any hydrogen-ready boilers installed in homes will therefore continue to burn natural gas until a potential future conversion.

5.1.24 The BEIS-funded £25m Hy4Heat programme,[60] which is due to end this year, has supported the development and demonstration of hydrogen-ready boilers. As set out above, we aim to shortly consult on proposals related to the case for enabling, or requiring, new natural gas boilers to be hydrogen-ready by 2026.

5.1.25 One approach to implementing a requirement that all gas boilers be hydrogen ready would be to utilise product standards. We will explore implementation options further as part of the upcoming consultation.

[58] These limits are based on calculating Seasonal Space Heating Energy Efficiency with a Primary Energy Factor of 2.5.
[59] The range in savings represent the range in achievable minimum performance standards with 160% being the maximum.
[60] BEIS, 2017, Hy4Heat: hydrogen for heating demonstration programme. Available at https://www.gov.uk/government/publications/hydrogen-for-heating-project

Efficiency

5.1.26 The boiler consultation will include proposals on boiler and heating system efficiency and explore the best ways to reduce carbon emissions from our gas heating systems over the next decade. It will consider the findings of the recently published Boiler Plus Review,[61] including the different energy efficiency technologies available and factors such as correct installation, operating at low flow temperatures and improved heating system maintenance, which can all influence heating system efficiency. The appropriate policy levers for delivering changes will be considered as part of that consultation.

5.1.27 This section considers the potential for using product standards as part of this overall effort.

5.1.28 Since condensing boilers became mandatory through amendments in Building Regulations introduced in 2005,[62] gas boilers sold in the UK have had higher minimum efficiency requirements than those demanded by the Ecodesign regulation. The Boiler Plus Standards (2018),[63] applicable in England, go further, and, through statutory guidance, set a minimum ErP efficiency standard for all new replacement gas boilers in domestic dwellings at 92%,[64] 6%-points higher than the Ecodesign minimum requirements. The Boiler Plus Standards also require an additional energy efficiency measure to be installed alongside combination gas boilers. A review into the impacts of the Boiler Plus Standards since their introduction was recently published.

5.1.29 In our recent ErP Call for Evidence, we explored whether we could set higher MEPS for boilers. Several respondents expressed the view that higher MEPS alone are not a solution to bringing forward low-carbon heating technologies. They felt that due to multiple variables (for example, the energy use of the home in question, control mechanism and consumer usage), the relative merits of heating options cannot be adequately captured through the single measure of tested efficiency expressed through MEPS. However, others thought MEPS could form a part of our overall approach to support market transformation.

[61] BEIS, 2021, Boiler Plus: Initial Policy Review. Available at: https://www.gov.uk/government/publications/boiler-plus-initial-policy-review

[62] Office of the Deputy Prime Minister, 2005, Guide to the Condensing Boiler Installation Assessment Procedure for Dwellings. Available at: https://www.gov.je/SiteCollectionDocuments/Planning%20and%20building/ID%20AssessmentGuidetoCondensingBoilerInstallationinDwellings%2020100910%20mm.pdf; Office of the Deputy Prime Minister, 2006, Domestic Heating Compliance Guide (First Edition - May 2006). Available at: https://webarchive.nationalarchives.gov.uk/20141202124404/https://www.planningportal.gov.uk/uploads/br/BR_PDF_PTL_DOMHEAT_2006.pdf

[63] BEIS, 2017, Boiler Plus Consultation Response. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/651853/Boiler_Plus_final_policy_and_consultation_response.pdf

[64] Commission Regulation (EU) No 813/2013. Available at: https://www.legislation.gov.uk/eur/2013/813/contents.

5.1.30 The energy-related products (ErP) Policy Study concluded that there is still potential to improve boiler efficiency.[65] We are aware that some products and product packages available advertise an efficiency above 92%. One option available to Government could be to further raise MEPS for gas boilers or gas boiler product packages. An illustration of an option based on raising MEPS by drawing on the Energy Labelling product package approach is set out below.

Illustrative proposal

Improving Boiler MEPS – A potential option could be to raise MEPS to a level above 92% ErP for gas boilers/gas boiler product packages. This might require the incorporation of additional energy saving technologies within the boiler, or alongside the boiler as part of the system.

5.1.31 Currently, some products available advertise efficiency above 92%. This is often achievable via the Energy Labelling Regulation[66] which requires a package energy label where boilers are installed with combinations of different temperature controls or solar devices. The regulation defines eight different classes of temperature control, with each class of control allocated an efficiency uplift. The package efficiency is given by adding the ErP efficiency of the boiler to that of the controls. Manufacturers are thus able to advertise boilers with higher package efficiency than that of the boiler alone, which are often between 92% to 94% ErP.

5.1.32 While heating controls can help to improve the performance of the boiler heating system, we are aware that the interoperation of boiler and controls, and real-world factors, will impact the efficiency gains in any given case and real-world savings could be above or below the savings suggested by the addition of ErP ratings.[67]

5.1.33 Further investigation will be required to understand the real-world improvement potential from these controls and the associated energy and carbon savings, and we will look to ensure that actual benefits and cost implications for consumers would be realised, and carbon savings delivered, before pursuing these options.

5.1.34 We estimate that every percentage improvement in system efficiency achieved could translate to a 0.6 MtCO2e carbon saving over CB5. Table 2 shows the potential impact of an illustrative range of improvements in system efficiency from 1%-3%.

[65] The report concluded that boilers could achieve between 1-3% savings. This figure is based on products on the Energy Technology List which advertise 95% efficiency.
[66] Commission Delegated Regulation (EU) No 811/2013. Available at: https://www.legislation.gov.uk/eur/2013/811.
[67] BEIS, 2021, Boiler Plus: Initial Policy Review. Available at: https://www.gov.uk/government/publications/boiler-plus-initial-policy-review

Table 2: Illustrative proposals for improving heating system efficiency from 2025

Improvement in real-world system efficiency	Estimated CB5 gas savings (GWH)	Estimated CB5 saving (MTCO2e)
1%	3,400	0.6
2%	6,800	1.2
3%	10,200	1.9

5.1.35 We are keen to understand stakeholder views on the use of a minimum package efficiency as a route to realising efficiency benefits and how they may encourage further innovation.

Moving above 100% efficiency

5.1.36 Our current policies and proposals under development aim to support delivery against the aim of reaching 600,000 heat pump installations per annum by 2028, supporting the roll out of green heat networks, and building towards strategic decisions on the role of hydrogen by 2026. As set out in the Heat and Buildings Strategy, from 2035, once the costs of low-carbon alternatives have come down, we will phase out the installation of new natural gas boilers.[68]

5.1.37 Higher MEPS for all space heating appliances may support these policies and help with a market transformation towards more efficient and lower carbon solutions over time. For traditional heating appliances, such as gas boilers, MEPS above 100% in some cases could allow for the incorporation of a renewable element to improve the efficiency of the heating system. Subject to strategic decisions on the role of hydrogen, this lever could allow for continued deployment of heat pumps and may also support the development and deployment of hybrid heating systems and technologies, such as heat pumps operating alongside or integrated within traditional gas boilers. Existing market offers include hybrid heat pumps integrated through a single set of controls or combined into a single unit, which advertise energy efficiency levels of greater than 130%. A broader range of technologies would also be deployable under such an option, including the incorporation of solar and heat storage technologies.

5.1.38 Pursuing an approach which could lead to increased deployment of hybrid technologies also raises strategic questions. Hybrid technologies may have some benefits versus traditional technologies and may be more deployable than fully low-

[68] BEIS, 2021, Heat and Buildings Strategy. Available at https://www.gov.uk/government/publications/heat-and-buildings-strategy

carbon alternatives – such as standalone heat pumps. However, any option that supports widespread deployment of hybrids later in the 2020s would need to work alongside both hydrogen and heat pumps pathways.

5.1.39 We want to understand stakeholders' views on the illustrative option below, before deciding whether it should be developed further alongside existing commitments and when such an option could be implemented. Illustrative Carbon Budget 5 estimates have been provided in Table 3 if new sales of heating appliances were required to meet a minimum efficiency above 100%.

Illustrative proposal

We are exploring whether a future principle should be for all new space heating systems to achieve MEPS above 100% ErP.

Raising boiler MEPS beyond 100%
The extent to which higher efficiency standards leads to improvements in real-world performance is uncertain. As an illustration, were these standards to lead to improvements of 10%, 20% and 30% it would lead to CB5 savings as shown in **Table 3.** The savings are also driven by the policy start date. Due to the early stage of this analysis, estimates do not include the difference in costs of products that meet the new standards. This will be explored as the policy develops, as will the potential interactions with other heat policies including the possible carbon savings.

Table 3: Illustrative proposals for improving heating system efficiency beyond 100%

Improvement in real-world system efficiency	**Estimated CB5 saving (GWH)**	**Estimated CB5 saving (MTCO2e)**
10%	18,000	3
20%	37,000	7
30%	56,000	10

5.1.40 The table above gives an illustration of potential savings from a policy of this sort. However, the interactions between such a policy and wider heat and buildings policy would need to be more fully considered before more certain estimates of the additional savings such a policy might deliver as part of the overall package are possible.

5.1.41 Respondents to our ErP Call for Evidence raised concerns around the increased costs to consumers and the increased complexity of installations under this type of option. We want to understand stakeholder expectations around the potential for cost reductions with increased competition and economies of scale, as any future policy

would need to be consistent with our commitment to keeping consumer bills down. We would also need to consider what complementary actions would be required to support deliverability.

5.1.42 Any proposal in this area would also need to ensure sufficient lead times for manufacturers to invest in developing and refining these technologies, and we would be keen to hear stakeholder views on the necessary lead in times for any such policy.

5.1.43 We also want to understand the performance of the hybrid products that a policy of this type might bring forward in a range of real-world conditions, to gauge what level of carbon and energy savings could be achieved. Finally, we want to understand consumer experience of these products to ensure that people realise the benefits they offer.

Oil, coal and LPG

Alongside the publication of the recently published Heat and Buildings Strategy, we are planning to consult on new regulations to phase out high carbon fossil fuel heating (i.e., systems which use oil, coal, or LPG) in homes off the gas grid this decade. **We will consider if setting MEPS above 100% across all domestic space heating could form part of the policy mix needed to deliver this phase out.**

Hot Water Storage Efficiency

5.1.44 Thermal stores are used with several heating technologies, most commonly with regular and system boilers. They are also required to be fitted alongside low-carbon heat pumps. The 2017 Boiler Plus Consultation found that efficiency savings in homes using system boilers could be achieved through changes to the hot water tank.[69] These tend to include cylinder insulation or a cylinder thermostat which can have a significant impact on fuel consumption and comfort.

5.1.45 Current Ecodesign requirements set the minimum standards for hot water cylinders as those achieving a rating of D.[70] The Building Regulations, through its supporting guidance, sets a minimum standard that a domestic hot water cylinder, vented or unvented, should have a thermostat which can control the temperature of the water to a desired level.[71]

5.1.46 We are aware that there are several products that offer an ErP label of B or A. This is often achieved through utilising vacuum panel installation. We are interested in understanding whether raising the minimum requirement for water cylinders from D

[69] BEIS, 2017, Boiler Plus Consultation Response. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/651853/Boiler_Plus_final_policy_and_consultation_response.pdf
[70] Commission Regulation (EU) No 814/2013. Available at: https://www.legislation.gov.uk/eur/2013/814/contents
[71] The Building Regulations 2010. Available at: https://www.legislation.gov.uk/uksi/2010/2214/contents/made

could create innovation and deliver consumer bill and carbon savings. Any potential significant increase in cost would have to be weighed against these potential benefits as well as impacts this would have on the size of cylinders.

Chapter 5.2: Domestic cooking

5.2.1 Domestic ovens, hobs, and range hoods are currently subject to minimum energy efficiency standards (MEPS) and energy labelling requirements as set out in the relevant Ecodesign and Energy Labelling regulations.[72,73] Currently an Energy Efficiency Index (EEI) limit applies for cavities of domestic ovens. For multi-ovens, at least one oven shall comply with the maximum Energy Efficiency Index. Domestic electric hobs must comply with maximum energy consumption limits, and domestic gas-fired hobs must comply with minimum energy efficiency limits. Under the existing Ecodesign regulation, MEPS are EEI_{cavity} <96 for ovens, $EC_{electric\ hob}$ <195 Wh/kg for electric hobs, and $EE_{gas\ hob}$ >55% for gas hobs.[74]

5.2.2 Our energy-related products (ErP) Call for Evidence considered whether higher MEPS than those which currently apply could be set for cooking appliances, resulting in a reduction in fuel consumption and cooking times, and facilitating a transition towards net zero.[75] Some respondents suggested that technology exists to enable higher product energy efficiency and therefore achieve higher MEPS, however the higher upfront costs may discourage the uptake of higher efficiency products. As a key consumer benefit of transitioning to a higher energy efficiency product is lower energy consumption, we will look to ensure that consumer choice and market accessibility are maintained and consider how MEPS can support this.

5.2.3 Respondents to our ErP Call for Evidence also noted that the different fuel types used for cooking, such as hydrogen and biofuels, provide the potential to transition away from gas cooking, although consideration will need to be given to the impact this will have on speciality cooking.[76] MEPS may be one mechanism to help drive the market away from gas appliances and we acknowledge that MEPS may need to consider different types of low-carbon alternatives.

Ovens

5.2.4 A third country preparatory study highlights that technology exists to improve the energy efficiency of some types of ovens and therefore facilitate the transition to net

[72] Commission Regulation (EU) No 66/2014. Available at: https://www.legislation.gov.uk/eur/2014/66
[73] Commission Delegated Regulation (EU) No 65/2014. Available at: https://www.legislation.gov.uk/eur/2014/65/contents
[74] Commission Delegated Regulation (EU) No 65/2014. Available at: https://www.legislation.gov.uk/eur/2014/65/contents
[75] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence
[76] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence

zero.[77] A 2011 economic and market analysis studyon ovens and cookers suggests that sales of ovens and cookers with energy class 'B' and below systematically decreased between 2005 and 2008 while sales of 'A' rated ovens increased.[78] Today, most appliances sold on the UK market have an 'A+' rating or more and a 2011 study indicates that roughly 70% of UK ovens are electric compared to 30% being gas.[79] This suggests that the growing sales trend of high energy efficiency products has continued since 2008 and electric ovens are becoming more prominent on the market. However, a third country study reviewing a sample of ovens suggests all but one gas oven in the sample would be unable to meet an A+ rating.[80] We therefore acknowledge, that in raising MEPS, the range of gas ovens available on the market may reduce and lead to a greater uptake of low-carbon alternatives.

