The same 2 questions are asked for **Cooking Appliances**, **Lighting**, **Water Pumps**, **Heat Pumps**, **Electric Motors**, **Space Cooling**, and **Ventilation**. These are:

Question A. Could better minimum energy performance standards, than those due to take effect from July 2021 in the EU, be set for X to save more energy in the UK and enable a transition towards net zero?

>IF YES, please provide further evidence and/or data (e.g. energy savings potential; carbon savings potential; technical feasibility; facilitation of behavioural change etc.)

>IF YES, in what timeframe could these minimum energy performance requirements be implemented after 1 January 2021? Please choose one of the below options and provide evidence and/or data:

- 6-12 months
- 12-24 months
- 2-3 years
- 3-5 years
- More than 5 years

>IF NO, why not? Please provide evidence and/or data (e.g. lack of energy savings potential; technical unfeasibility etc.)

Question B. Could better resource efficiency measures (material consumption, emissions, pollution and waste generation, as well as durability, repairability, recyclability and ease of material recovery) be set under Ecodesign regulations for X in the UK?

>IF YES, in what timeframe could these resource efficiency requirements be implemented after 1 January 2021? Please choose one of the below options and provide evidence and/or data:

- 6-12 months
- 12-24 months
- 2-3 years
- 3-5 years
- More than 5 years

>IF NO, why not? Please provide evidence and/or data (e.g. barriers to production; costs etc.)

Call for evidence Question	Can we/should we contribute? How? Any evidence/data?

Table 2: Energy-related product categories covered by existing EU Ecodesign measures

Air conditioners	Circulators
Domestic ovens, hobs and range hoods	Computer and computer servers
Electrical lamps and luminaires	Electric motors
Household dishwashers	External power supplies
Household refrigerating appliances	Refrigerating appliances with a direct sales function
Household washing machines	Vacuum cleaners
Fans driven by motors with an electric input power between 125 W and 500 kW	Standby and off mode electric power consumption of electrical and electronic household and office equipment
Electronic displays and televisions	Water pumps
Residential ventilation units	Welding equipment
Solid fuel boilers	Local space heaters
Space heaters	Household tumble dryers
Professional refrigerated storage cabinets	Small, medium and large power transformers
Water heaters	Simple set-top boxes
Air heating products, cooling products, high temperature process chillers and fan coil units	

1.[apart from the products listed in the table above (which lists products already covered by EU ecodesign legislation), and taps and shower, smart appliances, heat distribution systems, hot water and heat storage]… are there other new energy-related products that could save additional energy and resources through better minimum energy performance standards and/or resource efficiency requirements? Please provide evidence and/or data.

Throughout our response we have included embedded links and tables/figures and also used footnotes highlighting our evidence and the sources we have drawn our information from. Unfortunately, we have not been able to include these within this online portal. We have therefore also emailed our response to the email address provided so that the evidence underpinning our response can be accessed, if needed.

Energy Saving Trust was established by UK government in 1992 as a grant funded agency to support householders to improve the energy efficiency of their homes. We are the UK's leading impartial organisation helping people to save energy and reduce their carbon emissions. We do this by providing expert insight and knowledge on energy saving and supporting people to take action. With a focus on the citizen, issues around energy use in residential buildings are central to our work, but we also work on energy using products, personal transport and community energy. We act as a bridge between government, consumers, trade, businesses, local authorities and the energy market.

Energy Saving Trust has long history of engagement with ecodesign, standard-setting and energy labelling, having been involved in implementation of the EU Ecodesign Directive since its inception.

Representatives from Energy Saving Trust (EST) previously sat on a number of stakeholder groups focused on particularly affected sectors. Alongside this, EST, through the activities of the DEFRA / DECC-funded Energy Efficiency Partnership for Homes (EEPH), built the capacity and facilitated the engagement of different stakeholders in issues related to the EU Ecodesign Directive through its various Working Groups. These included representatives from different appliance sectors, heating, and insulation among others.

EST is a member of E^{n}R (www.enr-network.org) which is a voluntary network of 24 national European energy agencies with responsibility for the planning, management and review of national research, development, demonstration and dissemination programmes in the fields of energy efficiency and renewable energy and climate change abatement. It serves as a platform for cooperation between member agencies and other European actors on all issues relevant to sustainable energy. International comparison and exchange of knowledge takes place through eight Working Groups (Energy Efficiency, Buildings, Renewables, Transport,

	Labelling & Eco-design, Industry, Behaviour Change and Monitoring & Evaluation). EST is currently a member of the Management Troika for the network and chairs the E^{n}R Working Group on Labelling and Ecodesign as well as the E^{n}R Working Group on Transport (addressing transport related standards and certification as part of its remit). EST is an active member of the European Environmental Citizen's Organisation for Standardisation ECOS and Emilie Carmichael (Head of International Collaboration) sits on the organisation's Executive Committee and has held the position of Vice President since June 2019. EST is a member of the British Standards Institution (BSi) and, over the past three years we have been an active member of the BSi Consumer and Public Interest Strategic Advisory Committee, the BSi Consumer and Public Interest Network and the BSi Consumer Forum. EST administered the Energy Saving Recommended (ESR) Scheme and the associated consumer information and awareness raising efforts for a 10-year period spanning 2000-2010. ESR was a UK Government funded energy-efficiency product certification scheme, designed to improve energy efficiency standards in home products by showcasing the best performing products. At its height ESR covered 37 different product categories, including appliances, consumer electronics, heating, insulation, glazing, IT and lighting. Over 7500 products were certified and able to carry the ESR mark against regularly reviewed performance criteria, with over 900 of these tested to ensure compliance; more than 250 companies participated as either a certified manufacturer or partnering retailer. In addition, we carried out extensive monitoring and verification activities to ensure that the mark was not used incorrectly on non-certified products. The scheme was promoted through national marketing and communications campaign in partnership with retailers and manufacturers (online, in-store, at consumer and trade events like the Ideal Home Show and Lighting Show, national TV, radio & print advertising "look for the logo") and supported by telephone advice and information services – national hotline and network of local advice centres). Today, we continue to self-fund provision of consumer facing information (online) and have been either led consortiums of EU partners or been partners in a number of EU funded (Intelligent Energy Europe (IEE) followed by Horizon 2020) projects, including:

- IEE ComplianTV project (2012-15) – a monitoring programme to assess the compliance of televisions available on the market following the implementation of the labelling and ecodesign directives. Products were assessed against the stated performance claimed on the energy label and the information provided in the product fiche.
- IEE Marketwatch project (2013-16, EST was coordinator) – an extensive monitoring project assessing product compliance with regulations, performance against label claims and retailers compliances with display of the label in store and online
- H2020 TopTenACT (2015-18) project - a long running initiative identifying the best in class consumer products across a number of categories but most notably in appliances, consumer electronics and lighting.
- H2020 PremiumLightPro project (2016-19) – a supply chain support programme educating SMEs about upgrading to efficient lighting systems, the project incorporated a product database.
- H2020 Digi-label (PocketWatt) project (2016-19, EST was coordinator) – a research project in which the concept of digital labelling and digital tools to support the consumer purchase journey could lead consumers more easily towards the most efficient products.
- H2020 HACKS project (2019-21), this project leads on from the TopTenACT project and will utilise the platform to inform consumers about best in glass heating and cooling products.
- H2020 Label 2020 project (2019-21) - focussed on preparing the supply chain and educating consumers about the energy label rescale.

In the Energy Access sector, Energy Saving Trust co-manages (with US NGO CLASP) the £18M DfID funded (plus additional €5M Ikea Foundation co—funding) Low Energy Inclusive Appliances Programme - a 5 year research and innovation programme that seeks to double the efficiency and half the cost of a range of electrical appliances suited for off- and weak-grid household, small business, and industrial consumers. LEIA is DfID's contribution to the Efficiency for Access Coalition (EforA), for which EST is co-secretariat. EforA is a global coalition working to promote high performing appliances that enable access to clean energy for the world's poorest people. The EforA Secretariat raises awareness, builds capacity and

	coordinates stakeholder efforts across the broader energy access sector. Within the LEIA programme EST co-leads a suite of research, leads the programme M&E and manages the R&D Fund, which aims to accelerate innovation in off-grid and weak grid technologies. As well as the product classes listed in Table 2 and those discussed in sections 2.1.1 – 2.1.8 in the Call for Evidence we believe there are a number of additional product classes that should be considered for inclusion. This is based on their energy usage coupled with the potential energy and resource efficiency gains that could be achieved via better performance standards. Some of the products that we believe should also be considered for inclusion include: **Microwaves** Standalone microwave ovens were discussed in the recent meeting (19 March 2020) of the Technical Working Group for the Ecodesign / Energy Labelling Review Study of cooking appliances (EU TWG: cooking appliances) as a product being considered for inclusion in the new EU Ecodesign and Labelling regulations. The review is one of many being carried out by the European Product Bureau, managed by the Joint Research Centre (JRC). The JRC is cited in the minutes (page 4) as saying that "if the use of these appliances today was sufficiently high, the regulation might be missing a significant portion of EU energy consumption". Furthermore, an in-situ monitoring study of microwaves carried out by ADEME (French Agency for the Ecological Transition), cited at the meeting by the European Environmental Citizen's Organisation for Standardisation (ECOS) is reported to have found that microwave oven ownership (in France) is high and energy consumption is significant in the context of domestic cooking. In the EU TWG: Cooking appliances meeting minutes, JRC explained that one of the reasons for excluding microwaves from the scope of the revision was that there was considered limited improvement potential in terms of energy consumption for the technology, but noted that research indicates that microwaves can deliver substantial energy savings compared to other cooking processes in some cases (depending on food and amount), but that this would require consumer behaviour change as they are predominantly used for defrosting and heating currently.

Research in this area includes comparisons made for the Market Transformation Programme (MTP) in the UK[1], some of which are summarised on p21 of the 2011 Preparatory study for ecodesign of domestic and commercial ovens[2]. Microwaves could cook certain food types using around 30-50% of the energy of an electric oven in some cases, and also reduce water use (depending on the food). Use of microwaves are widespread in the UK. A 2013 report by BRE for DECC estimated that microwaves are used 5.5 times per week (median) and that 80% of households own a microwave.

Further research into the energy saving benefits of wider use of microwaves for cooking could be beneficial. Development of communication tools on their use for particular applications could also be considered.

Kettles

The EU has previously considered establishing ecodesign and energy labelling regulations for kettles, with final electricity savings of between 4.8 and 8.7 TWh per year identified.

A study by Gallego Schmid et al[3] conducted lifecycle assessment on 'eco-kettles', with specific design for greater water efficiency and reduced energy consumption. The study estimated that, compared to standard models, electricity consumption could be reduced by around a third. This is roughly in line with a 2006 study from Product Creation cited by Gallego Schmid et al, which saw a 31% reduction in energy use for 77 participants over a 4-week period, who used an eco-kettle with a water control system, versus a standard model. Gallego Schmidt et al also found that water consumption from over-filling could be reduced by up to 50%. Entire lifecycle impacts of eco-kettles were estimated as being between 30-35% compared to plastic kettles and 32-38% compared to metallic kettles. The main environmental impacts of kettle use were from overfilling and overboiling – the study

[1] Market Transformation Programme: BNCK07: Comparing energy use in microwave ovens with traditional electric fuelled methods

[2] 2011 Preparatory study for ecodesign of domestic and commercial ovens – Bio Intelligence Services, p21

[3] Gallego Schmid, A., Jeswani, H., Fernandez Mendoza, J. M., & Azapagic, A. (2018). Life cycle environmental evaluation of kettles: Recommendations for the development of eco-design regulations in the European Union. Science of the Total Environment, 625. https://doi.org/10.1016/j.scitotenv.2017.12.262

estimated that reducing the excess of boiled water could decrease all impacts by 31-33% compared to the current situation.