Illustrative proposal

We want to explore the feasibility of raising MEPS for gas and electric ovens. The table below sets out a range of options.

Table 4: Ovens potential policy options under consideration

	Tier 1 (2025)	**Tier 2 (2028)**
Option 1	**EEI_{cavity} <82**	**EEI_{cavity} <62**
Option 2	**EEI_{cavity} <70**	**EEI_{cavity} <62**
Option 3	**EEI_{cavity} <62**	**-**
Option 4	**-**	**EEI_{cavity} <62**

5.2.5 Research has found that to achieve higher efficiency ovens, consideration will need to be given to improving insulation, developing heating modes that use residual heat to reduce energy consumption, improving smart control systems, and introducing other

[77] European Commission, 2021, Review study of ecodesign and energy labelling for cooking appliances. Available at: https://susproc.jrc.ec.europa.eu/product-bureau//sites/default/files/2021-03/EDEL%20Cooking%20appliances%20ReviewStudy%202nddraft.pdf
[78] European Commission, 2011, Preparatory Studies for Ecodesign Requirements of EuPs (III) Lot 22 Domestic and commercial ovens (electric, gas, microwave), including when incorporated ovens Task 2: Economic and Market Analysis. Available at: https://www.eceee.org/static/media/uploads/site-2/ecodesign/products/lot22-23-kitchen/lot22-task2-final.pdf
[79] BRE, 2013, Domestic appliances, cooking & cooling equipment. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/274778/9_Domestic_appliances__cooking_and_cooling_equipment.pdf
[80] European Commission, 2021, Review study of ecodesign and energy labelling for cooking appliances. Available at: https://susproc.jrc.ec.europa.eu/product-bureau//sites/default/files/2021-03/EDEL%20Cooking%20appliances%20ReviewStudy%202nddraft.pdf

technological improvements that allow a reduction in cooking time.[81] In turn, this will lead to a progressive removal of the least efficient products.

5.2.6 For gas appliances, there is limited scope to make significant gains in energy efficiency and so setting the minimum efficiency between 70 and 82 would likely reduce the amount of gas ovens on the market. On the other hand, setting the minimum efficiency at <62 would likely result in a move away from gas appliances. When deciding on actual limits we will look to test these with stakeholders and will seek to understand impacts on the consumer experience which may be mitigated through specific exemptions.

Gas hobs

5.2.7 A third country preparatory study, which included gas hobs, suggests that MEPS could be raised to $EE_{gas\ hob}$ >58%, thus driving the market to reach the improvement potential of gas hobs.[82] The study also identified an indicative benchmark for gas hobs of 63.5%. As with ovens, we are interested in exploring how increasing the minimum efficiency could lead to the uptake of low-carbon alternatives. One way to do this might be to eventually raise the minimum efficiency to above the indicative benchmark which may trigger a shift away from gas appliances towards lower carbon alternatives.

Illustrative proposal

We are interested in exploring the feasibility of raising minimum energy efficiency levels for gas hobs. The table below illustrates a range of potential options

Table 5: Gas Hobs Potential policy options under consideration

	Tier 1 (2025)	**Tier 2 (2028)**
Option 1	**$EE_{gas\ hob}$ > 58%**	**-**
Option 2	**$EE_{gas\ hob}$ > 58%**	**$EE_{gas\ hob}$ > 64%**
Option 3	**$EE_{gas\ hob}$ > 64%**	**-**
Option 4	**-**	**$EE_{gas\ hob}$ > 64%**

[81] European Commission, 2021, Review study of ecodesign and energy labelling for cooking appliances. Available at: https://susproc.jrc.ec.europa.eu/product-bureau//sites/default/files/2021-03/EDEL%20Cooking%20appliances%20ReviewStudy%202nddraft.pdf

[82] European Commission, 2021, Review study of ecodesign and energy labelling for cooking appliances. Available at: https://susproc.jrc.ec.europa.eu/product-bureau//sites/default/files/2021-03/EDEL%20Cooking%20appliances%20ReviewStudy%202nddraft.pdf

5.2.8 We recognise that the energy efficiency improvement potential for gas hobs is marginal.[83] Therefore, raising efficiency levels for domestic gas hobs to above 58% would drive the market towards the most efficient appliances. On the other hand, setting MEPS at above 64% would likely encourage the uptake of existing alternatives such as electric hobs.

5.2.9 As we develop our policy, we will need to consider the implications of raising minimum energy efficiency levels for both consumers and manufacturers, and, for the role of low-carbon fuel sources, including electricity, biofuels, or hydrogen in facilitating a transition. We will look to work with stakeholders to consider how we should treat other low-carbon alternatives when setting MEPS including whether specific exemptions would be required.

Electric hobs

5.2.10 On electric hobs, the third country preparatory study evaluated the opportunity to adopt a technology-neutral approach as well as setting different minimum requirements for radiant and induction hobs.[84] Whilst the adoption of a technology-neutral approach is deemed appropriate for products delivering the same function and using the same approach, there is a risk that consumer choice may be limited if requirements are set too high. On the other hand, adopting separate requirements might protect consumer choice but would deviate from the current approach and mean radiant hobs remain on the market until market evolution leads induction hobs to replace them. For this reason, one approach considered in the report was keeping a technology-neutral approach for electric hobs and raising MEPS to <175 Wh/kg by 2025. We will look to improve the energy efficiency of products without compromising user experience and product performance.

Illustrative proposal

We are interested in exploring the feasibility of raising minimum energy efficiency levels. The table below illustrates a range of potential options.

[83] European Commission, 2021, Review study of ecodesign and energy labelling for cooking appliances. Available at: https://susproc.jrc.ec.europa.eu/product-bureau//sites/default/files/2021-03/EDEL%20Cooking%20appliances%20ReviewStudy%202nddraft.pdf

[84] European Commission, 2021, Review study of ecodesign and energy labelling for cooking appliances. Available at: https://susproc.jrc.ec.europa.eu/product-bureau//sites/default/files/2021-03/EDEL%20Cooking%20appliances%20ReviewStudy%202nddraft.pdf

Table 6: Electric Hobs - Potential policy options under consideration

	Tier 1 (2025)	**Tier 2 (2028)**
Option 1	**$EC_{electric\ hob}$<185 Wh/kg**	**$EC_{electric\ hob}$<175 Wh/kg**
Option 2	**$EC_{electric\ hob}$<175 Wh/kg**	**-**
Option 3	**Radiant hobs: $EC_{electric\ hob}$<185 Wh/kg** **Induction hobs: $EC_{electric\ hob}$<175 Wh/kg**	**-**

5.2.11 As manufacturers have indicated that no further energy savings can be achieved through improving the controls in radiant hobs, we recognise that raising MEPS for electric hobs to 175 Wh/kg could result in the phase out of radiant hobs. Whilst this would deliver carbon savings and lead to a progressive evolution of the market towards more energy efficient products, we acknowledge that a completely technology-neutral approach to electric hobs may not be appropriate. Therefore, to protect consumer choice, we will assess the need for specific exemptions, and also consider adopting separate minimum requirements for radiant and induction hobs.

Other considerations

5.2.12 These proposals for raising MEPS for both ovens and hobs will seek to avoid any impact on product performance and consumer experience.

5.2.13 We recognise that in raising MEPS for domestic cooking appliances we will need to consider the development of other low-carbon alternatives beyond electrical appliances. Therefore, as we develop our policy, we acknowledge that a completely technology-neutral approach may not always be appropriate, and so we will assess the need for specific exemptions across the various products. We will need to ensure there is evidence supporting the delivery of carbon savings and consumer benefits, and sufficient lead times for manufactures to invest in developing these technologies.

5.2.14 Whilst we expect an increase in average unit costs as a result of moving towards more energy efficient technologies, we anticipate that this will fall as the market expands. As the policy develops, we will explore the potential for initial costs to be recuperated through energy savings during the lifetime of the new product.

Table 7: Potential policy options under consideration

Policy option	Energy Savings GWh (CB5 Period)	Estimated CB5 saving (MTCO2e)
Raise minimum standards for domestic hobs and ovens from 2025.	4,590	1.7

Next Steps

Action	Date
We will work with stakeholders to develop a proposal based on the technical potential of products and the consumer and environmental impact.	2022

Chapter 5.3: Professional and commercial cooking

5.3.1 Professional and commercial cooking equipment, which includes hobs, chargrills, fryers, griddles, steam cookers, boiling pans, and ovens for use in professional and commercial settings, are not currently subject to minimum energy performance standards (MEPS) or energy labelling requirements.

5.3.2 Responses to the energy-related products (ErP) Call for Evidence included some support for regulating professional cooking appliances.[85] It was noted that purchasing habits within this sector are largely driven by cost, which can present a barrier to the uptake of more efficient products. However, as an example, initial research on commercial hobs has illustrated that potential energy efficiency savings could be achieved through greater uptake of induction hobs which can be up to 81% more efficient than gas hobs.[86]

5.3.3 Given that the sector is potentially a high impact energy consumption sector with possibilities for improvement, a third country study concluded that while regulation of professional cooking appliances would be beneficial, these appliances would need to be considered separately to domestic cooking products.[87] Stakeholders have indicated that key considerations for policymakers are the sector-specific user needs and product variability, including for speciality cooking; trends in purchasing equipment as a system; and the impact on building-level electricity capacity if there is to be greater

[85] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence
[86] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[87] European Commission, 2021, Review study of ecodesign and energy labelling for cooking appliances. Available at: https://susproc.jrc.ec.europa.eu/product-bureau//sites/default/files/2021-03/EDEL%20Cooking%20appliances%20ReviewStudy%202nddraft.pdf

electrification of cooking in the future. Taking these considerations into account, we recognise that MEPS may not always be appropriate for the diverse range of professional and commercial cooking equipment on the market. We will assess possible exemptions to support the introduction of MEPS, as well as other policy levers. Efforts to increase energy efficiency will also aim to maintain or improve product performance and consumer choice.

5.3.4 Greater product efficiency leads to reduced cooking times and fuel consumption. Better information about and awareness of the benefits of more efficient professional cooking appliances could support energy savings. A further advantage of greater energy efficiency of professional and commercial cooking equipment is improved air quality in the kitchen.

5.3.5 Whilst we expect an increase in average unit costs because of moving towards more energy efficient technologies, we anticipate that this will fall as the market expands. As the policy develops, we will explore the potential for initial costs to be recuperated through energy savings during the lifetime of the new product.

5.3.6 We will undertake further research and consultation with industry to understand how product efficiency can be improved across the sector as well as understand the role of low-carbon fuels such as biofuels and hydrogen in commercial cooking. We will seek to develop our understanding of the barriers and enablers to the uptake of energy efficient professional cooking products and encourage greater consideration of energy efficiency in purchasing behaviour.

Illustrative proposal

5.3.7 **We propose that regulatory standards could be introduced for professional and commercial cooking products.** We will consider the product categories that MEPS could apply to as well as supporting policy levers to balance energy savings with respect for the variety of professional and commercial cooking products and fuel types used within the sector. Our analysis indicates that the introduction of minimum efficiency standards could support up to 1 million tonnes of CO2 equivalent (MtCO2e) emissions savings over the Carbon Budget 5 period.

5.3.8 There are currently no MEPS in place for this product category and there are no internationally recognised measurement standards. However, German (DIN) standards exist for measuring the energy use from a range of equipment in commercial kitchens. As part of the Energy Technology List (ETL) research programme, we will be introducing criteria for professional foodservice equipment (PFSE) and will be developing measurement methods based on the DIN standard.[88] This ETL criteria will help to provide a first step in providing a consistent way of determining the energy

[88] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/ Combination Steam Ovens and Convection Ovens are the first two recommended sub-technologies for inclusion in ETL's new PFSE category.

efficiency of this product category and may provide a basis for setting MEPS in the future.

Table 8: Potential policy options under consideration

Policy option	Energy Savings GWh (CB5 Period)	Estimated CB5 saving (MTCO2e)
Introduce minimum standards for commercial hobs and ovens from 2025	1,910	0.9

Next steps

Action	Date
We will undertake research and consultation with industry stakeholders to develop proposals for mandatory ecodesign requirements for a range of professional cooking appliances. We propose that the minimum energy efficiency standards should be ambitious so that only the most energy efficient cooking appliances are sold.	2022

Chapter 5.4: Taps and non-electric showers

5.4.1 Taps and non-electric showers are not currently subject to ecodesign or energy labelling requirements (electric showers are already covered by both).[89,90] Evidence suggests that there is scope for these products to become more water efficient and reduce waste whilst maintaining consumer comfort. This, in turn, will lead to energy savings as it will reduce the energy demand from supplying, heating, and treating the water.

5.4.2 Currently, Part G of the UK Building Regulations sets a consumption limit of 125 litres per day (LPD) per person for new build dwellings, with an optional limit of 110 LPD per person in water-stressed areas.[91] As an alternative to calculating water efficiency

[89] Commission Delegated Regulation (EU) No 812/2013. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013R0812
[90] Commission Regulation (EU) 814/2013. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1521112004143&uri=CELEX:32013R0814
[91] Department for Levelling Up, Housing and Communities, 2010, Sanitation, hot water safety and water efficiency: Approved Document G. Available at: https://www.gov.uk/government/publications/sanitation-hot-water-safety-and-water-efficiency-approved-document-g

based on consumption, UK Building Regulations allow for a fittings approach, whereby the water consumption of water-fittings must not exceed a specified limit.

5.4.3 The Department for Environment, Food and Rural Affairs (Defra) has recently committed to introduce a mandatory water efficiency label for water-using products. This will provide consumers with information about a product's water efficiency, with the aim of encouraging the uptake of more water efficient products and cutting down on water wastage. This was supported by a Call for Evidence undertaken by Defra.[92]

5.4.4 In addition to this, the energy-related products (ErP) Call for Evidence gathered further evidence about the potential for water and energy savings to be made specifically from taps and non-electric showers.[93] We found stakeholder support for policy measures aimed at improving the water efficiency of these products through energy labelling, encouraging consumer behaviour change and minimum fitting standards.

5.4.5 Our analysis has indicated that there is significant scope to make energy savings, and associated reductions in carbon emissions, from improving products' water efficiency. We estimate that 0.9 million tonnes of CO2 equivalent (MtCO2e) could be saved over Carbon Budget 5 through consumer behaviour change encouraged by a mandatory water label on these products. International examples of water efficiency labelling schemes, such as the Australian Water Efficiency Labelling and Standards (WELS) scheme, include only water efficiency information on labels for taps and showers. Nevertheless, we are keen to explore, specifically in a UK context, whether a combination of water and energy efficiency information could prove more effective at encouraging uptake of the highest efficiency products.

5.4.6 Early estimates show that further savings of around 2.4 MtCO2e could be achieved through additional measures to improve the water efficiency of tap and non-electric shower fittings.

5.4.7 A key consideration for Government when developing policy for taps and non-electric showers will be how to reduce the water and energy wasted in the function of these products without compromising users' comfort or the product's overall performance. Historically, ecodesign has successfully maintained or improved product performance whilst increasing the water and energy efficiency of products such as washing machines and dishwashers. This has been achieved through specific functional requirements included in legislation and the underpinning performance measurement standards developed by international standardisation bodies.

5.4.8 To ensure consumers have confidence that a more water and energy efficient tap or non-electric shower will perform to the standard they expect, we will work with industry

[92] Defra, 2019, Water conservation: measures to reduce personal water use. Available at: https://www.gov.uk/government/consultations/water-conservation-measures-to-reduce-personal-water-use
[93] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence

and the British Standards Institute (BSI) to develop an appropriate performance measurement standard to support this.

Illustrative proposals

5.4.9 We propose that the water efficiency label which will be introduced by Defra could be accompanied by energy efficiency information for taps and non-electric showers. We will undertake research to evaluate the effectiveness of this approach.

5.4.10 We will explore the feasibility of other measures to improve the water and energy efficiency of taps and non-electric shower fittings.

5.4.11 We will work with industry and the BSI to ensure an appropriate performance measurement standard is available to support these measures.

5.4.12 We have undertaken analysis of the impact of water and energy labelling, and of other potential measures to improve the water efficiency of taps and non-electric shower fittings, shown in Table 9.[94]

Table 9: Potential policy options under consideration

Policy option	**Estimated GWH savings (CB5 Period)**	**Estimated CB5 saving (MTCO2e)**
Introduce a Mandatory Water Label only (policy led by Defra).	4.0	0.9
Introduce a mandatory water label and other measures to improve the water efficiency of taps and non-electric shower fittings.	14.0	3.3

[94] BEIS analysis, scenarios based on Waterwise study. Available at: https://waterwise.org.uk/wp-content/uploads/2020/08/Water-Labelling-Taps-and-Showers-final-report-20-8-20a-1.pdf

Next steps

Action	Date
We will undertake social research to assess whether the addition of information on energy consumption to the water efficiency label would be significantly more effective at encouraging consumers to purchase higher efficiency products, and as a result, whether it would lead to greater energy and water savings.	2021
We will undertake further research and engagement with industry to explore other measures to increase the water and energy efficiency of taps and non-electric shower fittings.	2021
We will support the development of a new international functional performance measurement standard for taps and non-electric showers.	2021-2023

Chapter 5.5: Lighting Products

5.5.1 Lighting products are subject to minimum energy performance standards (MEPS) and energy labelling requirements as set out in the various Ecodesign and Energy Labelling regulations.[95,96] Higher MEPS and a re-scaled energy label for lighting products were introduced in Great Britain from 1 October 2021 (or 1 September in Northern Ireland).[97]

5.5.2 To date, Ecodesign regulations have required MEPS to be calculated using the 'Ponmax' calculation. Under the new Ecodesign regulations which came into force on 1 October 2021, the baseline efficacy threshold for light sources is set at 120 lumens/watt (the amount of visible light produced for a given amount of electricity). However, this is reduced for certain lamps through the use of technology-specific end loss factors, meaning that these less energy efficient technologies can continue to be sold on the market, despite suitable LED replacements being available.

5.5.3 In 2020, the Government consulted on initial proposals for how to further improve the energy efficiency of lighting products beyond the changes that are due to take effect in 2021.[98] These future policy options were informed by analysis that showed a

[95] Commission Regulation (EC) No 244/209. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009R0244. Commission Regulation (EC) No 1194/2012. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32012R1194
[96] Commission Regulation (EU) No 874/2012. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012R0874
[97] The Ecodesign for Energy-Related Products and Energy Information (Lighting Products) Regulations 2021. Available at: https://www.legislation.gov.uk/uksi/2021/1095/contents/made
[98] BEIS, 2020 Ecodesign and energy labelling for lighting products: consultation document. Available at: https://www.gov.uk/government/consultations/draft-ecodesign-and-energy-labelling-regulations-lighting-sources-2021

technology-neutral approach to setting MEPS for lighting products could save additional carbon and improve energy bill savings. This would remove the complexity of the 'Ponmax' calculation, instead calculating efficacy through a single lumens/watt metric without the use of end loss factors. A single MEPS level would be applied to lighting products, whilst taking into account the current exemptions, having the effect of removing poor performing lamps from the market.

5.5.4 A number of relevant considerations were raised by stakeholders in relation to this proposed approach, including the need to balance energy savings with the protection of light quality for the broad range of applications of lighting products, and the importance of considering the potential health impacts of moving the market further towards LED lighting technologies.[99] Taking these considerations into account, we believe the contribution of more efficient lighting products to Carbon Budgets 4 and 5 could be significantly improved by raising MEPS on a simpler and more technology-neutral basis.

5.5.5 Feedback provided in the consultation also supported the idea that better installation, management, and use of lighting controls could offer the opportunity for significant energy savings by enabling better control of how and when lights are used. Lighting controls can reduce operating hours through occupancy detection and save energy via daylight harvesting, where artificial light levels are adjusted based on levels of natural daylight. Further, there was support for exploring other means of achieving energy savings outside of MEPS, for example through Building Regulations.

Illustrative proposals

5.5.6 In line with the initial policy scenario that we consulted on in early 2021, we propose the following increases to MEPS:

Tier 1 – MEPS level of 120 Lumens/Watt for a wide range of light sources from 2023; and

Tier 2 – Increase MEPS level to 140 Lumens/Watt for a wide range of light sources from 2025.

5.5.7 No lighting products would be less effective in terms of performance because of these requirements.

5.5.8 We acknowledge that a completely technology-neutral approach to MEPS may not be appropriate in every case, and so we will assess the need for specific exemptions where a technology cannot be replaced by a more energy efficient equivalent. For example, it may be that directional light sources require a lower MEPS level since they

[99] BEIS, 2021, Ecodesign and energy labelling for lighting products: government response. Available at: https://www.gov.uk/government/consultations/draft-ecodesign-and-energy-labelling-regulations-lighting-sources-2021

have greater internal losses than non-directional light sources. Implementing Tier 1 later than 2023 could result in missed carbon savings.

5.5.9 This early analysis assumes a very small average unit cost increase, which is expected to be offset by energy bill savings. The likely payback period could be improved by any changes in future energy bill prices and reduction in the cost of the product as the market expands - we will explore this further as the policy develops.

Table 10: Potential policy options under consideration

Policy option	**Energy Savings GWh (CB5 Period)**	**Estimated CB5 saving (MTCO2e)**
Raise minimum standards for lighting from 2023 to 120 Lumens/Watt and 2025 to 140 Lumens/Watt	8,550	1.2 MTCO2e

Next steps

Action	**Date**
We will conduct further research to inform and explore new MEPS, which exemptions would be required and to what extent we should consider photosensitivity without diminishing the overall performance of lighting products available on the market or hampering innovation and disproportionately impacting UK businesses and consumers.	2021-2022
We will explore the benefits of mandatory requirements for the installation, management, and use of lighting controls and consider what policy levers could support us to realise these savings.	2022

Chapter 5.6: Water pumps

5.6.1 Water pumps are currently subject to minimum energy performance standards (MEPS) as set in the Ecodesign regulation which focusses specifically on centrifugal water pumps and establishes a minimum energy efficiency index (EEIv) currently set at 0.4 as of January 2015.[100] This index establishes MEPS at the product level and focuses on improving the efficiency of the mechanical action of the pump.

[100] Commission Regulation (EU) 547/2012. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012R0547

5.6.2 The current MEPS which were set in 2012 are out of date, particularly given the considerable technological improvements in this sector since then. The energy-related products (ErP) Policy Study concluded that pumps have the potential to make significant savings in energy usage by running at their Best Efficiency Point (BEP) by using Variable Speed Drives (VSD) in variable flow application but concluded that the Extended Product Approach (EPA) presented the largest opportunity for additional savings.[101]

5.6.3 A third country review study favoured the introduction of energy efficiency requirements under the EPA for certain pumps, particularly pumps such as end-suction own-bearing pumps, end-suction close coupled pumps, end-suction close coupled inline pumps, and booster sets.[102] This approach takes into account the process system requirements by setting an EEIv for the whole pump unit. This combines the motor and VSD into an 'extended product' and assigns a combined efficiency, rather than an efficiency for each component.

5.6.4 This study also concluded that carbon savings could also be made by expanding the scope to include multi-stage horizontal (MS-H) pumps and booster sets. The ErP Policy Study suggested there were opportunities to expand the scope further in line with proposals in the third country study, for example, to swimming pool pumps and wastewater pumps such as submersible vortex radial pumps.[103, 104]

5.6.5 Further, the study showed that the current regulation contains a loophole where MS-H pumps are installed as multi-stage vertical (MS-V) pumps, making them exempt from the regulation. Inclusion of MS-H pumps would close an existing loophole, bringing thousands more water pumps into scope.

Illustrative proposal

5.6.6 We want to explore the feasibility of setting an EEIv limit for water pumps and expanding the scope of existing regulation to more types of pumps. We are considering a range of options:

[101] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[102] European Commission, 2019, Ecodesign Pump Review. Available at: https://www.ecopumpreview.eu/documents.htm
[103] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[104] European Commission, 2019, Ecodesign Pump Review. Available at: https://www.ecopumpreview.eu/documents.htm

Table 11: Potential policy options under consideration

	Tier 1 (2023)	Tier 2 (2025)
Option 1	**EEIv<0.62**	-
Option 2	**EEIv<0.62**	**EEI<0.57**
Option 3	**EEIv<0.57**	-
Option 4	-	**EEI<0.57**

5.6.7 Whilst we have not yet modelled the savings potential of this specific option, early analysis indicates that there is a potential to save between 0.3 – 0.7 million tonnes of CO2 equivalent (MtCO2e) over Carbon Budget 5 through further regulation, depending on the options considered. It has also been suggested that setting a lower EEIv for pumps in scope of the regulations would remove 5% of the worst performing pumps from the market. As a first step we will look to model the savings potential of this option and then begin testing the feasibility of implementing from 2025.

5.6.8 Due to the early stage of this analysis, estimates do not include the difference in costs of products that meet the new standards. This will be explored further as the policy develops.

Next steps

Action	***Date***
We will undertake further research, in consultation with stakeholders, to understand how further carbon savings could be made from: i. Introducing the Expanded Product Approach for water pumps and setting an EEIv limit for certain types of pumps ii. Expanding the scope of the regulation	2021 - 2022

Other products for further exploration

In addition to the products for which we have put forward illustrative proposals, products in this section have been identified as having potential for achieving additional energy savings through improved energy performance. Most of these products were not explored in the energy-related products (ErP) Call for Evidence.[105] However, some of these have since been identified by the ErP Policy Study as having high potential for carbon savings.[106, 107] We are keen to explore the savings potential further with stakeholders and how it could best be realised.

There may also be other products with potential not included in this framework which were identified in the ErP Policy Study.[108] We will also look to understand the carbon saving potential of these products further, as well as considering other products which are being explored by third countries.

Chapter 5.7: Low Flow Temperatures and Heating Emitters

5.7.1 While hot water storage products are currently subject to MEPS set through the Ecodesign regulation, heat emitters (such as radiators and underfloor heating), and heat storage products are not.[109] Heating distribution systems designed to operate at low flow temperatures are a key enabler for low-carbon heat, especially the most common low temperature heat pumps. Some heat pumps are also capable of running at high temperatures - comparable to oil and gas boilers - but, as with any heating system, running high temperature heat pumps at a lower temperature reduces running costs.

5.7.2 In addition, a system operating at low temperatures will benefit the most common condensing boilers that we use now, ensuring they operate in condensing mode, giving an immediate energy saving to the consumer. It would also reduce losses and improve system efficiencies in district heating and facilitate the transition to low-carbon technologies.

5.7.3 Research published by BEIS in March 2021 found that up to 90% of all heating systems may need to be upgraded to provide heat at low temperatures on a peak

[105] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence
[106] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[107] Due to the large number of products assessed during the study (e.g. 184 products in Task 3 and 26 products in Task 4), limited evidence and simple assumptions underpin the analysis undertaken. This reduced the robustness of the analysis, which can be considered a limitation to the study. Further research is recommended in order to fully evidence technology specific policy options.
[108] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[109] Commission Regulation (EU) No 814/2013, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013R0814

winter day.[110] The ErP Policy study indicated that there could be considerable savings from moving to low temperature emitters.[111] Therefore, heat emitters, hot water and heat storage products are expected to be key enablers in the transition to low-carbon heating.

5.7.4 In the Future Buildings Standard Consultation, the Department for Levelling Up, Housing and Communities proposed that all new heating systems installed when replacing boilers and radiators should be designed to operate at a maximum flow temperature of 55°C.[112] There are, however, significant energy system savings (in the order of £bns) from running heating systems at an even lower flow temperature, particularly under a high electrification scenario (e.g., 45°C or even lower). We are considering how minimum energy performance standards for heat emitters could support improvements to the emissions and environmental performance of the overall heating system by encouraging a move to higher performing, lower temperature heat emitters.

5.7.5 To run low-carbon heating systems at lower flow temperatures (e.g., 35 – 45°C), which could significantly improve efficiency and consumer bills, the size of emitters will need to increase substantially. For example, conventional radiators are commonly sized to produce enough heat output at a flow temperature of 75°C during a peak Winter Day. To produce the same level of heat output at low temperatures, heat emitters would need to be up to six times larger in terms of surface area. Installing these larger emitters could both increase resource use significantly (e.g. steel & aluminium used in production), and also increase disruption for consumers due to reduced wall space and required ancillary works.

5.7.6 Respondents to the ErP Call for Evidence were broadly supportive of the high energy savings potential of appropriately designed and sized heating systems to ensure appliances' operation is as efficient as possible. Respondents highlighted how they view heat emitters as critical to the performance of heating appliances in practice. While the size and positioning of a radiator is crucial to its thermal output, the material construction and design can also affect thermal efficiency. We will explore whether the development and introduction of MEPS for heat emitters could support emissions and bill savings benefits by reducing the demand on the heating system.