Ecodesign legislation for kettles has been explored previously in the EU. In the 2012-14 ecodesign workplan, kettles were ranked 13th of 36 energy related products considered for regulation development but were not taken forward as part of that workplan. The preparatory study concluded that significant water and energy savings, as much as 37 PJ/year in 2030, could be achieved for kettles through eco-design measures.

The UK is considered to be a large user of kettles, with 90.3 million kettles estimated in use in the UK by the Gallego Schmidt study (citing other sources, including a 2008 AEA study). The study calculated that the UK contributed a significant proportion of energy use to the EU figure on kettle consumption, but that even without UK membership of the EU, development of an EU ecodesign regulation was still justified and that 32.1 PJ/year would still be saved. This difference in figures puts potential energy savings from the UK at around 5 PJ/year.

Regulation of kettles has previously been an unpopular topic in some areas of the UK press, and consumer acceptance of eco-kettles may also be relatively low. However, given the large energy savings potential, there is benefit in exploring means to remove the most poorly performing kettles from the market. This would be more effective if coupled with effective consumer engagement and behaviour change campaigns with the opportunity for increased consumer awareness of the energy consumption of kettles from smart meter or real-time data.

Commercial and professional cooking appliances

Despite few studies quantifying the potential energy savings of non-domestic cooking appliances and operations, significant potential is understood to exist in this sector. Mudie et al[4] estimated possible energy savings of 70% from behavioural factors and 45% from better use and maintenance of cooking equipment such as ovens, grills and fryers. The paper recommends the expansion of energy labelling to this category and , supported by behaviour

[4] Electricity use in the commercial kitchen - S. Mudie, E.A. Essah, A. Grandison and R. Felgate

change initiatives / campaigns. The study also pointed out that appliances often lack insulation and appropriate controls, but in a fast-paced environment energy efficient behaviours may be of lower priority.

Further potential areas for standards
Other product groups not listed above, but which have previously been considered for Ecodesign regulations, or have preparatory studies ongoing, are listed below. These have been selected due to the identification of significant energy saving potential, if regulations were put in place.

There is benefit on monitoring the progress of development of these standards in the EU for future alignment, or considering developing equivalent or more ambitious standards in the UK.
Lifts/elevators

- **Building Automation and Control Systems**
- **Hand dryers**
- **Lifts**
- **Solar panels and inverters**
- **Refrigerated containers**
- **High-pressure cleaners**
- **Outdoor patio heaters:** we would also add that this should include all outdoor heating systems. The French Government have recently banned outdoor heaters in cafes and restaurants.

Additionally, we believe that the UK could go further than the current EU ambitions by considering implementing energy and resource efficiency minimum standards for the following product classes:

- **Humidifiers/dehumidifiers and ironing products**: these products have been discarded from the most recent EU workplans due to the fact that progress in terms of energy efficiency has been shown in these product classes, albeit based on relatively scant data. This should not exclude this class from Ecodesign indefinitely and new assessments under a range of conditions of

	energy usage, and particularly resource efficiency and material savings would be worthwhile. • **Domestic charging stations for electric cars**: given the government's welcome ambition to accelerate the rollout of electric vehicles it would be beneficial to assess the energy and resource efficiency of this soon-to-be vital product class as soon as is feasible. • **Loudspeakers, headphones/earphones**: while the proposed inclusion of televisions, set top boxes, and computer equipment is welcome we propose that audio equipment-related product classes are included in future energy and resource efficiency standards. Loudspeakers have previously been excluded from EU standards due to assumed low energy consumption whereas headphones/earphones have not previously been considered. The market for these products is large and growing and the potential gains in terms of resource efficiency in particular could be significant. Bridging this class and smart appliances are home/office assistants such as Amazon's Alexa. These too should be included. • **Software products**: considering software products in terms of energy and resource efficiency may seems counter-intuitive but the energy requirements of different software packages, especially after upgrades, can be a significant determinant of how long a consumer will retain a given related hardware product – impacting on durability and resource efficiency. This approach has already begun to be considered under the 'Blue Angel' programme which seeks to minimise the energy requirements of software and provides a blue angel label for high-achieving software. • **Hairdryers** We have highlighted these product classes either because: a) they currently use large amounts of energy to operate; b) they represent product classes with relatively low resource efficiency; c) they are product classes which are widely used by consumers and so their energy or resource efficiency is of greater concern. In general, product classes should not be excluded from consideration for ecodesign and energy labelling regulations purely on the basis of a lack of available data (whether energy or material-focused). If it is likely that significant savings can be made through minimum

	efficiency standards the given product group should undergo independent testing / assessment as a matter of priority with standards applied if appropriate.
Cooking Appliances	
2. See Question **A**	Response - YES The EU Ecodesign regulation (66/2014) and energy labelling regulations (65/2014) for cooking appliances are currently under review. Minimum energy performance standards (MEPS) and the effectiveness of current labelling are expected to be improved by this process, to increase its ambition in energy saving. The UK could align with changes to the EU MEPS and labelling system that may result from the review and could also consider introducing aspects that go above and beyond the EU legislation. Several suggestions are outlined below, which would take varying time to implement. Those involving further test method development could take in the order of 2-3 years, or more. Some amendments to MEPS could be achieved more quickly, as market and product data is generally available – this type of amendment would require industry consultation but could likely be completed in a 12-24 month timescale. Several of the suggestions below may also be considered as part of the EU label review. **Ovens** • The vast majority of ovens achieve A (around 70%) and A+ (around 29%) ratings[5] with very few in the B class below or A++ (0.06%) above. The most recent tier of Ecodesign regulations specifies A is the minimum label class allowed to enter the market after 2019. As a result, the energy label (scale of D-A+++) lacks fitness for purpose as a tool for product differentiation. As the vast majority of the market can already achieve the A rating, setting a more ambitious minimum level, and utilising more of the label classes, whilst leaving the top classes initially blank to allow space for innovation as part of a label rescale could prove beneficial. Better regulation in this case could involve developing a more fit-for purpose labelling scale. • Previous tiers in 2015 and 2016 of Ecodesign regulations for dual ovens set the requirement that only the most efficient cavity was considered for the energy rating

[5] Review Ecodesign/Energy Labelling - cooking appliances presentation – p59-60

	and Ecodesign compliance. However, from February 2019, secondary cavities are required to be below a maximum energy efficiency index (EEI) of 121 (equivalent to the B class). This aspect of the regulation could be amended to sett a higher minimum threshold, since the vast majority of ovens on the market have been shown to achieve at least an A rating. • The methodology for calculating the EEI for ovens could be updated to more accurately reflect real life usage. The recent EU TWG: cooking appliances meeting minutes[6] state that the definition of a "standard heating function" used in EEI calculations for ovens would benefit from consideration. Currently, manufacturers can choose which mode can be used for the EEI calculation, which may be an eco-mode that cannot cook a wide range of recipes. Whilst this aspect is challenging, given that it is difficult to establish an 'average' cooking mode, and that reporting energy information from all modes is not realistic (ovens may have up to 15 modes), it is recommended that energy labelling and MEPS ensure that any high-consuming modes are identified. The EEI could be determined through a weighted average of multiple modes (as has been the case previously for washing machines). An EEI designed to be a more accurate reflection of usage patterns could remove some products from the market with high consumption in modes outside their 'best' mode and incentivise the design of highly efficient ovens. Inclusion of an aspect such as this could take over 2 years to develop as it would require gathering of additional energy performance data. • Use of pyrolytic cleaning functions were estimated by Topten.eu in 2015 to use up to 4 kWh[7], which is estimated as over four times the energy of a standard baking cycle. The 2011 preparatory study for the 2014 Ecodesign regulation cited that the pyrolytic cleaning function may account for 11% of the total energy consumption of this type of oven, despite being only used for 2.7% of oven cycles[8]. This aspect is not included in the EEI calculation, nor communicated on the EU Energy Label. Topten

[6] Minutes from cooking appliance TWG meeting
[7] Topten ACT Criteria Paper: Ovens
[8] Preparatory studies for Ecodesign Requirements of EuPs, Lot 22, Domestic and commercial ovens (electric, gas, microwave), including when incorporated in cookers – Task 3: Consumer behaviour and local infrastructure

	Switzerland do not include ovens with this function within best-in-class efficiency listings[9]. Previous criteria for ovens under the Energy Saving Recommended scheme also excluded ovens with pyrolytic cleaning. Inclusion of this in the EEI calculation could provide a better reflection of the energy use of products. Consumer data on how often this feature is used would need to be available, and potentially a standardised test method. Inclusion of this aspect in criteria and conducting the necessary consumer research, data collection and testing could take 12-24 months, and possibly longer. • There is not a large difference between the estimated running costs of ovens achieving A, A+ and A++ ratings. For example, from assessing ovens on the Topten.eu website of a similar size (65-70L), 15-year electricity costs ranged from €313 (~€21/year) for an A rated oven to €254 (~€17/year) for an A++ rated oven. Inclusion of a built-in steamer in ovens appears to be a technology that can improve efficiency – the EU TWG: cooking appliances presentation observed around 70% of A++ ovens in 2018 had a steam feature. This could be added as an icon on the energy label to encourage uptake of this efficient technology, or the presence of the feature could be given a bonus in the energy labelling calculation. • With the majority of the market occupying the top classes, this has the effect of limiting innovation. Further innovation may be possible with ovens. The final report from 2016 of the Highly Efficient Oven project[10] (HEO) aimed to demonstrate technological advances that could improve the in-use efficiency of ovens (as well as reducing energy use in the production phase). The project was able to demonstrate technologies (substitution of cavity materials to increase reflectivity, new gel coating to protect cavities, heating system upgraded to increase quantity of energy transferred directly to food) that could improve in-use efficiency by around 30% compared to a conventional oven. The final report estimated that an increase of 20% in the efficiency of an electric oven would result in a saving of around 5 TWh of electricity per year in Europe. Rescaling the energy label for ovens to allow for more

[9] Topten Switzerland Efficient Oven selection criteria
[10] Final report, Highly Efficient Oven project

	innovation could be achieved in a similar timescale to efforts to re-scale the energy label for white goods, around 12-24 months, and could have the effect of boosting innovation. • New test methods could be explored to enable better differentiation between the label classes and make tests more representative of real-life conditions. The existing test method using a wet brick as thermal mass was discussed at the recent EU TWG: cooking appliances meeting, and has been updated, but different standardised methods more closely based on food types could be considered, which may also enable better communication of the most efficient means of cooking different foods. The label could communicate more efficiency ratings for different types of food, and also emphasise the presence of efficient features such as steam cooking. However, this aspect would take longer to introduce, likely at least 2-3 years to develop, prove and agree with industry. • Gas represents a small segment of the market for ovens (~0.1%) and cookers (~5.7%)[11]. Despite this low penetration, setting a timetable to phase out gas cooking could contribute positively to reducing carbon emissions. There may be issues with consumer acceptance of a phase out of gas cooking (particularly when applied to hobs). Phasing out gas hobs and ovens has been recommended by the UK Climate Change Committee under proposals to not connect any new homes to the gas grid by 2025[12]. A survey published by BEIS of public attitudes towards the transition to a low-carbon heating future[13] found that 46% of respondents were in favour of phasing out gas cookers for electric, and 21% were against. This was a lower acceptance rate than for gas boilers - figures for gas boilers were 66% for and 10% against. • Significant energy savings could be possible from upgrading the nation's stock of older ovens. The MTP estimates a lifetime of 19 years for electric and gas ovens.