Future considerations

5.7.7 One way to set efficiency thresholds for heat emitters would be to establish a metric for heat output per unit area and set a minimum efficiency performance standard which would push the market towards the sale of suitably sized emitters which are able to

[110] BEIS, 2021, Domestic heat distribution systems, evidence gathering: final report. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/976021/beis-dhds-final-report__1_.pdf
[111] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[112] Department for Levelling Up, Housing and Communities, 2021, The Future Buildings Standard. Available at: https://www.gov.uk/government/consultations/the-future-buildings-standard

provide a sufficient level of heat at lower temperatures. As there are many different types of heat emitters, separate efficiency levels may need to be set based on the heat emitter category.

Next steps

Action	Date
We will explore the feasibility of a performance-based metric for heat emitters	2022

Chapter 5.8: Direct electric heating

5.8.1 Direct electric heating appliances such as panel heaters and electric radiators are currently subject to MEPS and energy labelling requirements as set out in the Ecodesign[113] and Energy Labelling[114] regulations for local space heaters.

5.8.2 Of the 3.5 million homes off the gas grid, half use electric heating - mostly electric storage and heat pumps. In the UK, electric storage heaters and panel heaters have the largest market share.[115] Whilst these products can provide a lower carbon alternative to fossil fuel-based heating systems at a lower upfront cost than heatpumps, they are considerably more expensive for the consumer to run.

5.8.3 As properties are encouraged to move to low-carbon heating alternatives, it is important that alternatives are installed in properties which are both affordable to run for consumers and reduce pressure on the wider energy system. This is particularly relevant for rented properties where the owner of the property is not paying the energy bills.

Future considerations

5.8.4 We will explore how MEPS and energy labelling for these appliances could be used to ensure that the most energy efficient and cost-effective heating solutions are made available on the market. We will also consider whether targeted exemptions are required for specific products, where there are not effective alternatives yet.

[113] Commission Regulation (EU) 2015/1188. Available at: https://www.legislation.gov.uk/eur/2015/1188/contents
[114] Commission Delegated Regulation (EU) 2015/1186. Available at: https://www.legislation.gov.uk/eur/2015/1186/contents
[115] BEIS, 2019, Evidence gathering for electric heating options in off gas grid homes: Final Report. Available at:https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/831079/Electric_heating_options_in_off-gas_grid_homes.pdf

Next steps

Action	Date
We will explore the suitability of MEPS and energy labelling to encourage electric heating that is energy efficient and cost-effective for households	2021–2022

Chapter 5.9: Building Automation Controls

5.9.1 Building automation controls (BACS) are not regulated through the Ecodesign and Energy Labelling framework. Out of the products shortlisted by the energy-related products (ErP) Policy Study, initial high-level estimates suggest that these products may have the most potential to achieve carbon savings.[116]

5.9.2 BACS are an enabler of energy efficiency. There is an existing standard (EN 15232) which covers building controls and defines the category as a "system, comprising all products, software and engineering services for automatic controls (including interlocks), monitoring, optimisation, for operation, human intervention, and management to achieve energy–efficient, economical, and safe operation of building services". In effect, a BACS will control different aspects of a building operation such as, inter alia, the heating, ventilation, air conditioning, lighting and auxiliary power in a way that optimises energy use and reduces waste across the system. It also establishes a voluntary class system (A-D) to assess the level of control in a building and the associated energy performance.

Future considerations

5.9.3 Because BACS are an enabler of energy efficiency and their effectiveness relies on how they are installed, commissioned, and operated in buildings, minimum energy performance standards (MEPS) are not suitable for these products, as was concluded by a third country study for BACS.[117] However, the study did find that functionality and operability requirements may be suitable. These could include requirements for:

- Improved control accuracy
- Individual room control
- Adaptive room setpoint scheduling
- Demand orientated controls and adaptive generation sequencing

[116] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[117] European Commission, Ecodesign preparatory study for BACS. Available at: https://ec.europa.eu/energy/studies_main/preparatory-studies/ecodesign-preparatory-study-building-automation-and-control-systems_en

5.9.4 We will consider whether functionality requirements for BACS could be implemented through Ecodesign regulation to support improved performance of the energy system of buildings. We will consider how any requirements might work in conjunction with building regulations. We are also currently working with industry to develop eligibility criteria so that Building Energy Management systems (BEMS) can be added as a new sub-technology on the Energy Technology List (ETL) alongside Automatic Monitoring and Targeting Equipment.[118] Whilst BEMS and BACS are different product categories, there is considerable overlap between them and therefore any future ETL criteria may provide a starting point for minimum ecodesign requirements.

5.9.5 Early analysis based on limited evidence and simple assumptions indicates that there is potential to save between 0.3 – 10.0 million tonnes of CO2 equivalent (MtCO2e) over Carbon Budget 5 through further regulation, depending on the options considered.

Next steps

Action	**Date**
We will explore further the suitability of functionality requirements for BACS and undertake further analysis to understand the energy and savings potential of this.	2021–2022
Develop ETL eligibility criteria for BEMS to be added as a new sub-technology on the ETL alongside Automatic Monitoring and Targeting Equipment.	2021-2022

Chapter 5.10: Commercial refrigeration

5.10.1 As of 2021, commercial refrigeration is subject to Ecodesign and Energy Labelling regulations.[119] The Energy Technology List (ETL) currently lists 278 Refrigerated display cabinets (RDCs),[120] which are all within the top quartile of the market with respect to energy efficiency; the Government's super-deduction tax policy can be applied to purchases of highly energy efficient commercial refrigeration procured from the ETL, as well as to other business investments.

5.10.2 Commercial refrigeration refers to refrigerating appliances with a direct sales function, which are used to store and display chilled and/or frozen products in commercial,

[118] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/
[119] The Ecodesign for Energy-Related Products and Energy Information Regulations 2021 No. 745. Available at: https://www.legislation.gov.uk/uksi/2021/745/contents/made
[120] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/

institutional, or industrial environments. The most common type of commercial refrigeration is the RDC.

5.10.3 Research undertaken by BEIS, including as part of the energy-related products Policy Study, has identified commercial refrigeration as a key area for energy efficiency improvement.[121] A range of technologies, including air flow management, electronic controls, and LEDs, which can reduce energy consumption by between 20% and 60%, are available to the market today. However, most of these energy savings come from reducing warm air infiltration into the appliance.

5.10.4 Despite the availability of energy-saving commercial refrigeration and associated air-flow management technologies on the market, there remains inconsistent take up by businesses, resulting in energy usage remaining higher than it could be. Where businesses have taken up more energy efficient commercial refrigeration, this tends to concern technologies with energy-saving potential at the lower end of the spectrum. There is therefore a gap between the energy-savings currently being made and the potential that could be achieved.

Future considerations

5.10.5 Commercial refrigeration comes at high capital cost, with the higher efficiency appliances and more energy-saving retrofit technologies often costing more. Therefore, inconsistent uptake is, in part, driven by cost. However, our initial research has also identified that within the retail sector, there are practical and commercial barriers to investing in more energy efficient commercial refrigeration, and to retrofitting existing stock with energy-saving technologies, such as doors or enhanced air-flow management solutions.

5.10.6 Work is needed to build consensus and collaboration within the retail sector about how to increase energy savings from commercial refrigeration. Moreover, we will seek to deepen our understanding of the barriers that have prevented the uptake of the most energy efficient technology to date, and of the enablers which could help to lessen these barriers.

5.10.7 In addition to the potential to achieve significant carbon savings from commercial refrigeration through reducing energy consumption, carbon emissions can be further reduced through regulation of F-gases used in refrigeration. An existing Government policy (the F-gas regulation[122]) sets a target to reduce the CO2 equivalent of all gases in use to 21% of the baseline (2009-12) by 2030. The Government is reviewing this target with a view to consulting on revised legislation in 2022.

[121] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[122]The Ozone-Depleting Substances and Fluorinated Greenhouse Gases (Amendment etc.) (EU Exit) Regulations 2019. Available at: https://www.legislation.gov.uk/uksi/2019/583/contents/made

5.10.8 Early analysis based on limited evidence and simple assumptions indicates that there is a potential to save between 0.3 – 1.2 million tonnes of CO2 equivalent (MtCO2e) over Carbon Budget 5 through further regulation, depending on the options considered. RDCs alone account for approximately 60% of energy consumption in a typical supermarket, so represent a real opportunity for energy, carbon, and bill savings.

Next steps

Action	**Date**
We will undertake research to develop a test methodology that will verify the energy savings resulting from retrofitting open-fronted RDCs with measures such as night blinds, doors and enhanced air flow equipment. This will be a world-first and will enable verification and comparison of the energy-efficiency of these products.	2021
We will continue to engage with the retail sector, including via the Retail Sector Council as part of their Commercial Refrigeration working group, along with other industry-based stakeholders, to develop our understanding of the barriers to higher energy-efficiency equipment and to build consensus around policy options.	2021-2022
We will monitor the implementation of the new Ecodesign and Energy Labelling Regulations and consider the scope for raising MEPS to push the market further towards the energy-savings potential that we know can be achieved.	2021–2025
Defra are reviewing the F-gas regulation and will consult on revisions to this.	2022

Chapter 5.11: Servers

5.11.1 As of 2019, servers and data storage products are subject to minimum energy performance standards (MEPS) as set out in the Ecodesign regulations.[123] A server is a computing product which provides services and manages networked resources for client devices such as other computers, smartphones, or tablets. They do not have direct user input devices and are controlled by client devices via network connections. Servers can be run in dedicated facilities, known as datacentres, which have dedicated internet connectivity, power supply and temperature control. Alternatively, servers in non-dedicated facilities, such as offices, are referred to as distributed IT. Recently,

[123] Commission Regulation (EU) 2019/424. Available at: https://www.legislation.gov.uk/eur/2019/424

there has been a trend towards centralisation in dedicated server centres to create optimal work conditions and reduce the energy consumption of auxiliary equipment. Over time, the idle time of the servers, which is when the server is using power but not doing work, has been minimised.

5.11.2 As noted in the energy-related products (ErP) Policy Study, the UK is a world leader in datacentre technology and annual sales of servers is estimated to be 1.2 million units in the UK with an estimated market growth rate of 3-5% a year.[124]

5.11.3 Currently, only a transitional testing method underpins the measurement of energy performance for servers, although a mandate to create a comprehensive international test standard was issued by the European Commission in January 2021.

5.11.4 Servers are under constant performance improvement, so have a short average lifecycle as devices are continually being replaced with new products that can deliver more work for less power. As the energy used in datacentres forms a large part of running costs for businesses, there can be an incentive for them to be efficient, depending on how the datacentre is run. For distributed IT, however, the energy usage of the servers is not necessarily tracked, hence there is not currently an incentive for them to be energy efficient. Due to the short lifecycle, growing market and critical raw materials for servers, material efficiency measures could be considered to increase the recuperation and material recycling of servers.

5.11.5 The ErP Policy Study showed most of the savings' potential for servers can be attributed to datacentres due to the large average sales figures, with the best available servers on the market consuming up to 30% less energy than the average server.[125] Total energy consumption of data processing can be further improved through better utilisation techniques, such as virtualisation, and consumption on cooling, communication equipment and power conversion. To push towards virtualisation, there should be an incentive for businesses to move towards using cloud systems.

5.11.6 Early analysis using limited evidence and simple assumptions indicates that there is a potential to save between 0.1 – 1.1 million tonnes of CO2 equivalent (MtCO2e) over Carbon Budget 5 through further regulation, depending on the options considered. Due to the early stage of this analysis, estimates do not include the difference in costs of products that meet the new standards. This will be explored further as the policy develops.

Future considerations

5.11.7 As the EU has a requirement for data to be stored within the EU, datacentre capabilities are starting to develop in the EU. Whilst unlikely to lead to a decrease of datacentre market and capabilities of the UK in the short term since a key demand for

[124] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[125] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study

data needs is from the finance industry, which is prominent in the UK, this may result in increased competition from EU countries.

5.11.8 Since MEPS for servers are quite recent, a review should only be considered once their effects have been verified. This is especially important for the idle performance aspect of current MEPS, which are argued to decrease the efficiency of datacentres. These concerns have been raised by stakeholders. We will also consider how savings could be achieved by looking at better utilisation techniques and the system in which servers operate, such as considering the energy consumption of cooling, communication equipment and power conversion. We will review the trend towards datacentres and the appropriateness of idle power having MEPS, once their effects have been verified.

5.11.9 Although severs are already regulated and there is an incentive for them to be efficient, distributed IT (which is more likely to run in idle, and therefore to be less efficient) needs to be monitored since energy savings are being foregone. It is important we seek to understand the impact of this and explore whether the metrics for measuring energy efficiency of servers can be improved.

5.11.10 A recent report from the Energy Efficient End-use Equipment platform (4E) suggested a new metric to measure the efficiency of servers – the server idle coefficient and the datacentre idle coefficient.[126] These are ineffectiveness metrics and may be a good measure on which to focus the reduction of energy use of datacentres since servers account for over 80% of the total IT energy use of a datacentre. However, the sample used in this report is small and biased towards datacentres and there could be issues with obtaining the data needed to calculate the server idle coefficient. We will work with 4E and with product suppliers to help further develop a new metric that measures the energy efficiency of servers.

5.11.11 Servers are not currently featured in the Energy Technology List (ETL).[127] We will consider whether inclusion in the ETL would result in the uptake of the most energy efficient servers on the market and explore other potential metrics.

5.11.12 Any new requirements that we implement in the future would not make servers less effective in terms of their performance. Any increase in upfront cost would be offset by lower energy bills throughout the server's lifetime, with the cost of highly efficient servers decreasing over time due to innovation, competition, and economies of scale. This will have bedded in before any new requirements are in force.

[126] 4E Electronic Devices and Networks Annex, 2021, Data Centre and Server 'Idle Coefficients'. Available at: https://www.iea-4e.org/wp-content/uploads/2021/10/Server-Idle-Coefficients-FINAL.pdf
[127] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/

Next Steps

Action	Date
We will participate in the work being undertaken by 4E into developing a potential new metric to measure the energy efficiency of servers.	2021-2022
We will monitor and keep under review the recent implementation of MEPS for servers. We will work with stakeholders to understand more about the trends within distributed IT compared to datacentres in order to develop future policy.	2022
We will consider how to support the uptake of the most efficient servers on the market.	2022

Chapter 5.12: Compressors

5.12.1 The four types of compressors under consideration (low pressure, oil free, standard air, and commercial/industrial refrigeration) are not currently subject to Ecodesign or Energy Labelling regulations. There are 83 refrigeration compressors listed on the Energy Technology List (ETL),[128] which are all within the top quartile of the market with respect to energy efficiency.

5.12.2 The energy-related products (ErP) Policy Study concluded that there was scope to improve product energy efficiency by 4% for all types of compressors under consideration.[129] It also found potential for 20% system savings (primarily from a reduction in air leaks) for low pressure, oil free and standard air compressors.

5.12.3 This research suggests three possible ways to realise the product energy efficiency improvement potential for low pressure, oil free and standard air compressors:

- Improving the efficiency of the compressor itself,
- Utilising variable speed drives and
- Heat recovery.

5.12.4 For refrigeration compressors, the ErP Policy Study highlighted the potential for inverter compressors to offer increased efficiency over the traditional single speed compressor.[130] The inverter compressor runs at a range of speeds depending on how

[128] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/
[129] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[130] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study

the refrigerator is being used, allowing for quick pull down or freezing, or to run at a very low speed once the cabinet is at a steady state.

5.12.5 Early analysis indicates that there is a potential to save between 0.07 – 0.37 MtCO2e, across all four types of compressors but mostly from standard and refrigeration compressors, over Carbon Budget 5 through further regulation, depending on the options considered.[131]

Future considerations

5.12.6 Given the potential carbon savings from product and system efficiencies set out above, we intend to explore all these options further. We will focus on standard and refrigeration compressors as our research indicates they offer greater carbon saving potential, reflecting their larger market size. More information is required on the practical implications of introducing these measures including how mandating the use of more efficient compressors would impact on the wider technology, and to understand the options to encourage or mandate heat recovery.

5.12.7 One of the findings from the ErP Policy Study is that each of these four compressor product groups on the market contains products with a range of energy performance.[132] An agreed method for measuring the energy performance of each compressor type is a prerequisite to setting any minimum energy performance standards or energy labelling requirements, and consumers' ability to choose a more energy efficient product evidently depends on the existence of this information. Industry feedback goes beyond this finding to suggest backing up the information published by manufacturers with an independent testing regime.

Next Steps

Action	**Date**
We will explore how the energy efficiency of compressors and the associated systems can be improved alongside the costs and benefits for each type of compressor.	2022
We will explore the feasibility of options to encourage or mandate heat recovery.	2022
We will work with stakeholders to understand the benefits and options available for establishing an independent testing regime based on standard methodologies for measuring the energy performance of all compressor types.	2022

[131] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study
[132] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study

Chapter 6: Potential measures – horizontal proposals

This section sets out illustrative proposals for different policy levers which could be applied across various products that were noted in Chapter 5.

Chapter 6.1: Resource efficiency measures and the circular economy

6.1.1 By embedding circular economy principles in design so that products, components, and constituent materials remain in circulation for longer, we can increase the resource efficiency of our economy. This involves products being designed to be more durable, repairable, and recyclable, as well as making use of recycled content. Benefits are in reduced product lifecycle emissions, reduced impacts on nature, contribution to an increase in our resource security and creation of jobs in this country.

6.1.2 In Summer 2021, the Government introduced new Ecodesign Regulations which, for the first time, introduced measures relating to resource efficiency by supporting the 'right to repair'. These provisions cover a range of white and industrial goods as well as electronic display equipment; similar provisions already apply for servers and data storage products. They are an important step forward and focus on introducing requirements on manufacturers to make available spare parts, repair and maintenance information for professional repairers, and firmware/software updates.

6.1.3 Subject to further consideration and consultation, our aim is to introduce similar requirements more extensively across a wider range of products, provided the evidence supports this approach as optimal in terms of a product's overall environmental performance. As a minimum, we will seek to implement similar resource efficiency measures alongside new energy efficiency standards for any products coming into scope of future Ecodesign regulations, including those detailed in this document. Additional product groups will also be considered as candidates for these resource efficiency requirements.

6.1.4 Beyond this, we are:

- Exploring more ambitious measures to enable reuse, repair and remanufacture, including requiring design for disassembly. In considering options, we will consider the efficacy of requirements already introduced and developments and proposals made by the UK's trading partners and this will be underpinned by appropriate industry engagement.

- Developing principles for chemical and hazardous substance usage to support a circular economy.

- Exploring how we can best use requirements on the provision of product information and labelling to drive change, including commissioning new research through Waste & Resources Action Programme (WRAP).

6.1.5 Additionally, we will consult in 2022 on reforms to the producer responsibility scheme for electronic and electrical equipment (the 'WEEE Regulations'). One objective of these reforms is to better incentivise the design of more environmentally friendly electrical products and reduce the associated waste, potentially by modulating the producer obligation based upon performance against certain requirements or standards. The same principle may also be applied to reward businesses who operate under a circular business model, such as by hiring or leasing products to their customers. New or existing Ecodesign requirements concerning the resource efficiency of energy-related products may be used as the basis for modulation in order to incentivise manufacturers in this way.

Next steps

Action	**Date**
For each product group for which energy efficiency standards are to be introduced, consider introducing basic right to repair requirements – spare part availability, repair information, software and firmware updates.	Ongoing
Through the WEEE review, develop a position on how to use minimum ecodesign standards and modulation in parallel.	2022
Explore how chemicals can be managed to support a circular economy, including addressing barriers to reuse and recycling posed by their use.	2022

Chapter 6.2: Consumer information

6.2.1 Consumer purchasing decisions have an important role to play in limiting the environmental impacts of energy-related products. Providing useful product information is crucial for consumers to make informed purchasing decisions and incentivising them to buy more energy efficient products.

Energy Labels

6.2.2 The energy label was first introduced in 1994 for a range of energy-related products (ErPs) to help raise consumer awareness of the energy efficiency of products by providing consumers with a clear and easy to understand colour-coded letter scale. Since its development, energy labels have been a key source of information for consumers when purchasing ErPs, with consumer awareness expected to be around 85% in the UK. They have also encouraged manufacturers to innovate to produce more energy efficient products in order to achieve the highest energy label ratings. Energy labels currently cover sixteen product categories listed below:

Air conditioners	Dishwasher	Fridges and freezers	Light sources
Local space heaters	Ovens	Range hoods	Refrigerated storage cabinets (professional use)
Refrigeration with a direct sales function	Solid fuel boilers	Space heaters	Televisions and electronic displays
Tumble dryers	Ventilation units	Washing machines and washer dryers	Water heaters

6.2.3 On 1 March 2021 we introduced new, re-scaled energy labels for several ErPs which had achieved the highest energy label ratings. The simpler, re-scaled energy labels display an A-G rating scale, replacing the A+++ - G scale. Prior to this rescaling exercise, most products sat within the top energy label classes, and evidence from the Energy-related Products Call for Evidence suggested consumers were less able to distinguish between an A+++ and A rated product.[133]

6.2.4 Energy labels for these products were re-scaled to better reflect the relative efficiency of the products and to leave space in the higher classes for more energy efficient products to gradually enter the market. Leaving the 'A' and 'B' classes empty to start with will encourage manufacturers to innovate to achieve higher levels of energy efficiency. The products with re-scaled energy labels include:

[133] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence

Household refrigerators and freezers	Washing machines and washer-dryers	Dishwashers
TVs and electronic displays	Wine storage refrigerators	Light sources (from 1st October 2021)

6.2.5 We will continue to keep existing energy labels under review to identify where re-scaling the energy label classes could improve the effectiveness of the energy label.

6.2.6 As well as re-scaling energy labels, it is also important that we consider the effectiveness of energy efficiency information in influencing consumer purchasing decisions. There is some evidence to suggest that there remain barriers to uptake of energy efficient products that energy labels do not sufficiently address. For example, the ErP Call for Evidence suggested that consumers were dissuaded from purchasing the most energy efficient products if they have a higher upfront cost.[134] Further, studies have suggested that uptake of higher energy-efficiency household products such as televisions, and light bulbs were more likely to be purchased when the energy label displayed a lifetime energy cost, which allowed consumers to see that higher efficiency products cost less to run.[135]

6.2.7 In addition, five respondents to the ErP Call for Evidence believed some of the symbols included on the energy label were not well understood by consumers. Further, consumer preferences are influential in decision-making when buying energy-related products, therefore the impact of the energy label may vary from product to product, depending on what other factors are important to the consumer.

6.2.8 Overall, there has been limited research into the efficacy and comprehension of the energy labels among consumers and into the factors that might influence their purchasing decisions, particularly in a UK context. We are undertaking research into the barriers and enablers that influence consumers to purchase more energy efficient products in the UK. This work will seek to understand the impact of including information about a product's running costs on the energy label. We will consider the effectiveness of this change to energy labels, and the impacts that user-practices and fluctuations in energy prices have on the accuracy of this information.

[134] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence
[135] Hille, S. 2012, Study on displaying energy cost information. Available at: https://www.researchgate.net/publication/227451562_Disclosure_of_Energy_Operating_Cost_Information_A_Silver_Bullet_for_Overcoming_the_Energy-Efficiency_Gap/link/5459edba0cf26d5090ad2e89/download

Other measures to encourage demand for efficient products

Online presence

6.2.9 With a high proportion of energy-related product purchases made online, it is vital consumers are provided with adequate information to ensure they make informed purchasing decisions. The ErP Call for Evidence showed support for additional information about a product to be displayed online or via a QR code accessible from the energy label to increase the visibility of online energy-related information and aid consumers understanding of products' energy efficiency as they browse online.

6.2.10 More exploration is needed to understand how to optimise the online display of energy information for online retail. Information must be readily accessible at the time and location consumers need it – for example, during research into buying options or at the point of purchase.[136] A third country study suggested that in online settings consumers are motivated to avoid information overload and use a two-step decision making process.[137] This means the way energy label information is presented is vital to ensuring consumers factor them in to their buying process. Not only is the way the information is presented vital, but the study also concluded that energy efficiency information has a bigger impact in the consideration stage of purchasing than the choice stage and only presenting energy efficiency information after a consumer has already selected a product may be too late.

6.2.11 We are undertaking research to understand how consumers engage with energy information in the customer journey, which will provide insights to inform future policy development. This could take the form of providing the energy label in different formats more suitable for the online environment as suggested by a third country study.[138]

Enforcement

6.2.12 The UK's product-specific energy labelling regulations require energy labels and product related information to be visible to consumers when shopping online. Anecdotal evidence, received through the ErP Call for Evidence, suggests that energy labelling requirements are not complied with consistently in online marketplaces. We will work with the relevant market surveillance authorities to explore tools that could encourage online platforms to implement the energy labelling requirements more effectively.

[136] United Nations Environment Programme, Guidelines for providing product sustainability information. Available at: https://www.oneplanetnetwork.org/resource/guidelines-providing-product-sustainability-information
[137] Leenheer et al., 2014, Client Executive Agency for Health and Consumers Rotterdam, Study on the effects on consumer behaviour of online sustainability information displays. Available at: http://publications.europa.eu/resource/genpub/PUB_KK0214676ENN.1.1
[138] Leenheer et al., 2014, Client Executive Agency for Health and Consumers Rotterdam, Study on the effects on consumer behaviour of online sustainability information displays. Available at: http://publications.europa.eu/resource/genpub/PUB_KK0214676ENN.1.1

6.2.13 We will undertake a post-implementation review of the Energy Information Regulations 2011, which will provide insights as to how enforcement can best support energy labels to be more effective in encouraging the uptake of the most efficient products.

Advice and guidance

6.2.14 Evidence suggests most people visit price comparison websites or search for information before making purchases online and offline. A third country study found that 85.6% of participants had visited a price comparison website in the past 12 months.[139] Whilst this evidence is limited to one study, we are aware that the experience of shopping online and offline is quite different. Particularly for online purchases, there is a need to make the energy label more visible, alongside the ability to search for energy information and advice more generally.

6.2.15 It is important that advice and guidance is available to support consumers' understanding of the benefits of energy efficiency and to encourage them to use the energy label to guide purchasing decisions. We will explore the most effective way to provide advice and guidance to consumers and will consider the role communications campaigns provided by Government or other trusted bodies could play in encouraging demand for efficient products.

Future considerations

6.2.16 Available evidence shows that the barriers to uptake of more energy efficient products are complex and are not adequately overcome by the current energy label alone. For example, consumers place higher emphasis on certain factors dependent on the product they are purchasing and therefore energy efficiency may not always be the main reason for product selection.[140] It is likely that barriers vary between physical and online retail settings, as well as across different product groups.

6.2.17 Simply providing more information about energy efficiency or sustainability may not help consumers. Recent evidence from a Competition and Markets Authority consultation suggests many consumers are confused by the environmental information provided about goods and services and struggle to compare the impact of various products.[141]

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[139] Leenheer J, Elsen M, Mikola N, van der Wagt M, Lloyd L, 2014, Study on the effects on consumer behaviour of online sustainability information displays, Client Executive Agency for Health and Consumers Rotterdam. Available at: https://www.researchgate.net/publication/285596458_Study_on_the_effects_on_consumer_behaviour_of_online_sustainability_information_displays

[140] Brocklehurst F, 2018, Choosing energy efficiency – consumer response to operating costs at the point of sale, Ballarat Consulting. Available at: https://www.biee.org/wpcms/wp-content/uploads/Brocklehurst-choosing_energy_efficiency_consumer_-response-corrected.pdf

[141] Competition and Market Authority, 2021, Draft guidance on environmental claims on goods and services, Consultation document. Available at: https://assets.publishing.service.gov.uk/media/60a66a9cd3bf7f73893a8e1f/Draft_guidance_on_environmental_claims_on_goods_and_services-.pdf

6.2.18 As well as information relating to in-use energy performance, more sustainable purchasing decisions can be assisted with provision of details about a product's wider environmental performance, for example in the form of a repairability score like that recently introduced in France. Our work on energy information interventions will be mindful of the potential for future requirements for consumer information on resource efficiency, the interplay between the two and the importance of clarity and simplicity of message to best inform consumers.

Illustrative proposal

6.2.19 Shown below is an example of the potential carbon savings that could be possible if energy labels were to include the lifetime cost of a product on the label. This would allow consumers to compare the efficiency of products on a monetary basis as well as an efficiency rating and thus help overcome the cost barrier to the take up of more energy efficient products. There is a large range in the estimate of savings possible from this label type to account for the uncertain nature of consumer behavioural effects, as well as the variation of the impact of the label from product to product.