[11] Review Ecodesign/Energy Labelling - cooking appliances presentation – p58
[12] UK housing: Fit for the future? Committee on Climate Change
[13] Transforming Heat – Public Attitudes Research A survey of the GB public on the transition to a low-carbon heating future

The Energy Follow-Up survey estimated that in 2011, 22% of ovens were over 10 years old (equivalent to around 4.5 million ovens). If a similar proportion of older ovens that predate the 2014 Ecodesign regulations are still in use today, Ecodesignsignificant scope for energy saving exist. The EU TWG: cooking appliance minutes set a current base case for a 70L electric oven as using 0.9 kWh/cycle in conventional mode and 0.7 kWh/cycle in fan forced mode – current best available technology (BAT) is defined as 0.89 kWh/cycle (conventional) and 0.52 kWh/cycle (fan-forced) for an electric oven with a steam assisted function. Estimating the average performance of an older oven is challenging, with little data available. A 2001 paper by Kevin Lane for the SAVE II project, *Labelling Domestic Ovens*[14] provides some data on the average consumption per cycle of ovens available at the time. These are set out in the table below. All values are derived from use of the wet brick test.

Oven	Energy use/cycle, conventional mode (kWh)	Energy use/cycle, fan-forced (kWh)
Average oven, 2001, Data from CECED for SAVE II report (Lane)	1.22	1.27
2020 base case	0.90	0.70
2020 BAT	0.89	0.52

SEE COMPLETE DOCUMENT PROVIDED VIA EMAIL FOR FIGURES/TABLES

Use patterns in different countries vary – the average across the EU cited in Kevin Lane's paper was 135 uses per year and 157 uses was the estimated figure in the UK. Assuming 150 uses per year (75 cycles in conventional and 75 cycles in fan forced), a rough estimate of the saving from upgrading an older oven to a current BAT model would be around 80 kWh/year. Across 4.5m ovens, this could save around 360 GWh energy per year. The consumer guidance document[15] for the 2014 regulations estimated that moving from a D rated oven to an A+ rated on could save €230 over the oven's lifetime.

[14] Labelling domestic ovens (Save study 4.1031/D/97-047)
[15] A Consumer's Guide to Energy-Efficient Ovens and Range Hoods

Addressing this aspect through improved minimum energy performance standards (MEPS) may not be the most powerful instrument – it is more likely that encouraging householders to upgrade older, less efficient ovens would be better achieved through communication activities, financial incentives (such as scrappage schemes) and through the use of tools such as smart meters/in-home displays.

Hobs

- Regulation could be improved by removing the exemption of small burners (nominal heat input <1.16kW)from Ecodesign regulations. The test procedure, previously described as non-optimal, was reportedly being improved by CENELEC in the recent EU TWG: cooking appliances meeting minutes.
- As with gas ovens, developing a timeline to phase out gas hobs is feasible, although consumer acceptance would need to be taken into account.
- Energy labelling for hobs could be introduced, enabling a scale that compares the efficiency of different types (induction, ceramic, gas).

Range hoods

Range hoods currently span all the allowed efficiency classes, but a high proportion are being observed to achieve the higher ratings. Taking data accessed on 3/9/20 from AO.com as an example, the following breakdown of energy classes was seen:

Energy class	Number of products
A++	7
A+	36
A	147
B	127
C	99
D	88
E	26

SEE COMPLETE DOCUMENT PROVIDED VIA EMAIL FOR FIGURES/TABLES

	However, in line with re-scaling efforts for other product categories that will initially keep the top classes empty, outputs of the kitchen appliances EU Ecodesign review are expected to require range hoods to have more stringent efficiency standards to achieve the top classes whilst removing inefficient models from the market.

3. See Question **B**	Response - YES
	
	Better resource efficiency measures could be set. The inclusion of circularity criteria in the recent updates in Ecodesign legislation for white goods, TVs and lighting could be applied to cooking products. This would include aspects as summarised below:
	
	• Availability of spare parts, including length of time and maximum delivery time
	• Ensuring that spare parts can be replaced and appliances dismantled with commonly available tools
	• Access to repair and maintenance information
	
	Assuming that the UK will, as a minimum, seek to transpose the EU resource efficiency requirements already adopted for other Ecodesign regulations, UK Government could seek to go further by strengthening the EU provisions to:
	- Remove the "professional repairers" concept
	- Reinforce the provisions on spare parts as follows:
	  o Duration: all spare parts should be available during the average product lifetime, i.e. 12 years after the last unit is supplied.
	  o Delivery: A maximum delivery time of one week for spare parts should also be specified.
	  o Audience: spare parts access should not be restricted to professional repairers but should be open to all types of repairers. We firmly believe that no restrictions should be put to the availability of spare parts, to facilitate the involvement of as many actors as possible as described above. Spare parts have a cost, which will serve as a deterrent to inexperienced consumers.
	  o Prevent bundling of spare parts

	Other areas for future development could include: • Assessment and display of the score for repairability of cooking appliances under standard prEn 45554 *General methods for the assessment of the ability to repair, reuse and upgrade energy-related products* (or an equivalent methodology). This could apply to products already covered by Ecodesign (ovens, hobs, range hoods) and be extended to further products (blenders, toasters, microwaves) • Assessment of resource efficiency in relation to the production phase of appliances, e.g. content of recycled metals in a range hood. This process has already been undertaken for the first round of product groups to be updated Ecodesign regulation, so could be quicker for subsequent products – estimated time: 12-24 months. The benefits derived from extending the lifetime of cooking products would be reduced e-waste and reduced energy and resource consumption.
4. To what extent are energy efficient products and practices taken up in the catering sector?	Several studies suggest a low take up of energy-efficiency measures in the catering sector. A 2012 AEA report[16] and sector survey indicated low uptake of standard energy efficiency measures within the sector, citing a lack of available data to improve products. Other barriers include behavioural aspects and / or 'ownership' issues - contract caterers may operate on clients premises, but do not own the equipment they use (which may be sub-optimal for the tasks) and are not aware and do not bear the cost of their energy consumption. Policies, such as the UK Energy Savings Obligation Scheme (ESOS), that require larger companies to measure and reduce their energy use would be expected to have some effect, but many catering businesses operate as smaller entities. The two biggest opportunities for energy and carbon reduction cited by the above mentioned AEA report were from behaviour change for cooking, and installation if sub-metering and transfer of energy costs to caterer, which combined could save over 150,000 tCO_2e in the sector.

[16] Sector Guide - Industrial Energy Efficiency Accelerator -Contract Catering Sector

	Other barriers to reducing energy consumption in commercial cooking were explored in the EU Ecodesign Preparatory study for cooking products. These included: • Cost being a driver – lower price appliances which are less efficient may be bought • Absence of economies of scale for efficient products • Lack of information on appliance efficiency Commercial/professional cooking appliances are currently outside of the scope of the EU Ecodesign and energy labelling regulations, although the regulations' text states they will be considered in the upcoming review. The pros and cons of their inclusion in regulations are detailed in the recent EU TWG: cooking appliances meeting minutes. It is considered that there is a significant potential impact from introducing ED/EL measures. The Preparatory study estimated the annual consumption of the catering industry in the UK to be 21.6 TWh/year, equivalent to 4% of the total energy consumed by UK households, with 50% of this in the non-commercial catering sector (schools, hospitals etc). Some product level data for commercial ovens, fryers, grills, and steamers from various sources is available in the preparatory study, including in-use and standby power energy consumption. Without regulatory drivers in place, there is a lack of incentive to reduce this consumption. The below table from the preparatory study shows comparisons between commercial and domestic cooking products, and the difference in electricity consumption, which is significantly higher for commercial, as expected, due to higher power products and longer use times.

Table 3-18: Final energy consumption per use and per oven from consumer behaviour in EU (2008)

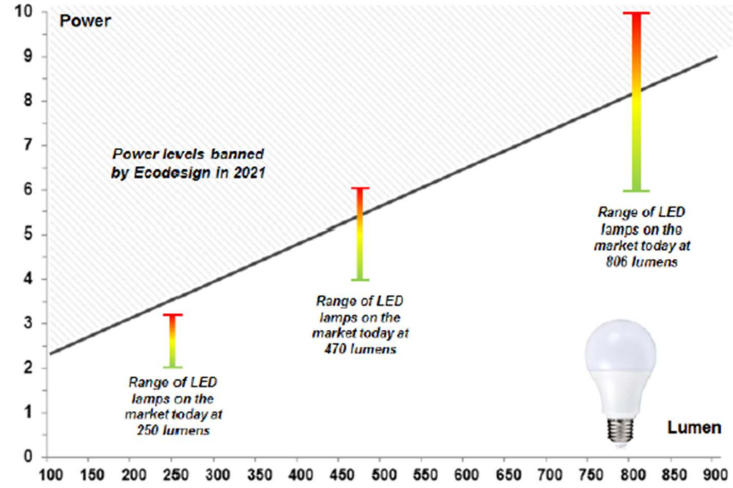
	Electricity consumption per year and per oven (kWh/yr)	Natural gas consumption per year and per oven (kWh/year)
Domestic electric oven	164.3	
Domestic gas oven		183.7
Domestic microwave oven	86.4	
Commercial electric combi steamer	9,266	
Commercial gas combi steamer	1,310	11,887
Commercial electric deck oven	47,174	
Commercial gas deck oven	1,498	61,401
Commercial in-store oven	20,000	
Commercial electric rack oven	71,100	
Commercial gas rack oven	5,910	78,345

SEE COMPLETE DOCUMENT PROVIDED VIA EMAIL FOR FIGURES/TABLES

However, developing test methods and regulations is a complex process with high variability in products and use patterns. It is proposed that their potential inclusion is separated from domestic cooking appliances.

Some energy efficient products and practices are taken up in the catering sector. Energy labelling is in place for professional refrigeration, some of which have also been covered by the Enhanced Capital Allowance scheme. However, cooking appliances are not included in this scheme. Some resources are available online to suggest some engagement in this area,

	for example, the Carbon Trust has published some guidance on practices and products enabling energy savings in the catering sector. Effective policy instruments are recommended to be deployed to address this energy consumption, which could include Ecodesign and energy labelling regulations, but also setting criteria for green public procurement, information campaigns, or voluntary initiatives, such as extending an ESOS-type scheme to the catering sector.
Lighting	
5. See Question **A**	Response - YES Better regulation could be introduced for lighting products. There is less concern about this in relation to energy efficiency standards, but more about ensuring effective market surveillance in the UK post-Brexit. New Ecodesign and energy labelling regulations for lighting are estimated to deliver final energy savings of 41.9 TWh per year by 2030. New lighting MEPS are considered ambitious and will phase out most fluorescent lighting technologies and most remaining halogen lighting on the market. The updated regulation has also been designed to be in line with the European Commission's 'Better Regulation' policy, by merging multiple regulations and calculations into one, to reduce the administrative burden on suppliers. However, the Commission Regulation (EU) 2019/2020 currently sets the end-loss factor (L) for LED lamps at 1.5 for efficacy requirements. This value is significantly too high to achieve impact on household products in the low and medium lumen ranges, where efficiency can still be substantially improved (see attached graph). The L factor should therefore be adjusted and set at 1.0 instead of 1.5. This could likely be implemented in 12-24 months following consultation.



SEE COMPLETE DOCUMENT PROVIDED VIA EMAIL FOR FIGURE/TABLE

In the UK, whilst it is expected that this regulation will remain transposed into UK law post-Brexit, it will be important to ensure that market surveillance is sufficient to ensure that low-quality lighting products that do not achieve minimum efficiency standards as laid down in the regulation, as well as aspects such as safety standards, do not enter the UK market. In a fast-paced market such as LED lighting, is a possible products may avoid market surveillance due to the sheer volume available. Previous investigations have looked at the quality of lighting products on the UK market, including the LIA's Market Surveillance report from 2018 which found numerous compliance issues with lighting products[17].

Related to this, restrictions should be imposed upon the green claims of lighting suppliers so that only the most energy efficient models (e.g. label classes A through C only) can be

[17] Energys Group's response to LIA Report which highlights dangers of non-compliant products entering UK market

	referred to in this way. Terms such as “energy saver” or “eco lamp” should not be permitted for advertising the lowest performing models. These measures could be quickly implemented within the 6-12 month time frame and would improve consumer choice and behaviour.
6. See Question **B**	Response - YES Better resource efficiency measures for lighting could be introduced. In the new EU lighting regulation, which is expected to continue to apply in the UK post-Brexit, certain circularity aspects are included, as defined in Article 4 of Regulation 2019/2020: • Manufacturers shall ensure that light sources and separate control gears can be replaced with the use of common available tools and without permanent damage to the containing product • Information on replaceability and non-replaceability of light source and control gears will be made available • Manufacturers shall ensure light sources and control gears can be dismantled However, more can be done beyond the requirements of the EU legislation to enable better recovery and re-use of critical raw materials (CRMs) in lighting products. This includes rare earth elements used in phosphors, copper and gold in circuitry and gallium and indium in semiconductor material. This will ultimately help reduce primary energy consumption and dependency on raw materials. Recycling rates of LED bulbs are currently considered low. Recolight reported the lamp recycling rates improved between 2015 (43.6%) and 2016 (47.5%), but this still represents a low rate.

	In general, the recyclability of lighting products could likely be improved through enhanced Ecodesign regulations. We recognise that this may not be easy to achieve at pace and so believe that a 3-5 year time frame is a realistic estimate for implementation. Non-destructive disassembly requirements could be applied to all containing products, including those covered by individual Ecodesign regulations. Consumers or independent repairers should be able to disassemble, repair and replace component parts without permanent damage to products. On these particular repairability issues a realistic timescale for implementation is 2-3 years. On durability testing: A mid-term check should be introduced in endurance testing in order to ensure the swift identification and sanctioning of non-compliant products. We believe that some poor-quality products are likely to fail the newly introduced test in the first few hundred hours of testing and therefore suggest to introduce a mid-term check during the test through the insertion of the following requirement: *"After half of the test is complete (i.e., 600 switching cycles), a visual check is made on the sample under test. If at least one light source has already either failed, or a significant proportion (i.e. > 15%) of the LED chips constituting it have failed, then the test is discontinued and the model is considered non-compliant."* Legislating for better circularity in lighting could include provision of incentives, such as take-back schemes, extending producer responsibility, encouraging more 'lighting as a service' models to enable greater recovery of lighting by suppliers, and legislating further for lighting products that are easier to dismantle, so as to be able to recover a greater amount of CRMs.
7. Which lighting-related service businesses exist in the UK? Please provide data on service types, volume and any other relevant market information where possible.	Lighting as a service (LaaS) has been increasing as an option, mainly for UK businesses, schools, and public sector organisations. Business models have slight variations, but are in general based on a subscription package, based on the output and not the hardware. In some cases, customers may own the asset at the end of the term.

	This business model is becoming more common, particularly in the UK, Germany and North America[18] and offered by larger and smaller companies. Beyond the efficiency improvements that can be achieved from replacing older lighting technology such as fluorescent to LED, there are many other benefits of moving away from a product-based model. The service based model can also enable better lighting control, better design for the space and the users (in some cases removing the need for unnecessary lighting), integration with HVAC systems and BEMS (for example varying the lighting based on occupancy), improved monitoring and maintenance, improved circularity and take-back of product for recovery of critical raw materials, and the opportunity to guarantee light levels for the end user. In general, service provision removes the need for upfront costs. LaaS generally works better in settings with larger lighting requirements where greater scale can be realised, and is more economical where the site has longer in-use hours of the lighting (eg a 24-hour lit space versus a site that only had lighting during business hours), however, this is dependent on the lighting installed and what it being upgraded from. Business Wire estimate that the LaaS market will grow at a rate (by compound annual growth) of 40.8% between 2018-2025. Smart cities world report that the LaaS market may be worth $638.7m by 2021[19]. Active UK companies offering LaaS include: • Philips/Signify - office LaaS brochure, general information • Aura Light • Thorn (Zumtobel) • eLight • Spirit Energy/ECI Energy • Future Energy Solutions • Urban Volt

[18] https://www.researchandmarkets.com/reports/4600423/global-lighting-as-a-service-market-focus-on#rela0-4805606
[19] https://www.smartcitiesworld.net/news/news/lighting-as-a-service-worth-639m-by-2021-1271

	Service types generally include that the LaaS supplier takes on the responsibility for, and guarantees energy and financial savings[20], and also takes care of end-of-life and recycling activities.
Water Pumps	

8. See Question **A**	Current EU regulations and efficiency standards have remained unchanged since they were set in 2012. The current minimum energy efficiency requirement of Minimum Efficiency Index (MEI) = 0.4 is relatively unambitious, particularly given the technological improvements that have been achieved in this area over the last 8 years. A more stringent 2-tier Ecodesign implementation approach for water pumps could be considered. Such a scheme running from 2021 to 2023 could be set up as follows:
	• Tier 1 in 2021: MEI ≥ 0.70 (benchmark in the current regulation),
	• Tier 2 in 2023: constant flow pumps MEI ≥ 0.90.
	
	We also support the introduction of an overall (Energy Efficiency Index) EEI for the pump unit alongside the MEI for component parts. We believe that different standards should apply to variable and constant speed devices because the different standard operation profiles need to have different levels of requirements. Once again, we feel that a 2-tier implementation plan should be considered and could be structured as follows:
	• Tier 1 in 2021:
	  ○ constant flow pumps EEIc ≤ 0.xx (to be determined)
	  ○ variable flow pump units: EEIv ≤ 0.62
	• Tier 2 in 2023:
	  ○ constant flow pumps EEIc ≤ 0
	  ○ variable flow pump units: EEIv ≤ 0.57.
	
	Alongside these Ecodesign considerations UK Government should consider removing the exemptions in the existing EU regulations. Currently, there are exemptions related to pump size (EEI only for pumps < 45 kW), type (EEI only for ESOB, ESCC and ESCCi) and fluid type (clean water, drinking water, waste water). In future these could be kept to minimum and

[20] https://www.ledsmagazine.com/architectural-lighting/indoor-lighting/article/16695783/lighting-as-a-service-makes-it-easier-to-raise-money-for-other-things-even-in-2019-magazine

	precise descriptions and declarations of exempt pumps could be required. Closing these loopholes and setting more ambitious standards could likely be achieved in 2-3 years.
9. See Question **B**	We believe that the limited resource efficiency considerations the EU are undertaking (information requirements on disassembly, recycling or disposal at end of life) represent a lost opportunity to increase efficiency and reduce emissions. UK Government should consider adopting more ambitious resource efficiency requirements as a priority area. As a minimum, the resource efficiency requirements for water pumps should reflect the provisions included in the EU Ecodesign Regulations adopted this year for other product classes. The review study conducted ahead of the EU consultation on Ecodesign regulations clearly stated that water pump equipment will require repair and maintenance during its lifetime and that some of the largest pump manufacturers provide onsite repair and workshop repair services already today. UK Government should consider strengthening regulations above and beyond the EU requirements to ensure the continued supply of spare parts for at least 10 years after the product has ceased to be sold as well as to maximise ease of repair. One particular area that could benefit from attention and regulation, and an area ECOS and the EU-funded CoolProducts campaign have focused attention on, is the use of rare earth elements in specific water pumps with rare earth magnets. These products can be challenging to identify[21] without specific, expert knowledge and significant testing and dismantling. Therefore, a mandatory and standardised marking of products containing rare earth magnets above a certain minimum weight (e.g. > 10 g) could help to facilitate better reuse and future recycling practices. It is believed that a marking signaling and providing information on the presence of rare earth magnets as well as information on the applied type (e.g. SmCo, FeNdB) could assist with the establishment of a circular economy for rare earth elements. We recommend:

[21] Preparatory Study to establish the Ecodesign Working Plan 2015- 2017 implementing Directive 2009/125/EC, Task 2: Supplementary Report "Identification or resource-relevant product groups and horizontal issues", Andreas Manhart, Kathrin Graulich (Oeko-Institut), 15th September 2014 (Chapter 7.1)

	• Introducing an information requirement on the presence of rare earth material in magnets, their localisation, as well as their extraction process allowing safe and cost-effective reuse or recycling. • Considering the specific requirements for how these permanent magnets can be integrated in the motor to maximise cost effectiveness of reuse and recovery process (e.g. no glue and no welding hampering the extraction/recovery of rare earths elements; or maximum amount of non- destructive disassembly time to foster the reuse of the magnets rather than the mere recovery of rare earth elements). These measures could likely be implemented in 12-24 months for provision of information requirements and 2-3 years for the other measures.
10. Does the UK provide any water pumps services (including research & development, repair and/or design etc.)?	
11. Is there scope for introducing systems-level Ecodesign regulations for water pumps in the UK? Please provide evidence and/or data.	Though the following is the view held by ECOS and the members of the EU-funded CoolProducts campaign it also aligns with much of our own thinking in this area. ECOS/CoolProducts believe that a system-level EPA which considers the energy efficiency of the water pump as a single entity would be of value, particularly as it would help facilitate the introduction of energy labels for these devices and account for energy losses beyond the pump. We believe however that individual regulations on particular component parts should remain in place so that the EPA is in *addition* to these. We believe the best approach to the extended product approach (EPA) is to ensure MEPS for the pump (MEI), the motor (IE code IE3) and the converter (IE code IE2) as well as to introduce, in parallel, an EEI for the pump system that can harvest the benefits of the system integration and the variable speed operation. In addition to the proposals made above we also feel that extending the scope of Ecodesign regulations, both in terms of energy efficiency and resource efficiency, to include horizontal multistage pumps and booster sets (as is being considered by the EU), and self-priming, swimming pool and wastewater pumps (which are not currently under consideration) would be beneficial given the considerable energy saving potential, as indicated by the EU review study into potential energy savings in 2030.

Boilers	
12.For the different heating systems discussed [modulating boilers, heat pumps, hybrid heating systems, zero-carbon fuels] what are the potential benefits, technical barriers, costs and impacts on UK businesses and consumers? Please provide evidence and/or data.	A significant proportion of UK emissions are derived from heating our homes, homes account for just under 30 percent of energy use and around 20 percent of greenhouse gas emissions in the UK. Given that the typical lifetime of a heating system is 15-20 years we effectively have until 2030-2035 to decarbonised heating in the UK. At present only 1-2% of UK homes are fitted with zero carbon heating systems. What is clear is that we have a considerable challenge ahead to decarbonise heating in the UK. The UK will struggle to meet it's 2050 climate targets if inefficient and high-carbon heating systems are not removed from the market. Modulating boilers provide improvement over older gas boilers by reducing fuel consumption, due to the ability to vary the boiler output according to temperature and load parameters. This reduces the frequency by which the boiler has to cycle on and off (fewer firings). Most modern boilers have this capability, but studies (for example from Bennett[22]) suggest that despite modulation functionality, where boilers are over-sized in-situ, boilers may still unnecessarily cycle, increasing fuel use. This can be addressed to a degree by use of specific modulating controls to provide information on what heat output to provide. However, oversizing is a technical barrier to realising the benefits of modulation. Dynamic operation, such modulation functionality is not considered by current boiler efficiency ratings, which only consider steady state operation. Modulating heating controls can be added, and carry a 'bonus' under the ErP ratings system for heating system packages. Controls required under the Boiler Plus Legislation (weather compensation, load compensation, smart control) also enable this functionality. Gas boilers remain less expensive to purchase upfront than other newer heating technologies, and consumers have high awareness and acceptance of the technology, but a rapid transition away from gas heating is an essential part of achieving the UK's net-zero 2050 target, and the preparation for this needs to begin now, given the expected timetable for moving to low-carbon heating. Purchasing a new gas boiler now may result in a lock-in effect, missed carbon savings and a slower than needed transition to renewable heating for

[22] The secret life of boilers: Dynamic performance of residential gas boiler heating systems – a modelling and empirical study

	a large segment of consumers. An efficient, modulating gas boiler to replace a very inefficient heating system, with a view to evolving to a hybrid system and heat pump before the end of the boiler's expected life, may be a beneficial short term-option for lower-income households. Heat Pumps Heat pumps are expected to play a large role in decarbonisation of heating, with significantly lower carbon emissions than gas boilers. Additional benefits are that they have lower running costs to the consumer due to increased efficiency, long lifespans and lower maintenance, are considered safer than combustion based appliances, and are a good solution for off-grid users. However, a significant barrier remains their current upfront cost (with installation, this may be between £9,000 and £17,000, and consumer understanding and acceptance of the technology is currently low. Installation may be disruptive and require a borehole, and the skill base of installers needs to be increased. There is a lack of performance data available for purchasers. The UK is considered to be behind other European countries on heat pump uptake, although UK sales were reported to rise by 19.7% in 2018. Further interventions are recommended to increase the uptake of heat pumps, both from a financial perspective and in terms of proving and demonstrating the technology.