Table 12: Potential policy options under consideration

Policy option	**Energy savings GWh (CB5 Period)**	**Estimated CB5 saving (MTCO2e)**
Include lifetime costs on the energy label	160 – 1,960	0.03 – 2.1

Next steps

Action	Date
We are undertaking Behavioural Insights research to build the evidence base supporting energy information interventions. This research will aim to: • Deepen our understanding of the barriers to take up of more energy efficient products, including how these vary across different product categories, and between physical and online settings; • Consider what information on the label, or information presented to the consumer during their customer journey, is the most effective at influencing them to purchase a more energy efficient product; and • Explore how consumers currently engage with the energy label in their consumer journey, and what enablers there are, or could be, to purchasing a more energy efficient product.	2021
We will undertake a Post-Implementation Review of energy labelling enforcement, which will help us to identify where this could be made more effective.	2021
We will consider whether the introduction of an energy label could be an effective policy lever to realise the energy-savings potential of some of the products identified in this Framework. Similarly, building on the re-scaled energy label that was introduced earlier in 2021 for a handful of products, we will continue to keep existing energy labels under review to identify where this could improve the effectiveness of the energy label.	2022

Chapter 6.3: Enforcement and compliance

6.3.1 The Office for Product Safety and Standards (OPSS) is responsible for enforcing the ecodesign and energy labelling requirements placed on manufacturers, authorised representatives, and importers across the UK. Local Weights and Measures Authorities (Local Trading Standards) and the Department for the Economy (NI) enforce energy labelling requirements placed on dealers in Great Britain and Northern Ireland respectively. The Advertising Standards Authority (ASA) is responsible for

ensuring marketers' advertising of energy labels across various media is in accordance with UK advertising codes.

6.3.2 Effective market surveillance protects consumers and provides them with confidence in the information they are given when making purchasing decisions. It provides industry stakeholders with confidence when trading on the UK market. Further, it supports the realisation of the projected energy and carbon savings once new regulations are introduced by preventing non-compliant goods being placed, and circulating, on the UK market. Robust market surveillance and enforcement will be important in supporting the UK's transition to a carbon neutral economy by 2050. It will only grow in importance as the UK Government considers regulatory divergence from the EU on energy-related product standards.

6.3.3 The OPSS is committed to delivering regulation in a manner that is risk based, proportionate and consistent, and aims to be transparent and accountable about their regulatory approach and activities, in accordance with the statutory principles of good regulation:

- **Targeted** – the OPSS use strategic and operational risk assessment to focus our resources where we believe they are most needed.
- **Proportionate –** the OPSS activities and actions will reflect the level of risk to people and the environment, and our responses to non-compliance will take account of the nature, seriousness and circumstances of the offence, as well as the impact of regulatory action on the business community or individual businesses.
- **Consistent –** where circumstances are comparable, the OPSS will endeavour to act consistently, and will collaborate with other regulators where appropriate to promote coherent and complementary approaches.
- **Transparent –** the OPSS will ensure that those we regulate are able to understand what they can expect of us, and what is expected of them.
- **Accountable –** the OPSS activities will be open to public scrutiny, with clear and accessible policies, supported by a fair and efficient complaints procedure.

6.3.4 In the energy-related products (ErP) Call for Evidence,[142] we sought feedback on the effectiveness of UK market surveillance activity for ecodesign and energy labelling. In addition, we recently published a Post-Implementation Review (PIR)[143] of the Ecodesign for Energy-Related Products Regulations 2010, which set out the enforcement regime for Ecodesign regulations in the UK.[144] Later in 2021, we will

[142] BEIS, 2020, Energy-related Products: Call for Evidence. Available at: https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence
[143] The Post-Implementation Review of the Ecodesign for Energy-Related Products Regulations 2010 Available at: https://www.legislation.gov.uk/uksi/2010/2617/resources
[144] The Ecodesign for Energy-Related Products Regulations (UK) No 2010/2617. Available at: https://www.legislation.gov.uk/uksi/2010/2617/contents

publish a Post-Implementation Review of the Energy Information Regulations 2011, which set out the enforcement regime for Energy Labelling regulations in the UK.[145]

6.3.5 Through the ErP Call for Evidence and PIR exercises, we found some evidence to suggest that the complexity of ecodesign and energy labelling legislation can be a barrier to compliance. Representatives noted that non-compliance can be caused by a lack of awareness or understanding of the requirements - for example, it may be the result of limited capacity within the organisation to engage with the regulatory framework, or the fact the organisation is not UK-based. It was suggested that trade association membership provided effective support with understanding the regulatory framework. The evidence gathered to date about the effectiveness of UK market surveillance has been anecdotal.

Tools to Facilitate Compliance

6.3.6 The OPSS undertakes a range of engagement activities with businesses by providing advice, guidance, and support to facilitate compliance with the ecodesign and energy labelling regulatory framework. Efforts are made to reach businesses of all sizes. In addition, the OPSS has an accessible enquiry service enabling stakeholders to seek support and make enquiries in relation to UK standards and regulations. Regulatory compliance is further supported through e-alerts provided to relevant stakeholders.

6.3.7 Further measures taken by BEIS and the OPSS to facilitate compliance include online support tools, which support businesses to understand and comply with complex requirements. The 'create an energy label' service was developed to provide manufacturers with a means of generating UK energy labels.[146] Since its creation, the site has drawn over 20,000 users, with a clear rise since the UK's departure from the EU. The service gives suppliers and manufactures confidence that they are meeting the energy label design requirements and supports consistency in the UK market. Another example is a regulatory relief tool for Power Transformers,[147] this supports stakeholders to determine whether they are eligible for a derogation from certain provisions set out in the Ecodesign regulations on Power Transformers.[148]

Ecodesign Enforcement

6.3.8 With respect to ecodesign, the OPSS has an active programme of market surveillance activities that includes regular inspections of business sites and online platforms, along with product performance testing. Where non-compliance with product specific ecodesign regulations is identified, the OPSS has the power to impose Civil Sanctions

[145] The Energy Information Regulations 2011, No. 1524. Available at: https://www.legislation.gov.uk/uksi/2011/1524/contents
[146] BEIS and OPSS, Create an energy label. Available at: https://www.gov.uk/guidance/create-an-energy-label
[147] BEIS and OPSS, 2021, How to use the power transformer regulatory relief tool. Available at: https://www.gov.uk/government/publications/ecodesign-requirements-for-power-transformers-find-out-whether-your-installation-is-eligible-for-regulatory-relief/how-to-use-the-power-transformer-regulatory-relief-tool
[148] Commission Regulation (EU) 548/2014, as amended by Commission Regulation (EU) 2019/1783. Available at: https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32019R1783

(such as compliance notices, variable monetary penalties and stop notices to enforcement undertakings) on certain economic operators.[149] Additionally, the OPSS has the power to recover testing costs from the economic operators of non-compliant products.

6.3.9 A recent post-implementation review (PIR) of the enforcement and compliance regime for ecodesign found that this has supported the achievement of the expected carbon savings and financial benefits for consumers from ecodesign regulations. The review suggested that Civil Sanctions are an effective and positive lever for reducing the incidence of non-compliance.

6.3.10 The PIR and ErP Call for Evidence also identified some weaknesses in the enforcement of ecodesign regulations. Several stakeholders expressed the views that: (a) cost sharing powers have not been fully utilised, and (b) it could be beneficial to increase the visibility of enforcement activities related to ecodesign.

Energy Labelling Enforcement

6.3.11 We are currently conducting a PIR on the effectiveness of the Energy Information Regulations 2011which set out the enforcement regime for energy labelling in the UK.[150] Anecdotal evidence submitted as part of the ErP Call for Evidence suggested that there was little visibility of the enforcement of the Regulations, particularly online. Further evidence suggested that a lack of complaints to the ASA and Local Trading Standards Authorities might result in energy labelling enforcement activities being given a lower priority. Nonetheless, the OPSS has recently implemented a team dedicated to online market surveillance, and recent work has seen several items removed from online marketplaces.

6.3.12 To produce full recommendations, we will gather more evidence from the Market Surveillance Authorities (MSAs) and from stakeholders to enhance our understanding of the effectiveness of energy labelling enforcement.

[149] Ecodesign enforcement powers are set out in The Ecodesign for Energy-Related Products Regulations 2010. Available at: https://www.legislation.gov.uk/uksi/2010/2617/contents
[150] Energy Information Regulations 2011 (SI 2011/1524). Available at: http://www.legislation.gov.uk/uksi/2011/1524/contents/made

Next Steps

Actions	Date
We will publish the outcome of the PIR on the enforcement of the Energy Labelling alongside recommendations for improving enforcement.	2021
To increase the visibility of the OPSS' activities, we will publish, where appropriate, future enforcement actions both in the OPSS annual report and on their website.	2021
To improve the reporting of non-compliance, we will review our web content to make it easier for stakeholders to report suspected non-compliance.	2021
We will explore the barriers to implementing the cost sharing power and consider how to enable the OPSS to utilise it more effectively.	2022
We will explore various options to improve scrutiny of distance sellers, including working in partnership with online marketplaces to check products meet UK standards.	2022

Chapter 6.4: Energy Technology List (ETL)

6.4.1 BEIS' ambition for the ETL is for it to become the 'first choice' specification and procurement tool and low-carbon information source for private and public sector organisations looking to invest in new highly energy efficient equipment.[151]

6.4.2 In 2020, BEIS conducted a significant upgrade to the ETL website to improve the user experience and improve ease of access to its database of products. We completely overhauled the website's content, significantly improved the product search functionality and gave manufacturers the ability to upload product images. This has led to a significant increase in website traffic, with rates consistently exceeding 100,000 users per month.

6.4.3 We also built an Application Programming Interface (API) that allows businesses to add the ability to find energy efficient, ETL-listed products to their own websites and applications. All the data available on the ETL product search service is available via the API, including technical information, product images and the ability to search and filter products.

6.4.4 Over the last four years, BEIS has been working with stakeholders to technically review all of the ETL categories to reflect the linkages of eligibility criteria with technology-relevant national and international measurement standards and efficiency parameters. In the future, we will look to broaden the range of technologies included

[151] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/

within the ETL's remit to encourage and promote the uptake of innovative products that could offer greater carbon savings potential. We will introduce a new process to accelerate the speed at which new technology proposals are adopted onto the ETL.

6.4.5 As well as the above, we will continue to work with stakeholders to develop the website and to encourage greater awareness of this asset. As well as continuous improvement and development of website content to enhance the user experience, we will consider options for future changes, such as facilitating a Building Information Modelling repository, and adding product data sheets to further enhance the value and portability of data for both manufacturers and product buyers.

6.4.6 We will work with our delivery partners to improve awareness of the ETL. We intend to bring manufacturers and buyers together to build links and share knowledge. We will continue to engage with ETL users, to encourage their participation through a programme of events, and facilitate networking between user groups. BEIS will review how the ETL is promoted, the messaging strategy employed, and the scheme materials offered so that it will become more user focussed. We aim to use these strategies to help drive up awareness of the ETL over the next 12 months and continue afterwards using the most effective methods demonstrated.

6.4.7 We will also look to develop metrics to quantify purchases associated with the ETL and, through this, understand the emissions reduction this represents. We intend to assess the value for money of maintaining and updating the ETL by comparing the amount spent against the tonnes of carbon saved. We anticipate that estimating the lifetime costs for purchases will demonstrate that the cost is outweighed by these bill savings.

6.4.8 BEIS will introduce a new technology category for Professional Foodservice Equipment that will initially have four sub-technologies (Combination Steam Ovens, Convection Ovens, Undercounter Dishwashers and Hood-door Type Dishwashers). We will also add new ETL Sub-Technologies for Building Energy Management Systems (BEMS), Laboratory Grade Refrigerators and Freezers, and Commercial Fans.

Public Procurement

6.4.9 Use of the ETL has long been mandated in the UK Government Buying Standards which apply for central government departments and are encouraged for the wider public sector.[152] BEIS will review and update the standards that pertain to energy-related products (ErPs) to ensure that the highest energy efficient performance standards are mandated.

[152] Defra, 2012, Sustainable procurement: the Government Buying Standards. Available at: https://www.gov.uk/government/collections/sustainable-procurement-the-government-buying-standards-gbs

6.4.10 BEIS will work with colleagues across government to evaluate the options for better embedding the ETL into public procurement processes to assist public sector buyers and specifiers. We will also consider whether the Office for Product Safety and Standards could assess uptake rates across central government.

Commercial Procurement

6.4.11 We will continue to engage with the relevant trade bodies and commercial E-procurement platform operators to encourage uptake of the ETL website's Application Programming Interface (API).

Chapter 6.5: Voluntary Agreements

6.5.1 We believe there is potential in some instances for industry-led voluntary schemes to achieve our policy objectives more quickly and at lesser expense than mandatory requirements if they comply with the relevant criteria. These criteria include requirements that the agreement meets the level of our ambition, is open to participation and covers a large majority of the relevant market.

6.5.2 BEIS will draw on the recent energy-related products (ErP) Policy Study[153] to identify high potential products and, in addition, we will look to international best practice in voluntary agreements (VAs) to develop our own as an alternative approach to regulation or to secure additional emissions and consumer savings before regulation takes effect.

6.5.3 Games consoles and imaging equipment are currently covered by a voluntary agreement in the EU. We supported this initiative as a Member State and will look to secure the benefits of such agreements with UK Voluntary Agreements. We are currently exploring a VA with the games consoles industry, securing energy and emissions savings through a proportionate approach without regulation. We will monitor the development of further voluntary agreements internationally and seek to leverage the benefits of these initiatives when they fit with UK ambition.

Chapter 6.6: Energy Smart Appliances

6.6.1 Full decarbonisation of power, heat and transport will require significant levels of system flexibility, much higher than present levels. Historically, flexibility has been provided by fossil fuels; however, it will now need to come from clean technologies such as storage, demand side response (including from heat pumps, electric vehicles, and other energy smart appliances) and interconnection. The system will need

[153] ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study

consumers of all types – domestic, business, public sector, and communities – to respond to price signals and shift demand away from peak periods.

6.6.2 The Government intends to take powers to set regulatory requirements for 'energy smart appliances'. This will apply to the cohort of appliances including:

- Cold appliances
- Wet appliances
- Electrical space and water heating
- Ventilation
- Air conditioning
- Battery storage

6.6.3 These will be underpinned by the principles of interoperability, data privacy, grid stability and cyber security. We will ensure that our approach is compatible with wider government regulation of consumer-connected products. We also need to do further work to ensure that consumers are suitably informed and protected so that they can participate in this smart system with confidence.