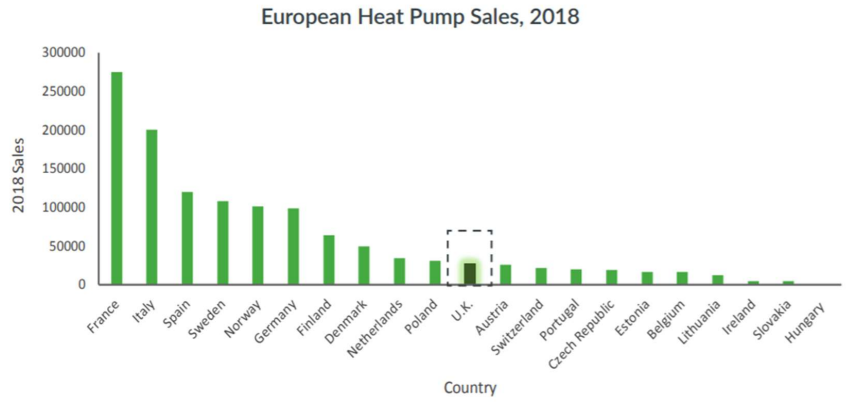


Figure 3: Heat Pump Sales Across Europe, 2018 (Source: EHPA)

Figure 1 - 2018 heat pump sales, with UK lower than several other European states SEE COMPLETE DOCUMENT PROVIDED VIA EMAIL

In terms of consumer understanding, the BEIS survey on public attitudes to the transition to a low-carbon heating future[13] shows very low awareness of low-carbon heating technologies, with over 60% having never heard of ground source heat pumps, and over 75% having never heard of air source heat pumps.

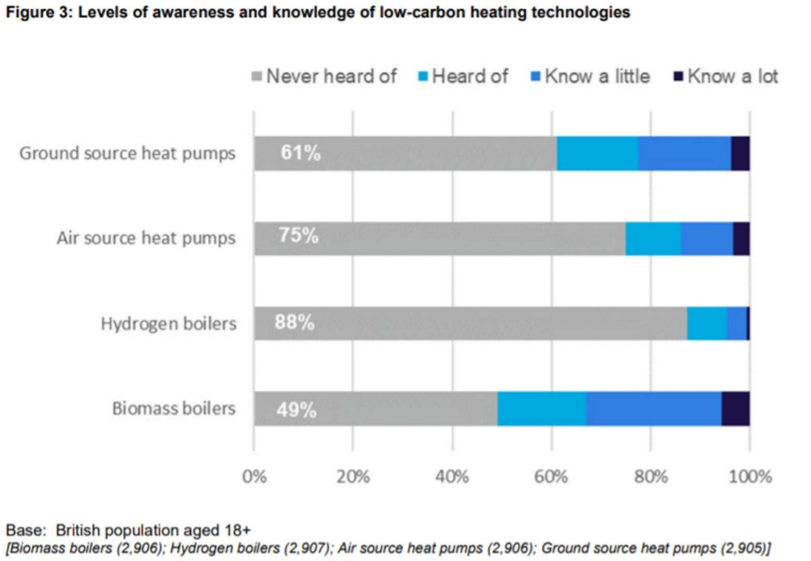


Figure 2 - source: BEIS SEE COMPLETE DOCUMENT PROVIDED VIA EMAIL

Hybrid Heating Systems can combine the efficiency of a heat pump alongside an existing boiler installation, and as such provide a useful bridging technology towards low-carbon heating for consumers who are familiar with gas boilers, and may desire a less disruptive installation. The heat pump component can often provide the majority of heating needs, particularly space heating, before a gas boiler component would need to be called upon.

Low/zero-carbon fuels: Use of hydrogen in the gas grid would have an advantage of reducing the need for significant infrastructure changes, but currently hydrogen cannot be consider a zero carbon fuel, as the majority is produced from fossil based sources (Friends of

	the Earth reported in 2020 that 4% of UK hydrogen production comes from electrolysis[23]. Whilst there is benefit in this transition, it has yet to be widely proved that hydrogen can be produced and deployed at significant scale in the UK.
13.Could tighter minimum energy efficiency levels above the existing 92% (for example 120%, 130%, 140% etc.) help bring to market low-carbon heating technologies? >IF YES, what exemptions may be required for certain applications? Please provide evidence and/or data. >IF NO, why not? Please provide evidence and/or data.	Yes, but this appears to be an unusual approach given that all efficiencies above 100% rule out boilers, and the relative merits of the remaining options cannot be sensibly expressed through efficiency. If the required end-result is a reduction in carbon emissions while still providing adequate heating, then the requirement needs to be designed to support that objective. This requires a carbon metric, and compliance will be dependent on both technology and fuel, as well as factors beyond the usual scope of Ecodesign regulations, such as building fabric and occupant behaviour. For example, the effectiveness of a solution such as a hybrid heat pump/gas boiler system will be determined by the relative carbon factors of mains electricity and gas, the control mechanism for determining when to use which fuel, and the occupants' choice on how to use the controls, as well as the efficiencies of the gas boiler and heat pump. Also, the efficiency of both systems will be influenced by the occupants' control strategy and the nature and condition of the building fabric and heat distribution system, amongst other things. We cannot conceive of a way to take account of these multiple variables in a single measure of minimum efficiency. This being said, if the intention is to effectively phase out fossil fuel-powered boilers, implementing more stringent minimum energy efficiency standards which 'ratchet' up over time is a means by which this could be achieved (though convoluted if this is the intention). The UK already outperforms the EU in terms of boiler efficiency with a 92% minimum energy efficiency standard as opposed to 86% in the EU. The market (relative and absolute) is larger in the UK than other EU member states and so the average efficiency of boilers has a greater impact on overall emissions. More stringent minimum energy efficiency standards in the UK have already delivered considerable savings with little negative impact on consumers.

[23] https://policy.friendsoftheearth.uk/insight/role-hydrogen-our-low-carbon-transition

	We would suggest that, if UK Government did decide to implement new, more stringent minimum energy efficiency standards, these are introduced alongside an adapted Energy Labelling scheme for heating products that would allow better comparison across heating technologies, create the necessary market visibility and enable proper anticipation by economic actors and the authorities. A policy regime made up of more stringent standards coupled with an A-G energy label could be constructed as follows (the following is adapted from positions taken by ECOS, altered to reflect the different nature of the UK market and the already more stringent MEES in the UK): - Inefficient electric appliances and less efficient (non-condensing) fossil fuel technologies are included in a bottom class 'G' (Eff <92%). - All condensing boilers and similarly performing technologies are included in the second-bottom class 'F' (Eff 92 – 110%). The minimum energy efficiency regulations would then phase out class G technologies immediately from the point of implementation and class F by 2025. We suggest setting the limit between F and E classes at 110% efficiency so that fossil fuel boilers with only minor assistance from renewables are excluded, and to make sure that only efficient technologies operating mainly with renewable energy can enter the market post-2025. This would result in the effective minimum standard being 111% efficiency by 2025, though this should be closely monitored / kept under review and seek to be increased post-2025 and earlier, if possible. We note the recent publication from the CBI and Birmingham University which called for all fossil fuel boilers to be phased out by 2025. Our proposal broadly aligns with this ambition but allows a degree of flexibility for high performing hybrid boilers in the medium term with the desire being that these too are phased out in the future. Once again, it should be pointed out that if the Government's goal is to phase out fossil fuel boilers by a particular date achieving this through more stringent energy efficiency standards may be an unnecessarily complex means of achieving this aim.
14. To what extent could raising the minimum energy efficiency of boilers drive improvements in emissions savings in heating and enable a transition towards net zero?	As boiler efficiency is currently set at 92% or higher, and as there are inevitable losses in above ambient flue gas emissions, the potential for additional gains through higher boiler

	efficiencies is extremely small – clearly significantly less than 8% maximum possible benefit. Raising the minimum energy efficiency standard would effectively phase out fossil fuel powered appliances but if this is the intention it need not be achieved through efficiency standards. There is scope to reduce energy use and carbon emissions while still using boilers, through better controls, better use of controls, better distribution of heat, reduced heat loss, reduced fuel carbon intensity and partial or complete switching of fuel. However, none of these can effectively be driven by an increase in boiler efficiency.
15. What role do you think minimum energy performance standards should play in driving a transition to zero-carbon heat? Are there alternatives, or complementary measures, that might work better?	As discussed above, there are plenty of technical options for decarbonising heat, and many of these can be encouraged through minimum standards. The existing European Directives have demonstrated that a combination of product labelling and minimum standards can be very effective in driving improved performance and reduced emissions. Financial incentives have been proven successful in supporting newer technologies to become established in the market (for example, the Feed-in Tariff has moved solar PV from an expensive fringe technology to a financially viable and widely available domestic option). However, once a technology has become commercially widely available, minimum standards become the most effective way to ensure rapid roll-out. The introduction of condensing gas boilers is a good example, supported initially through a cashback scheme to support early adopters and then effectively made a requirement for all through changes to the building regulations – an approach which adhered to the 'Market Transformation Curve'. Subsidy schemes such as the Renewable Heat Incentive (RHI) can be an effective means of incentivising the replacement of existing boiler systems and can make the most efficient technologies accessible and affordable for a greater number of consumers. However, as our recent submission to the Department for Business, Energy and Industrial Strategy '*Future Support for Low Carbon Heat'* consultation highlighted, the RHI has not been as effective as anticipated at delivering low carbon heat installations. It is our view that a shift to £1 billion of grant funding, allocated over 4 years, for low carbon heat installations would be better for consumers, who highlight upfront cost as a significant barrier. We feel this would be the best way to deliver, in the short to medium-term, on the considerable number of extra low carbon heat installations which must take place to reach net zero.

	The Committee on Climate Change's latest Annual Progress Report reiterated that to meet our climate targets we will have to increase heat pump installations from below 30,000 a year currently to 1 million per year by 2030. Assuming that other low-carbon heat technologies will also play a role there is a need to increase their rollout immediately. We were pleased to see the Scottish Government commit to an annual doubling of heat pump installations out to 2030, ultimately aiming for 64,000 installations per annum. To achieve the CCCs target, considerable investment will be required in the supply chain and in qualified installers. Many households in the UK are unaware that their heating system produces emissions at all and many more are unfamiliar with low-carbon heat technologies. Engaging with consumers to help them understand the climate impact of their heating systems, demonstrate the alternatives on offer, and providing free and impartial advice must also be a priority. Complementary measures could also include increased use of smart meter data to track real-time heating system energy consumption. Obligations could be placed on energy suppliers to track this real time consumption and take action where necessary, whether this is providing servicing or recommending an upgraded system. The CCC has suggested that direct regulation of home performance of heating systems, as part of a new approach to improving energy efficiency could be considered[24]. Minimum energy performance standards can only play a limited role in driving a transition to zero-carbon heat, as this instrument can have limited effect on the in-use impact of boilers, and technology in the form of smart meters is available (if not yet fully viable for being used for extensive in-situ monitoring of heating systems), that can help reduce in-use consumption and/or encourage the transition to new heating technology,
16. What regulatory product standard changes could be put in place to reduce cycling and improve the performance of boiler installations?	More needs to be understood about the performance of boilers in-situ and ensuring boilers are correctly sized. Modulating aspects are not covered by existing energy labelling ratings which only consider steady state operation. Some consideration for heating controls that enable this functionality is specified in the boiler plus legislation, but more can be done to ensure that real-life performance is optimised.

[24] https://www.carbonbrief.org/ccc-uk-must-act-now-secure-zero-carbon-heat-2050

	Ultimately, standards should be more focused towards real-world performance than modelled performance, and use of smart meter data from boilers, including on aspects such as cycling, could be incorporated into regulations and building performance labelling. For example, regulation could seek to place more responsibility on installers to ensure that boilers installed are correctly sized and track excess cycling through smart meter data. This could form part of the basis of financing schemes for boilers, where the energy performance contracting company guarantees the savings, and tracks performance through smart meter data. Additionally, obligations could be placed on energy companies to enable reductions in heating energy consumption as a result of taking actions informed by smart meter data. Addressing the inefficiency and sub-optimal operation of existing boiler stock, including on cycling should be pursued. It is estimated that there are approximately nine million inefficient boilers in the UK. This could include the reintroduction of a scrappage scheme, or further deployment of heating controls that enable reduced cycling. The voluntary HHIC retrofit labelling scheme introduced in 2016[25] provided a householder with information on how their existing system compared to a more modern, efficient system by proving a rating label. This could be expanded or promoted more widely as part of the current Green Homes Grant Scheme. Is it recommended that extending existing minimum energy efficiency requirements for boilers in privately rented accommodation could provide a trigger point for intervention and accelerate the progress of low-carbon heating in this sector, as well as reducing bills for renters.
17. Would wider modulation boilers address the performance issues in combination boilers?	Tightening standards for new build properties and support for retrofit schemes have led to a gradual reduction in peak space heating demand across the housing stock, while peak hot water demand has remained largely unchanged. For combination boilers, this has increased the gap between the output required to meet hot water demand and the output required for space heating. Boilers are therefore often dramatically oversized with regards to the

[25] https://phpionline.co.uk/news/baxi-welcomes-launch-hhic-retrofit-labelling-scheme/

	space heating requirement, and spend much of their time operating well below optimum output, and hence at reduced efficiency. One option to address this would be to stipulate minimum efficiencies at lower outputs, which would encourage the specification of boilers with wider modulation. However, as decarbonisation continues it is important to make sure that regulations facilitate alternative solutions, including separate solutions for space and water heating, the use of regular or system boilers where more appropriate (bearing in mind alternative heat sources for hot water cylinders such as solar thermal, surplus solar PV and cheap/low carbon off-peak grid electricity) and the specification for water heating systems in homes with very low space heating demands and hence no centralised heating system.
Heat Pumps	
18. See Question **A**	No, given that heat pumps are already among the most efficient space heating technologies the potential for additional energy savings in the near to medium-term is relatively small. This does not mean that this issue couldn't be revisited at a later stage as technology develops. Our concern with performance standards as they relate to heat pumps is that testing must be reflective of real-life conditions (there are similar issues for a host of technologies). According to recent review studies, boiler efficiency is up to 9 % higher in tests than in real use, and for heat pumps the measure of efficiency is up to 15% higher in tests than in real use. This can be explained by higher forward and return temperatures in real use compared to testing situations, over-dimensioned boilers, or problems with the testing methodology. One such issue, identified by the German Environmental Agency (UBA) and the German Federal Institute for Materials Research and Testing (BAM), focuses on the current EN 14825 testing regime. They found that the test method is not realistic, as testing is undertaken with fixed speed compressors. This is only possible when setting the appliance to a specific test mode that is not used or even available in normal use. According to a recent study from the German BAM, this testing regime resulted in higher efficiencies than could be expected under normal, *in situ* conditions. We share the concerns of BAM concerning EN14825 and suggest that a more realistic test method is introduced once the UK leaves the EU and can undertake its own testing regime. Ideally, all the available modes should be tested, and the

	energy label should refer to the most energy-consuming mode. The proposals for 'dynamic' testing laid out by BAM on this topic will be of use in designing a new testing regime. Given that the efficiency and effectiveness of heat pumps is reliant on the fabric efficiency of the building it is situated in, as well as the behaviour of the occupier, these variables should be better reflected within the testing regime. With the general improvement of the insulation of buildings, the parameter of ventilation becomes more significant in the calculation of heat loss for dwellings, and over-ventilation is not considered in existing standards. Standards should be improved to penalize units requiring a high air flow and rewarding units requiring low ventilation air flows.
19. See Question **B**	
20. Could better measures be delivered under Ecodesign regulations to improve product design, such as better integration with smart systems? >IF YES, in what timeframe could these requirements be implemented after 1 January 2021? Please choose one of the below options and provide evidence and/or data: • 6-12 months • 12-24 months • 2-3 years • 3-5 years • More than 5 years >IF NO, why not? Please provide evidence and/or data (e.g. barriers to production; costs etc.)	The appropriate control of heat pumps is a key factor in achieving high performance factors in combination with acceptable comfort levels and, given the low levels of public awareness around heat pump control, there is clearly potential for smart controls to help optimise control settings. Smart systems could also provide more immediate and intuitive feedback on performance, enabling householders to learn more appropriate control habits. The likely increase in time of use tariffs will also drive different control strategies, potentially incorporating greater heat storage, to make use of cheaper and lower carbon electricity at off-peak times. This could potentially lead to optimisation of control strategies for minimising energy cost and emissions, while deviating from a strategy that maximises performance factors. It is important that any standards or other requirements do not accidentally force system designers and users to follow sub-optimal design and operation by focussing on a single metric (such as SPF) even when the metric does not correlate to the desired outcome. Given the rapid rate of change in this field, it may be that the best approach would be to develop regulations that allow for bespoke justification of alternative means of compliance, where the system manufacturer or installer can demonstrate reduced energy and/or carbon emissions compared to a standard solution that meets the specified minimum standards.

21. Should different product standards apply to higher temperature heat pumps which may be required for hard-to-treat homes?	We believe that applying different standards to different groups of heat pumps where there is not a clear functional difference between the two groups is potentially misleading or confusing and could easily lead to unintended consequences. Different heat pumps operate over different temperature ranges and the distinction between conventional and high temperature heat pumps is arbitrary. Similarly, the definition of hard-to-treat homes varies, and the technical options for providing heat from heat pumps in a home with limited insulation potential are multiple and complex. We would therefore recommend that all efforts to support heat decarbonisation in homes are results based in as much as is possible. While standards typically apply to individual products, the complexity of this aspect of the decarbonisation challenge requires a flexible approach, where multiple solutions can be compared on a level playing field. Standards for heat pumps therefore need to take account of different operating circumstances and, if different standards are required for different circumstances, these need to be defined in terms of those circumstances. For example, this might be based on the age of the building, the current EPC rating the design flow temperature etc. A note on the current testing regime as it relates to energy efficiency: Flaws in the current regime can mistakenly suggest that low temperature heat pumps are more efficient than they are in reality. Higher efficiency results for low-temperature heat pumps are achieved because at present under the EU regulations these are tested with lower temperatures (35°C inlet temperature to the heating systems instead of 55°C; see Annex VII in regulation EU/811/2013). A low-temperature heat pump is therefore not more efficient than a high-temperature heat pump in the same label class, it is simply tested in a way that produces a higher efficiency result, because it cannot deliver the temperatures needed for the test of normal heat pumps.
Electric Motors	
22. See Question **A**	
23. See Question **B**	Similarly to our position for water pumps we draw much of our response from the work and positions of ECOS and the CoolProducts campaign we recommend particular attention be paid to rare earth magnets in some of these devices. These products can be challenging to identify[26] without specific, expert knowledge and significant testing and dismantling.

[26] Preparatory Study to establish the Ecodesign Working Plan 2015- 2017 implementing Directive

	Therefore, a mandatory and standardised marking of products containing rare earth magnets above a certain minimum weight (e.g. > 10 g) could help to facilitate better reuse and future recycling practices. It is believed that a marking signaling and giving information on the presence of rare earth magnets as well as information on the applied type (e.g. SmCo, FeNdB) could assist with the establishment of a circular economy for rare earth elements. We recommend: • Introducing an information requirement on the presence of rare earth material in magnets, their localisation, as well as their extraction process allowing safe and cost-effective reuse or recycling. • Considering the specific requirements for how these permanent magnets can be integrated in the motor to maximise cost effectiveness of reuse and recovery process (e.g. no glue and no welding hampering the extraction/recovery of rare earths elements; or maximum amount of non- destructive disassembly time to foster the reuse of the magnets rather than the mere recovery of rare earth elements). These measures could likely be implemented in 12-24 months for provision of information requirements and 2-3 years for the other measures.
Space Cooling	
24. See Question **A**	As the climate continues to warm and the UK becomes more likely to experience high temperatures and prolonged heat waves the number of air conditioners and other cooling devices will increase dramatically. The devices can be considerable users of electricity. The departure of the UK for the EU presents an excellent opportunity to improve the efficiency and functionality of these devices before they achieve truly significant market penetration through the introduction of more ambitious Ecodesign and energy labelling regulation. Particular attention should be paid to devices on the more affordable side of the market such as portable air conditioners and comfort fans, which are typically less energy efficient and well designed as the more expensive, fixed air conditioners on the market.

2009/125/EC, Task 2: Supplementary Report "Identification or resource-relevant product groups and horizontal issues", Andreas Manhart, Kathrin Graulich (Oeko-Institut), 15th September 2014 (Chapter 7.1)

Much of what has been proposed in the most recent round of EU consultations for this product class is welcome and will likely save an additional 3.5TWh by 2030 across the EU[27]. Among the measures under consideration which we are in support of, and believe the UK should seek to implement, are: the common energy label scheme for all appliances in scope, the move to seasonal metrics which better reflect real-life conditions of use, resource efficiency requirements, and the proposed ecodesign and energy labelling requirements for comfort fans. However, we strongly regret to see that the crucial issue of refrigerants has been entirely removed from the EU plans.

In terms of adequate labelling, the ambition to have a uniform label across the class to allow for better consumer decision-making must be a priority but the efficiency measure used must be easily understood. The n% efficiency measure may be confusing for consumers when the figure is above 100%. A traffic light system alongside a 'best-in-class' approach would be beneficial. Underpinning this could be a more stringent efficiency requirement for fixed air conditioner units, perhaps as follows:

- Split units < 6KW = SEER of 7.0
- Split units > 6KW = SEER of 6.5

Particular attention should be paid to local air coolers (LACs) which, under current EU regulation, are treated separately to other air cooling products. This gives them an unfair advantage and given that they are inefficient and problematic products (due to needing a window to be open for use and that they tend to be impulsive/distress purchases wi information provided by salespeople or installers) this should be addressed by consid them under the same suite of standards and regulations as other products.