6.6.4 In 2019, we consulted on taking secondary legislation forward under the Automated and Electric Vehicles Act 2018 to mandate that private electric vehicle (EV) charge points must be smart and meet device level requirements.[154] Government published its response to the consultation in July 2021[155] and committed to introducing secondary legislation later in 2021 to ensure that private charge points sold in Britain have smart functionality.

6.6.5 We will explore the options for mandatory requirements for 'energy smart' appliances. The government will work with industry to support the uptake of PAS 1878 and 1879 for 'energy smart' appliances[156], to encourage development and deployment of Demand Side Response (DSR)-capable devices and to establish a technical framework for small-scale DSR.

6.6.6 Other products may also be appropriate for regulatory requirements. For example, the energy-related products (ErP) Policy Study identified products which have smart functionality potential such as lighting, servers, data storage, compressors, water

[154] Department for Transport, 2019, Electric Vehicle Smart Charging Consultation. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/817107/electric-vehicle-smart-charging.pdf

[155] Department for Transport, 2021, Electric Vehicle Smart Charging: Government Response. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1008744/electric-vehicle-smart-charging-government-response.pdf

[156] British Standards Institution, Energy Smart Appliances Programme. Available at: https://www.bsigroup.com/en-GB/about-bsi/uk-national-standards-body/about-standards/Innovation/energy-smart-appliances-programme/

pumps etc. Additionally, the role of home energy management systems (HEMS) that form part of smart energy systems may also be considered. However, further research would be required to establish benefits associated with additional products.

Chapter 6.7: International cooperation

SEAD

6.7.1 The Super-efficient Equipment and Appliance Deployment initiative (SEAD) is a voluntary collaboration between global governments covering nearly half the world's population. The initiative aims to address urgent global energy challenges and promote the manufacture, purchase, and use of energy efficient appliances and lighting.

6.7.2 As COP26 President, the UK aims to drive international action on product energy efficiency policy. Ahead of COP26, the UK and International Energy Agency (IEA) launched a Call to Action to strengthen SEAD to support countries in achieving raised ambition more quickly, easily and at a lower cost. The objectives of the Call to Action are to:

- Set countries on a trajectory to double the efficiency of key products sold globally by 2030 – motors, air conditioners, refrigerators, lighting.
- Support the delivery of crucial national climate change targets.
- Provide consumers and businesses with more efficient products that are affordable and cost-effective to own and operate.
- Stimulate innovation and provide businesses with export opportunities.
- Promote a dual course of action, making products both energy efficient and climate friendly by reducing the use of refrigerants in cooling appliances.

Energy-Efficient End-Use Equipment (4E)

6.7.3 The UK is one of seven countries that participate in the Solid State Lighting (SSL) Annex of 4E. SSL can surpass traditional lighting technologies in energy efficiency, at a lower lifetime cost; however, there is a wide variation in the quality and performance of SSL products currently on the market. The SSL Annex engages in international collaboration and joint activities to improve the quality and performance of SSL products globally.

6.7.4 The Electronic Devices and Networks Annex (EDNA) provides technical analysis and policy guidance to governments aimed at improving the energy efficiency of connected devices and their systems. EDNA is focused on the optimal operation of systems of network connected devices to save energy. The UK is one of 14 members of EDNA

and we aim to incorporate international best practice and learnings from EDNA into our own policies while sharing our own expertise through this global forum.

Harmonisation and trade

6.7.5 Since leaving the EU, the UK Government has signed free trade agreements (FTAs) with the EU, Japan, and EEA-EFTA, as well as agreements in principle with New Zealand and Australia. FTA negotiations are due to commence with India as well as to modernise existing agreements with Canada and Mexico. Through FTAs, we can help to ensure that the most efficient products around the globe, that meet UK standards, can be placed on the UK market and to reduce barriers to trade.

6.7.6 Harmonisation refers to the process of creating more coherent and in some cases common technical standards and policy requirements. As with FTAs, harmonisation ensures that the most efficient products are more able to circulate on the UK market, and that innovation in product technologies can be reached on a global scale. In order to reach harmonisation, increased international dialogue is needed, along with mutual recognition of test and product standards, coherent definitions of products and the scope of regulations, equivalence or at least comparability of test procedures, and coherent product performance level frameworks. We hope to achieve greater harmonisation in ErP policy globally through our international work and FTA negotiations.

Chapter 7: Next steps

7.1.1 This Framework provides an overview of our energy-related products (ErP) policy approach in addition to broad proposals for the next stage of policy development to maintain our ambition for energy and resource efficiency, emissions, and consumer bills. The proposals utilise both regulatory and voluntary approaches and we will work closely with stakeholders to minimise the burden on business and ensure policy interventions are targeted and appropriate. We will engage with industry as we develop the detail of our proposals over the next year. An indicative timeline of further activity is provided below. This is supplementary to Chapter 3, which sets out a high-level map of the policy development process.

Date	**Activity**
2021	Initial stakeholder engagement on illustrative proposals, for example through policy workshops. The aim will be to refine proposals, inform our understanding of likely impacts and explore any appropriate exemptions or phasing.
2021 – 2022	Further research and development of illustrative proposals.
	Ongoing stakeholder engagement.
2022	Final policy options.
2022-23	Consultation on draft legislation.
	WTO notification.
	Parliamentary process.
2025 onwards[157]	First measures come into effect.

[157] While we envisage most proposed measures would come into effect in 2025 or later, for a number of appliances and products where market readiness is clear – with more efficient alternatives well established and available – we may be able to introduce some measures earlier.

Annex 1 - Legislative framework

Ecodesign and Energy Information

Background

Prior to the UK's exit from the EU, there were two main pieces of European legislation on energy-related products: Directive 2009/125/EC establishing a framework for the setting of ecodesign requirements for energy-related products ("**the Ecodesign Directive**") and Regulation (EU) 2017/1369 setting a framework for energy labelling ("**the Energy Labelling Regulation**"). In addition, there was various product-specific Ecodesign and Energy Labelling legislation sitting under these frameworks that was directly applicable in the UK.

The Ecodesign Directive was implemented domestically by the Ecodesign for Energy-Related Products Regulations 2010 ("**the 2010 Regulations**") which establish a related enforcement regime.[158] The Energy Information Regulations 2011 ("**the 2011 Regulations**") created domestic obligations and a related enforcement regime to ensure that the UK has powers to enforce the Energy Labelling Regulation and product-specific labelling measures.[159]

Following the end of the transition period, EU Ecodesign and Energy Labelling legislation which was in effect prior to 1 January 2021 was retained in domestic law meaning it will continue to apply in Great Britain (GB) until any further changes are made. Any new EU product-specific legislation which takes effect after 1 January 2021, will not apply automatically in GB.

Adapting retained EU law to UK context

To ensure retained EU Ecodesign and Energy Labelling legislation remains fully operable in the UK after the end of the transition period, and to implement the Northern Ireland Protocol, amendments were made to the underlying legislation via:

- The Ecodesign for Energy-Related Products and Energy Information (EU Exit)(Amendment) Regulations 2019[160]
- The Ecodesign for Energy-Related Products and Energy Information (EU Exit)(Amendment) Regulations 2020[161]

In particular, the powers formerly vested in the European Commission to set ecodesign and energy labelling requirements for ErPs were transferred to the Secretary of State allowing GB to maintain its environmental standards for energy-related products. These powers were

[158] The Ecodesign for Energy-Related Products Regulations 2010. Available at: https://www.legislation.gov.uk/uksi/2010/2617/contents
[159]The Energy Information Regulations 2011. Available at: https://www.legislation.gov.uk/uksi/2011/1524/contents/made
[160]The Ecodesign for Energy-Related Products and Energy Information (EU Exit) (Amendment) Regulations 2019. Available at: https://www.legislation.gov.uk/uksi/2019/539/contents/made
[161] The Ecodesign for Energy-Related Products and Energy Information (EU Exit) (Amendment) Regulations 2020. Available at: https://www.legislation.gov.uk/uksi/2020/1528/contents/made

recently used to implement new ecodesign and energy labelling requirements in GB for a package of products which the UK had previously agreed as a Member State at EU level.

Table 13 clarifies in which pieces of legislation different parts of the GB legislative framework are established.

Table 13: Legislative Framework in GB

	Ecodesign	**Energy Labelling**
Powers to regulate products	Regulations 22 and 24 of the 2010 Regulations	Articles 11 and 11A of Retained Energy Labelling Regulation
Product-specific requirements	Product-specific retained EU implementing acts or measures made by the Secretary of State under regulations 22 and 24. The relevant measures which apply in GB are listed in the table in paragraph 4 of Schedule 1 to the 2010 Regulations.	Product-specific retained EU delegated acts and measures made by the Secretary of State under articles 11 and 11A. The relevant measures which apply in GB are listed in the table in Schedule 1 to the 2011 Regulations.
Enforcement regime	The 2010 Regulations	The 2011 Regulations

Northern Ireland

The Protocol on Ireland/Northern Ireland ("the Northern Ireland Protocol") was agreed by the UK and the EU as part of the arrangements for the UK's withdrawal from the EU. The objectives of the Northern Ireland Protocol are to avoid a hard land border in Ireland, to maintain the necessary conditions for continued north-south co-operation, and to protect the Belfast (Good Friday) Agreement. It protects Northern Ireland's place in the UK's customs territory and requires Northern Ireland to remain aligned to the EU single market and customs rules to avoid a hard land border in Ireland (*Articles 5-10*). In accordance with the Northern Ireland Protocol, EU Ecodesign and Energy Labelling legislation as it has effect in the EU will continue to apply automatically in Northern Ireland (*Annex 2 to the Northern Ireland Protocol*). Ecodesign and energy labelling is a reserved matter under the devolution settlements and the 2010 and 2011 Regulations will continue to provide the enforcement regime.

The Northern Ireland Protocol as it currently operates is presenting very significant challenges for people and businesses in Northern Ireland. The Government is seeking to find a new balance in the Protocol to place it on a more sustainable footing. This includes proposals to establish a dual regulatory regime, to ensure that consumers in Northern Ireland do not face barriers in accessing goods from Great Britain, which would enable goods made to UK rules or goods made to EU rules to circulate and be placed on the market in Northern Ireland. The EU has since published proposals in response, and we are studying them constructively and positively. Officials are working closely with their EU counterparts and Lord Frost remains in close contact with Vice President Sefcovic.

Other relevant legislation

Waste Electronic and Electrical Equipment (WEEE) Regulations 2013:[162]

The WEEE Regulations place obligations on producers of electrical equipment to finance the collection and treatment of the equipment they place on the market when it becomes waste. This ensures waste electricals are diverted from landfill.

We are seeking to review the existing regulations to increase levels of collections, ensure compatibility with the broader EPR framework and circular economy principles and ensure all producers, including those who sell online, are playing their part to reduce the environmental impact of waste electricals.

Resource Efficiency Information, Environment Bill Schedule 6

This power will enable government, via secondary legislation, to require resource efficiency information to be provided about products which it identifies as requiring such regulation. These may be either energy-related or non-energy related products, and these regulations will be made by way of the affirmative procedure.

This is primarily about providing information on the resource efficiency of products to enable consumers to make more sustainable purchasing decisions.

The information must be relevant to the impact of the product on the natural environment. It may relate to the durability, reparability, and recycled content of such products, or it may be information that aids remanufacture or end of life disposal including recyclability and ease of extraction of constituent materials. It may also relate to materials used or manufacturing techniques, resources consumed in production or use, or pollutants emitted at any stage of production, use or disposal. This could take the form of consumer information rating schemes, or labels specifying that a product meets a certain environmental standard.

[162] The Waste Electrical and Electronic Equipment Regulations 2013 SI 3113/2013. Available at: https://www.legislation.gov.uk/uksi/2013/3113/contents/made

Annex 2 – Analytical Summary

Summary of costs and benefits from proposed policy options

While some policies in this document will require further development before quantifying their benefits, the options for which we have early quantitative estimates of both carbon and energy savings are listed below. Given the significant uncertainty associated with changes in technology, market forces, consumer preferences, relative costs of gas and electricity, and the carbon impact of energy generation, we have not included an assessment of the cost, benefits, net present value or carbon cost effectiveness at this stage. Where there is particular uncertainty on assumptions used, or alternative options that could be pursued, we have used a range estimate. Where illustrative proposals are taken forward, we will prepare impact assessments where appropriate based on the latest evidence, including on expected costs and benefits.

Table 14: Carbon Budget 5 (CB5) estimations

Product	**Energy Savings (GWh)**	**Savings (MtCO2e)**
Gas Boilers (98% EEP)	3,400 – 10,200	0.6 – 1.9
Gas Boiler to Hybrid	18,000 – 56,000	3 – 10
Heat Pumps	9,000 -26,000	1.0 – 3.0
Domestic Cooking	13,600	1.7
Commercial Cooking	1,900	0.9
Taps and non-electric Showers (policy led by DEFRA)	4,000 - 14,000	0.9 - 3.3
Lighting Products	8,800	1.2
Labelling	900 – 10,700	0.03 – 2.1
Total	**60,000 – 141,200**	**9.7 – 24.1**

Table 15: Carbon Budget 6 (CB6) estimations

Product	**Energy Savings (GWh)**	**Savings (MtCO2e)**
Gas Boilers (98% ERP)	2,900 – 8,600	0.5 – 1.6
Gas Boiler to Hybrid	30,400 – 92,000	6 - 17
Heat Pumps	25,000 – 74,900	1.1 – 3.3
Domestic Cooking	8,400	3.1
Commercial Cooking	3,400	1.6
Taps and non-electric Showers (policy led by Defra)	7,200 -25,300	1.6 - 5.9
Lighting Products	6,300	0.5
Labelling	900 – 10,600	0.02 – 2.0
Total	**84,500 – 229,500**	**14.0 – 35.0**

Table 16: Estimations to 2050

Product	**Energy Savings (GWh)**	**Savings (MtCO2e)**
Gas Boilers (98% ERP)	7,700 – 23,000	1.4 - 4.2
Gas Boiler to Hybrid	92,100 – 278,000	17 - 51
Heat Pumps	162,000 – 486,000	3.8 – 11.4
Domestic Cooking	50,500	15.9
Commercial Cooking	19,500	5.9
Taps and non-electric Showers (policy led by Defra)	33,000 – 115,000	7.2 - 26.9
Lighting Products	29,800	3.2
Labelling	5,400 – 63,900	0.7 – 12.4
Total	**400,000 – 1,065,700**	**55.0 – 130.9**

In addition to the policy options above, estimates have been made of the CB5 potential for several other products options. As more information is needed to estimate energy savings only an illustrative range of potential carbon savings has been presented.