A combined energy efficiency energy label could have bands as follows (as proposed ECOS and partners as part of their submission to the EU ecodesign and labelling consultation):

Commented [EC1]: I think there is a widely used term for this – it's used for fridge purchases (e.g. when they break down) can't remember it right now.

Commented [JW2R1]: Stew suggested 'distress' purchases

[27] Review of Regulation 206/2012 and 626/2011 Air conditioners and comfort fans. Task 7 report (p. 43). May 2018

Energy efficiency class	$\eta_{s,c}$ (%)
A	$\eta_{s,c} \geq 550$
B	$478 \leq \eta_{s,c} < 550$
C	$407 \leq \eta_{s,c} < 478$
D	$335 \leq \eta_{s,c} < 407$
E	$264 \leq \eta_{s,c} < 335$
F	$192 \leq \eta_{s,c} < 264$
G	$\eta_{s,c} < 192$

PLEASE SEE COMPLETE DOCUMENT PROVIDED VIA EMAIL FOR FIGURE/TABLE

On enhanced refrigerant regulation: Though not directly energy efficiency related there is an excellent opportunity for the UK to go beyond the existing EU regulations on high Global Warming Potential (GWP) refrigerants with significant potential to reduce / avoid CO2 emissions by incentivising the uptake of the existing alternatives on the market. Current EU regulation sets out a manufacturer bonus for those who reduce the GWP refrigerant content of their devices. The uptake of this bonus has been minimal and despite the 2020 ban (lower than GWP 150), in the case of portable units only one company currently offers a model which is compatible with this threshold according to the EU review study on ecodesign. Much of the regulation regarding these compounds looks set to be covered in the EU by the provision for F-Gases. We believe that ecodesign measures in this product class could complement similar F-Gas regulation in the UK. Uptake of alternative refrigerants has been slow for both fixed and portable AC, illustrating that the mix of incentives and regulation is not currently effective. In practice this means that the GWP of AC units is higher than it needs to be given that suitable alternatives already exist. Not taking measures to address this and encourage an early transition to alternatives will mean high levels of high GWP refrigerants will persist in the market, negatively impacting consumers who will face high

	maintenance costs due to their increasing scarcity – this may encourage consumers to dispose of otherwise functional units earlier than necessary, contributing to poor resource efficiency. We suggest that the manufacturer bonus be enhanced with a sliding scale of bonus so that those manufacturers who show ambition and take the lead are rewarded more. It should also be made clear to consumers which products are using natural refrigerants and/or low GWP (<150 GWP) refrigerant via a pictogram on an energy label. We believe that this suite of measures could be implemented in the UK in 3-5 years (and earlier for the measures regarding low GWP bonuses and the associated labels). On comfort fans, we welcomed the proposals being made in the EU to implement ecodesign and energy labelling regulations for this product class. The Service Value is a good value to use to assess the energy efficiency because it also assesses the effectiveness of the fan (ability to move a maximum amount of air). This will not only lead to improvements in the electrical components (motor) but also in the design of the blades of the fan. The UK could go further by ensuring that both tower fans, which account for a large share of the domestic market, and fans with blade diameter <20cm are explicitly included in any UK ecodesign regulation. In the EU regulations there are currently no MEPs for these products despite ceiling fans of > 0cm having dedicated MEPs. We believe this could be implemented in 12-24 months.
25. See Question **B**	Yes, each of the components of these devices could benefit from greater resource efficiency. • Limiting hydrofluoroolefin (HFO) use: although HFO has a low GWP and minimal ozone depletion potential concerns persist related to its overall sustainability. These include environmentally harmful and toxic by-products on production and decomposition, environmental persistence, toxic flammability and potential recycling challenges[28] • Provision of spare parts: all spare parts should be available during at least the average product lifetime, i.e. 12 years after the last unit is supplied. As a minimum, these should be available for 10 years, in line with the Austrian standard ONR 192102. The list of spare parts that are readily available should be expanded to

[28] https://eia-international.org/wp-content/uploads/2019-High-Stakes-Spreads.pdf

	include buttons and controls, filters, and product housing, with these being accessible by typical consumers as well as specialists. • General repairability: related to the above, manufacturers should make clear which repairs can be completed by competent consumers and manufacture their products to facilitate this (e.g. by using standard fastenings and not welding/gluing components if not necessary). In general, the ability to disassemble without damage should be encouraged. • Requirement on maintenance: Currently, during the maintenance of the air conditioner, if the circuit is sealed, the only way to work on the appliance is by letting the refrigerant escape. There should be a clause in the UK ecodesign regulations requiring that it is possible to contain the refrigerant on one side of the circuit so that work can be performed on the other side without leakage.
Ventilation	
26. See Question **A**	As this Call for Evidence alludes to, and has been pointed out during the Preparatory Study for the EU ecodesign consultation, the numbers of ventilation units (VUs) is likely to increase in the UK and Europe with these products having a relatively long lifetime. For these reasons they offer considerable energy saving potential. A growing section of this market will be VUs installed alongside heat pumps as a suite of insulation and energy efficiency measures in homes. As the UK will soon be able to go further than the current EU regulations we believe it will be important to consider including the following VU-related points in ecodesign regulations (these recommendations are adapted from the response provided by ECOS and partners to the corresponding EU consultation but align with our own thinking on these issues): - Include VUs with an electric power input of less than 30 W per air stream - Include VUs designed to operate specifically in sterile or clean manufacturing environments where the use of HEPA or ULPA filters is mandatory. These are linked with high energy consumption and therefor significant energy saving could be achieved. - Include VUs designed to operate exclusively for emergency purposes or in exceptional or hazardous environments - the effects of filters and climatic conditions on energy use should be assessed - Include BVUs with heat exchanger and heat pump for heat recovery

	- Addressing efficiency losses due to air leakage can significantly reduce energy use. A maximum of 3% leakage rate should be required for non-ducted and ducted systems, using recuperative or regenerative heat exchangers. This will help to make these systems 'net zero ready'. - Improve heat recovery requirements - Introduce a systems approach when setting energy requirements, similar to our proposals for water pumps. - Consider the option of introducing overarching ecodesign regulations so that domestic and commercial VUs are under the same regulatory regime. Given that many VUs are used in both environments loopholes can be created and exploited if they are classified separately. - Introduce an energy label for non-residential ventilation units and VUs below 30W per air stream. The timescales required to implement these considerations likely ranges from 12 months to 5 years.
27. See Question **B**	Yes, we believe the following should be considered and acted upon: - Material efficiency requirements should be introduced, for example to facilitate recyclability. Design evolutions should be assessed, such as the increased use of plastics, that may complicate current recycling practices
Taps and Showers	
28. What is the size of UK manufacturing for taps, shower valves and shower heads in the domestic and non-domestic sectors? Please provide evidence and/or data for each of these product categories separately (e.g. stock, annual sales, rate of replacement, water flow rate, annual water consumption, annual primary energy demand etc.)	• Various annual water consumption figures, at household and product level are available from EST's At Home with Water report[29]. Average daily household consumption was estimated at 349 litres from the report, and based on a household size of 2.5 people, per-person water use was estimated at 142 litres per day. Showers account for around 25% of consumption, cold taps (bathroom and kitchen combined) around 22%, the bathroom hot tap around 7% and the kitchen hot tap around 4%. The current minimum standard for water consumption, as specified in the building

[29] At Home with Water, Energy Saving Trust

regulations is 125 litres per person per day. EST's previous response to the Defra Consultation on Measures to Reduce Personal Water Use identified that the technology is widely available to significantly reduce this per capita water use, and that more ambitious targets are achievable – for example " New standards setting performance criteria equivalent to a 95 litres per person per day according the water efficiency calculator for new dwellings can be met using only products that are already commercially established in the domestic sector".

- Large energy savings potential from water using products such as taps and showers has also been identified. For example in the EU Ecodesign Working plan for 2012-14, water-related products were at the top of the list for product groups on the indicative list for the working plan. Estimated energy savings of 885 PJ/year by 2030 in the EU were identified.

– ANNEX II: NON-EXHAUSTIVE ASSESSMENT OF THE PRODUCT GROUPS ON THE INDICATIVE LIST FOR THIS WORKING PLAN

Product group	Estimated energy savings potential (in PJ/year as of 2030)	Considerations for inclusion in the working plan
Priority list		
Water-related products (e.g. showers and taps)	885	Large savings potential (both energy and water) representing an opportunity for an EU labelling scheme
Window products for buildings	785	Large savings potential and opportunity for an energy labelling scheme
Steam boilers (< 50 MW) (e.g., oil-fired boilers, stoker (coal) fire boilers)	177	Relatively large savings potential, even if the potential of boilers with a power over 50MW is likely to be covered by the Industrial Emissions Directive (IED). For boilers under 50MW of power, there seems to be an absence of EU legislation applicable to ecodesign requirements. The savings potential would need to be verified by a dedicated preparatory study.
Power cables	182	There are indications that a substantial improvement potential can be realised by introducing minimum efficiency levels at EU level. There is also an opportunity to introduce the EU energy labelling scheme.

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- Replacement of water using products is believed to take place for various reasons. A report from Trend Monitor[30] provides insights into customer purchase trends. The report found that in 90% of cases, householders were replacing existing stock, and

[30] Trend Monitor - Bathroom Purchasing Trends, Consumer Insight Report 2018

of these replacements, 74% were where products were in need of replacement or considered old. Lifetimes of products have been estimated from the NACHI[31] database – for taps and showers, a lifetime of around 17.5 years is estimated. Toilets may last for at least 20 years. Whilst long lifetimes are a benefit from a resource efficiency point of view, many users may be essentially 'locked in' to higher flow taps and other fittings for a significant length of time.

- Water flow rates for taps and showers vary. The European Water Label (EWL) designates a rating for products based on flow rate, with the top band for products under 6 l/min and the lowest band for products that use over 13 l/min.

- Data from the EWL's Scheme Roadmap and Vision report from 2017 shows the split of products registered in the different categories. This is not representative of the entire market – the EWL reported in 2017 that the market share of the current registered brands is 58% of the tap/shower/shower handset market and 60% of the Sanitaryware market[32]. However, this gives an approximate guide to the state of the market and the split of different products by flow rate. A study by Cordella et al, *Follow-up of the MEErP Preparatory Study on Taps and Showers - Final Report*[33], also cites the EWL listings as providing a reasonable picture of the market in terms of product flow rates.

- For bathroom taps, registrations in each category were as follows. Over 60% achieved the lowest flow rate, suggesting low flow technology in this capacity is widely available and accepted by the consumer and retailers:

PLEASE SEE COMPLETE DOCUMENT PROVIDED VIA EMAIL FOR FIGURE/TABLE

[31] https://www.nachi.org/life-expectancy.htm
[32] European Water Label Scheme Roadmap and Vision
[33] Follow-up of the MEErP Preparatory Study on Taps and Showers - Final Report

- TAPS

Litres per minute	Product registrations
Less than 6	1580
6-8 litres	227
8-10 litres	414
10-13 litres	43
More than 13 litres	306

- For kitchen taps, registrations were as follows. 30% achieved the lowest flow rate. However, 30% also had flow rates of over 13L. This suggests that low flow taps are in use and widely accepted, but there remains a segment of the market that still shows preference for high flow taps.

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Litres per minute	Product registrations
Less than 6 litres	137
6-8 litres	55
8-10 litres	112
10-13 litres	23
More than 13 litres	132

- For shower valves, figures were as follows. 16% of registrations were <6 l/min, and 73% were of higher flow products over 10l/min.