Table 17: Estimated savings for potential policy options

Product	**Low Estimate MtCO2e**	**High Estimate MtCO2e**
ETL	0.7	1.8
Water Pumps	0.3	0.7
BACS	0.3	10.0
Commercial Refrigeration	0.3	1.2
Servers	0.1	1.1
Compressors	0.1	0.4
Total	**1.8**	**15.2**

Assumptions and sources for specific products

Below is an outline of the modelling approach used for the specific product proposals in this document. Where not otherwise stated, estimates used for this analysis were derived from the Energy Using Products Policy Model (EUPP).

The main purpose of the model is to assess the impact of policies around energy-related products (ErPs). Its outputs include the likely costs (in particular, higher costs resulting from the purchase of new products); and benefits (primarily in the form of energy and carbon savings from using more energy efficient products).

The model uses a “bottom-up” approach, allowing detailed scenarios to be modelled for specific products such as the setting of minimum energy performance standards (MEPS). Each product and scenario require specific inputs to be calculated/estimated, including:

- Stocks and/or sales of ErP being modelled (including breakdown by technology type);
- The lifespan of the ErP;
- The energy consumption of ErP (including by mode type and mode such as “on” or “standby”);
- The level of usage of ErP (hours/year); and
- The price and value estimates, to calculate costs and benefits.

Comparing the outputs of the model under different scenarios, the model quantifies the:

- Additional purchase/production costs associated with new products (typically incurred by the consumer, and/or other groups such as industry or government);
- Benefits of energy savings over the lifetime of the products from switching to more energy efficient products;
- Costs and benefits of non-monetary factors such as improved air quality and a reduction in emissions; and
- Costs of the additional heating requirements due to the heat replacement effect. This is the extra heating required in the colder months to replace the reduced waste heat loss from more efficient products. It is only considered for domestic products since, for non-domestic use, it is considered to be cancelled out by reduced cooling costs in the warmer months.

Due the uncertainties in some of these above we have not included an assessment of the cost and benefits of these proposals. However, where these are taken forward, future impact assessments will consider all of these factors.

Input variables

Whether sourced from the EUPP model or other sources, the following variables are considered when modelling the energy and Carbon savings of each policy option.

Stocks and/or sales

The stock of ErPs refers to the number of products, along with their technical characteristics, owned by consumers and businesses during a given year. Flows into the stock include new purchases (sales) and flow out of the stock arise from disposals. Stock/sales figures are independent of other inputs, such as costs.

The average energy efficiency of the stock evolves according to the rate at which ErPs at one level of energy efficiency are replaced by ErPs of another level of energy efficiency. In the context of ErPs, the rate of increase in energy efficiency over time depends on the rate at which older, less energy efficient products are replaced by newer, more energy efficient products which, in turn, may be affected by the policy being assessed.

If the data on the stock of ErPs from year to year are more complete than the data on new purchases (sales), then stock data and projections are used as an input to the model and sales in each year are calculated according to the rate of disposal and end-of-year stocks. This is called a "sales from stock" model. Alternatively, if the sales data are more complete than the stock data, then these figures are used as inputs and the stock is calculated as the sum of sales and disposals. This is called a "stock from sales" model.

Lifespan (years)

The modelling considers the technical/economic lifespan, accounting for products being replaced before they are irreparable (for example, a mobile phone being replaced at the end of a fixed-term contract).

Level of usage (hours/year)

The number of hours that each product is in use per year is estimated.

Energy consumption (kWh)

In each year, energy demand is given by annual usage (hours/year) multiplied by the average efficiency of the stock. The annual usage figures can be differentiated by technology and operating mode (e.g., "on" versus "standby") and may also differ over time. Estimates of greenhouse gas emissions are calculated from the energy demand figures by applying emissions factors to the series from the *Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal.*[163]

Modelling assumptions

Our modelling does not link Costs and Stocks/Sales, i.e., if the cost of a product increases, stocks/sales figures are unaffected and vice-versa. Similarly, our modelling assumes that a

[163] BEIS, 2020, Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal. Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal.

change in the price of energy will only lead to a change in the value of energy savings (and not the effective lifespan of products).

Our modelling does not address decisions about whether to replace a product before the end of its life, if it becomes cost-effective to do so, or which of the candidate technology types is the preferred replacement choice.

Modelling Assumptions for specific products

Below are the key assumptions used for estimating impacts of the policy proposals in the main document. Unless otherwise stated, the methodology outlined above is used for calculating energy and Carbon savings.

Gas boilers

Please refer to the example modelling approach above for a description of the stocks and sales approach applied to gas boilers. Energy and Carbon savings from raising minimum standards on existing boiler technology are accrued by improving the in-situ efficiency of new boiler sales from 2025. The efficiency can be improved by optimising deployment and use of existing technologies.

Sales of gas boilers are forecast to fall steadily between 2025 and 2035 because of the increased deployment of more efficient home heating technologies such as heat pumps. Boilers have an assumed lifetime of 10-15 years.

Savings are calculated by estimating the energy use improvements achieved by a 1%, 2%, and 3% decrease in annual energy demand from gas boilers. The baseline heat demand of gas boilers, without the technology improvements, comes from the BEIS 'Heat in Buildings - The Future of Heat' consultation.[164]

The proportion of sales of more efficient boilers rises steadily between 2025 and 2035 in the counterfactual scenario. This represents a natural technology improvement and limits the saving potential of boilers sold in the future.

A similar methodology is used to evaluate the energy and Carbon savings of hypothetical options to raise the standards of boilers further through use of alternative technologies. As roll out and potential costs of these options are more uncertain, only potential benefits based on the change of efficiencies are presented.

Heat pumps

Please refer to the example modelling approach above for a description of the stocks and sales approach applied to heat pumps. Energy and Carbon savings from raising minimum standards on heat pumps are accrued by the staggered improvement the efficiency of heat pumps in 2025 and 2030. The efficiency can be improved by optimising deployment and use of existing technologies.

[164] BEIS, 2016, Heat in Buildings – The Future of Heat. Available at: https://www.gov.uk/government/consultations/heat-in-buildings-the-future-of-heat

Sales of heat pumps are forecast to rise rapidly between now and 2035 with a target of 600,000 heat pump sales in 2028. Due to a lack of market data, there is no counterfactual scenario for the sales of improved heat pumps without minimum performance standards so the savings will be an overestimate. Heat pumps have an assumed lifetime of 15 years.

Savings are calculated by estimating the energy use improvements achieved by a decrease in annual energy demand from heat pumps by 10%, 20%, and 30%. The baseline heat demand of heat pumps is reached by multiplying average annual heat demand by the efficiency of a standard heat pump.

Domestic Cooking

Please refer to the example modelling approach above for a description of the stocks and sales approach applied to domestic cooking. The energy and Carbon savings accrued from this product area are associated with raising the minimum energy efficiency levels for gas and electric cooking appliances from 2025. These appliances include ovens, hobs and grills used in a domestic environment, which have an assumed lifespan of 20 years.

It is assumed that total sales remain constant over the examined period of 2025 to 2050. However, it is anticipated that raising MEPS in 2025 and 2028 will lead to the market being composed of an increasingly high proportion of electric cookers. Additionally, it is assumed in this model that average product efficiency and overall use does not change over this period. Therefore, potential carbon savings are driven by a significant increase in the stock of electric cookers.

The headline carbon savings are calculated by estimating the change in energy consumption and associated emissions from electricity production as a result of the increase in the number of electric appliances.

There is further scope to analyse switching away from gas cooking appliances towards those fuelled by hydrogen. This will address some of the social dimensions associated with this product area, such as the disproportionate impact on groups whose cuisines rely on the use of non-induction hobs, and households for whom electric appliances are unsuitable. Although, this option is not included in the illustrative benefits estimate.

Professional / Commercial cooking

Please refer to the example modelling approach above for a description of the stocks and sales approach applied to commercial cooking. The energy and Carbon savings accrued from this product area are associated with raising the minimum energy efficiency levels for gas and electric cooking appliances from 2025. These appliances include ovens, hobs and grills used in a commercial environment, which have an assumed lifespan of 15 years. It is assumed that total sales remain constant over the examined period of 2025 to 2050, and that raising MEPS will gradually increase the proportion of electric appliances in the market.

The headline carbon savings are calculated by estimating the change in energy consumption and associated traded and non-traded emissions from electricity production because of the switch towards electric appliances.

There is further scope to analyse switching away from gas cooking appliances towards those fuelled by hydrogen. This will address some of the social dimensions associated with this

product area, such as the disproportionate impact on groups whose cuisines rely on the use of non-induction hobs. Though this option is not included in the illustrative benefits estimate.

Taps and Non-electric Showers

The estimated savings from introducing a harmonised water label and minimum standards on taps and non-electric showers are based on an Energy Savings Trust technical report.[165] Headline carbon savings have also been included for a mandatory water label only.

The Energy Savings Trust report covered seven household products including dishwashers and toilets as well as taps and non-electric showers. Water Wise, in collaboration with EST apportioned the potential savings to only taps and non-electric showers.

Headline Carbon savings from the Waterwise report were given for the entire period between 2025 and 2050. A stocks and sales model, similar to the methodology described in the example above, was used to apportion the total savings between years in order to estimate CB5 and CB6 savings. 2020 sales estimates are based on a third country study which has been apportioned to the UK using population estimates.[166]

Lighting Products

The methodology of the example model approach was used for estimating costs and benefits and the products policy model was used as the main source of key product information. In addition, to the methodology described above, the following assumptions were made for the costing.

Lamp lifetimes and usage assumptions were based on the Model for European Light Sources (MELISA),[167] which was prepared by the light sources review study authors. These values are associated with actual rated lifetimes and usage data.

Average energy demand values were based on MELISA and US Department of Energy (DOE) data for LEDs.[168] Sales proportions were based on UK Lighting Industry Association (LIA) sales data (2016). LED sales were derived US DOE data.

LED efficacy improvement in the reference scenarios is based on US DOE data up to 2035. Efficacies are assumed to continue until 2040, where they are assumed to stay static. This is because LED technologies have theoretical limits to their efficacy levels, and it's unlikely that commercially available products would reach them. All costs were assumed to be due to product switching.

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[165] Energy Saving Trust, Independent review of the costs and benefits of water labelling options in the UK. Available at: https://www.waterwise.org.uk/wp-content/uploads/2019/02/Water-Labelling-Summary-Report-Final.pdf

[166] European Commission, 2014, MEErP Preparatory Study on Taps and Showers. Available at: https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/meerp-preparatory-study-taps-and-showers-final-report

[167] European Commission, Lot 8/9/19 Ecdesign Preparatory Study on Light Sources. Available at: http://ecodesign-lightsources.eu/documents.

[168] US Department of Energy, 2019, Energy Savings Forecast of Solid-State Lighting in General Illumination Applications. Available at: https://www.energy.gov/sites/prod/files/2020/02/f72/2019_ssl-energy-savings-forecast.pdf

For all policy scenarios, we have assumed that no impact would be seen in the same year a MEPS tier comes into force. This is because suppliers are allowed to sell off their existing stocks.

In addition, history has shown that previously banned lamps remained on the market for a number of years after the ban. Indeed, some online vendors continue to sell banned lamps. To account for this, in the year after a ban takes place due to MEPS, sales are reduced by 1/3 until they reach zero.

Installed stock values for the domestic lamp models were based on ONS UK households data[169] and assumptions on lamps per household. Commercial lamp models were based on the Building Energy Efficiency Survey (BEES) data.[170] Streetlamp model stock data were provided by the Highways Electrical Association.

Labelling

This estimate takes the energy savings (GWh) for each product group, calculated using the Products Policy Model with the methodology described above, and calculates the estimated energy savings and carbon savings that would be attributable to energy labels. The following assumptions were used.

The assumption is that for each product sold, 0.75% of the total energy/carbon savings will be attributable to the label. This is based off a study in partnership with John Lewis, which suggested an average 1% effect of an enhanced energy label.[171] Though this savings also included a possible effect from additional staff training, which is why a lower overall figure has been chosen. This saving has been applied to the year-on-year energy projections of the total energy-use of all products which have an energy label.

Carbon savings are derived from energy savings using the Green Book methodology described above, with the proportion of traded/non-traded savings being attributed to the percentage of products that are fuelled by electricity/gas.

This costing applies the proportion of energy savings from label changes to the energy consumption of all labelled products of our average yearly sales (obtained by dividing total energy consumption for the product by the stock and multiplying by the sales). So, we have year 1 savings, then in year 2 we have this plus another year's sales savings etc.

Energy Technology List

The sales of Energy Technology List (ETL) and non-ETL products, as well as average difference in energy consumption is monitored as part of the ETL research programme and refreshed on a rolling basis.[172] This gives an estimate on the difference in energy savings if all non-ETL products were replaced with ETL products each year.

[169] ONS, 2021, Families and households dataset. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/datasets/familiesandhouseholdsfamiliesandhouseholds
[170] BEIS, 2016, Building Energy Efficiency Survey (BEES). Available at: https://www.gov.uk/government/publications/building-energy-efficiency-survey-bees
[171] DECC, 2014, Evaluation of the DECC and John Lewis energy labelling trial. Available at: https://www.gov.uk/government/publications/evaluation-of-the-decc-and-john-lewis-energy-labelling-trial
[172] BEIS, The Energy Technology List. Available at: https://etl.beis.gov.uk/

To obtain an estimate of the actual sales because of the ETL, historically the claims data of the Enhanced Capitol Allowance (ECA) was used to monitor take up, as purchase of ETL compliant products could be used to claim a deduction on Corporation Tax.

To obtain a new estimate the historic level of take up was applied to the current sales and energy data, then projected forward over the CB5 period. A range of take up was chosen that reflects the possible changes in take up because of fresh incentives, revamp of the ETL website and public information campaigns.

Other Product Estimates

All other CB5 estimates for products were derived using data from the UK Energy-related Products Policy Study.[173] This study looked at the difference between the best available technology and the current market average and estimated the potential savings possible by applying policy levers using limited evidence and simple assumptions.

A range of energy saving potential was then converted to Carbon savings using standard Green Book conversions. These savings are only intended to illustrate a potential scale of savings to be explored further. These estimates will be refined as the policies develop.

[173]ICF, 2021, UK Energy-Related Products Policy Study. Available at: https://etl.beis.gov.uk/erp-policy-study

This publication is available from: https://www.gov.uk/government/publications/energy-related-products-policy-framework

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