- SHOWER VALVES

Litres per minute	Product registrations
No more than 6 litres	415
6-8 litres	190
8-10 litres	75
10-13 litres	127
More than 13 litres	629

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	• For shower handsets, again the majority were in the high-flow category. 40% of registered products were higher flow products over 10l/min. PLEASE SEE COMPLETE DOCUMENT PROVIDED VIA EMAIL FOR FIGURE/TABLE Litres per minute — Product registrations ○ No more than 6 litres — 74 ○ 6-8 litres — 102 ○ 8-10 litres — 173 ○ 10-13 litres — 91 ○ More than 13 litres — 149 Overall, the data suggests that efficient, low-flow technology is established and accepted, but that further market transformation towards efficient products can take place. • The preparatory study for Ecodesign Requirements on taps and showers gives details of several other endorsement schemes for taps and showers. Data presented shows that flow rates even below the lowest specified by the EWL are in place.
29. Are there any existing measures in place which encourage energy and water savings in these products? >IF YES, how can they be made more effective? Please provide evidence and/or data. >IF NO, should some be introduced (e.g. restriction of flow rates, mandatory or voluntary labelling)? Please provide evidence and/or data.	Yes, the industry led voluntary EU Water Labelling scheme: http://www.europeanwaterlabel.eu/ for water efficiency, encourages consumers to compare products and allow them to make the water efficient choice. However, according to our research on water labelling we have found this scheme has little retail penetration and is not being used widely enough to act as a means for consumers to make an informed choice. Additional measures in place include, the provision in Building Regulations, and inclusion of water saving in ratings schemes such as BREAAM. More can be done in these areas. For example, Part G of the Building regulations[34] sets out water efficiency requirements for new

[34] Building Regulations 2010 – Part G - Sanitation, hot water safety and water efficiency, 2015 edition with 2016 amendments

dwellings, where the 'potential consumption' of water is <125L per person per day, using the water efficiency calculator. A fittings approach is specified as an alternative to this 'ceiling' consumption figure, with maximum fittings consumption detailed as follows. Some of the consumption figures are in line with efficient technology (for example taps at 6l/min), but it is considered that this water consumption figure can be significantly reduced.

Table 2.1 **Maximum fittings consumption**

Water fitting	Maximum consumption
WC	6/4 litres dual flush or 4.5 litres single flush
Shower	10 l/min
Bath	185 litres
Basin taps	6 l/min
Sink taps	8 l/min
Dishwasher	1.25 l/place setting
Washing machine	8.17 l/kilogram

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With this said, EST determined from our research that the greatest benefit to be made through water savings, financial savings, and CO2 reduction is through introducing a mandatory water efficiency label led by government which includes minimum standards to help drive products to become more water efficient, in much the same way the current energy label operates. The full analysis can be found here: https://waterwise.org.uk/knowledge-base/water-labelling-phase-2-project-technical-report/

More recent research for Southern Water and Waterwise looked at the relative merits of these strategies if applied to taps and showers only, as per the proposal here. This analysis concluded that moving from the current voluntary label to mandatory label linked to

	ambitious minimum standards would increase the energy and carbon savings from improved tap and shower performance by over 1400%, while also increasing the cost effectiveness of the scheme by 300%. The full report can be found here: https://waterwise.org.uk/knowledge-base/water-labelling-taps-and-showers-only-comparison-est-2020/
30. What more could be done to enhance the resource efficiency (material consumption, emissions, pollution and waste generation, as well as durability, repairability, recyclability and ease of material recovery) of taps, shower valves and shower heads in the UK? Please provide evidence and/or data for each of these product categories separately	Our response focuses on durability, repairability and recyclability and draws extensively on the work of ECOS, Right to Repair, Cool Products, and IFix It Europe. The industry-led proposal for the EU ecodesign regulations lacks commitments on resource efficiency aspects. Regrettably, the sections on repair and recycling are descriptions of business-as-usual and resource efficiency targets should do more than reflect the *status quo*. As the UK is now able to set its own ecodesign regulations we would welcome greater ambition being shown in this area. We call for UK ecodesign regulation to better align with circular economy ambitions. In regard to this, the EU preparatory study in 2014 confirmed that the durability of taps and showers can be significantly ameliorated by proper installation or maintenance, and that installation and maintenance vary according to the product. In relation to general resource efficiency considerations, ecodesign regulations should at the very least include the following: • Requirements for disassembly of all key components to be possible with commonly available tools without permanently damaging to the product, • Repair instructions, detailing the sequence of dismantling steps as well as tools needed to access the targeted components, as well as maintenance information should be made available on free-access websites, • Set a minimum number of years for the availability of spare parts for key components of 10 years after placing the last unit of the model on the market. Furthermore, as far as recycling is concerned, some parts of taps as well as entire shower heads and accessories, are made of chrome-plated plastic. This creates a serious problem for recycling, as the chrome plating changes the specific weight of the part, which interferes with the sink/float separation that is commonly used to separate plastics after shredding, in

	order to recycle each plastic fraction separately. While metal might be recycled chrome-plated plastic that ends up in mixed waste is practically/economically unrecyclable. In this sense, we recommend consulting industry on the possibility of prohibiting galvanic coatings on plastic parts for better recyclability of products. All of the above improvements to ecodesign regulations could likely be implemented in 2-3 years.
31. Based on existing technologies, what is the maximum amount of energy and water that could be saved from taps and showers in the following timeframes after 1 January 2021? Please provide evidence and/or data: • 6-12 months • 12-24 months • 2-3 years • 3-5 years • More than 5 years	The Energy Saving Trust was commissioned by Southern Water and Waterwise to compare the differences in savings between regulating just taps and shower products with all the main domestic water using products. This was the concluding recommendations from that study: On the basis of this modelling, there is very good evidence for introducing labelling and minimum standards for taps and showers, but there is equally good evidence for expanding that labelling to include other water using appliances. We therefore recommend that the UK Government takes a coordinated approach to labelling and regulation for household appliances and fittings. This should include both an energy label and a water label, with the water labelling covering a wide range of domestic water using fittings and appliances. We recommend special consideration of how best to present information to consumers where a product uses both energy and water. There is considerable international experience in both separate and combined energy and water labels, and this should be used to determine best practice and maximise effectiveness. The UK has well established needs to reduce both carbon dioxide emissions and water consumption, and it therefore makes sense to tackle both of these issues at once where appropriate. Given the overlap between energy labelling and water labelling opportunities, a co-ordinated approach across both resource requirements will give the most cost-effective solution to the combined policy objectives. None of our research has suggested any credible counterarguments to this approach, or any arguments for limiting the ambition of labelling schemes and minimum standards for any water using products." The projected savings for an ambitious energy label for taps and shower, including minimum standards for new build homes and sale of new products, are:

	1 Year Total	2 Year Total	3 Year Total	5 Year Total	10 Year Total	25 Year Total
Energy saved (MWh/yr)	157	494	1,033	3,601	20,314	160,035
Water saved Ml/yr	5,496	17,200	35,831	125,489	704,653	5,373,998
CO2e saved (tCo2e/yr)	37,683	118,117	246,366	854,596	4,757,108	36,156,231
Bills saved (£ million)	26	80	163	544	2,755	15,713

PLEASE SEE COMPLETE DOCUMENT PROVIDED VIA EMAIL FOR FIGURE/TABLE

For comparison, the equivalent figures for a wider water label including other water-using appliances and fitting are:

	1 Year Total	2 Year Total	3 Year Total	5 Year Total	10 Year Total	25 Year Total
Energy saved (MWh/yr)	249	769	1,582	5,459	30,675	243,743

Water saved Ml/yr	9,588	29,876	61,644	206,357	1,134,765	8,987,406
CO2e saved (tCo2e/yr)	60,633	187,311	385,021	1,313,372	7,258,880	55,912,126
Bills saved (£ million)	43	128	258	860	4,421	26,225

PLEASE SEE COMPLETE DOCUMENT PROVIDED VIA EMAIL FOR FIGURE/TABLE

The full report can be found here: https://waterwise.org.uk/knowledge-base/water-labelling-taps-and-showers-only-comparison-est-2020/

Smart Appliances	
32. What quantifiable environmental benefits do you see as being potentially available if the UK became international leaders on the regulation of smart appliances?	Quantifiable benefits include: • Increased proportion of renewables in the energy mix, due to better load balancing from smart appliances • Improved appliance analytics and system reliability, enabling greater lifespan and resource efficiency Reduced reliance on imported gas and improved security of supply
33. Are there any technical barriers in achieving these benefits? Please provide evidence and/or data.	Beyond consumer acceptance of smart appliances and the ability of a 3rd party to vary appliance's power consumption, technical barriers may include: • Functional and compatibility issues with smart appliances. These issues may concern appliance hardware and interfaces, but barriers may be encountered with the communications protocols used. This also includes the safe, efficient and compatible workings of appliances as a result of incorporating smart functionality • Network congestion issues from smart appliances reporting data could be a barrier • Grid stability – this could be affected by errors in appliance functionality or data reporting

	• Cyber security – for example, a series of 'hacked' appliances or data connections could result in issues with grid stability or excess consumption Potential for increased networked standby power consumption from smart appliances – this is a potential unintended consequence that should be monitored. This and other 'hidden' costs of smart appliances which have not been fully considered are explored by ECOS and CoolProducts in their submission to the EU preparatory study on smart appliances.
34. Would leading in the regulation of smart appliances allow the UK to develop economic benefits from DSR? >IF YES, would these economic benefits be exploitable in an export market? Please provide evidence and/or data. >IF NO, why not? Please provide evidence and/or data.	Leading in the regulation of smart appliances may provide the UK with a competitive edge in relation to the development of related services, products and training, that could be exported. These may include: • dedicated communications protocols • analytics software and algorithms • smart appliance communications hardware However, as increased connectivity between energy grids and networks are expected to be seen future, a collaborative approach to standard development will also likely be required. Energy performance standards for appliances are likely to have to align with those in other markets, such as the EU where products standards are expected to maintain a high degree of alignment.
Heat distribution systems, hot water and heat storage	
35. Do heat emitters, hot water and heat storage products have a high energy savings potential, either directly or as an enabler for the adoption of lower-temperature heating, in the following timeframes after 1 January 2021? Please provide evidence and/or data: • 6-12 months • 12-24 months • 2-3 years • 3-5 years • More than 5 years	
Making energy labels more useful for consumers	
36. Apart from the products listed in Table 3, are there other energy-related products that could be subject to energy labelling requirements to help increase the uptake of the most energy and resource efficient products? Please provide evidence and/or data.	We recommend energy labelling be considered for those products which are currently only subject to a voluntary agreement, those for which energy labelling is being developed as 'work in hand' and for which energy labelling is proposed in the current EU workplan. We

Table 3: Energy-related product categories covered by existing EU Energy Labelling measures

Air conditioners	Electrical lamps and luminaires
Domestic ovens and range hoods	Residential ventilation units
Professional refrigerated storage cabinets	Refrigerating appliances with a direct sales function
Household dishwashers	Space heaters
Household washing machines	Electronic displays and televisions
Household tumble dryers	Water heaters, hot water storage tanks
Household refrigerating appliances	Household combination washer-dryers
Local space heaters	Solid fuel boilers

feel it is always worthwhile considering an energy label where energy efficiency is likely to be a consideration and there is enough choice within the market to allow for an informed decision on the part of the consumer (whether domestic or commercial). As well as the product classes detailed above which we believe would benefit from additional energy labelling we also feel that the following product classes would be well served by the addition of a label:

Commercial cooking appliances
As stated in question 1, cooking appliances offer strong potential for energy savings. Energy labelling could be an effective means of enabling procurement professionals to identify the best performing products, or communicate the efficiency of different functionalities of products. Energy labelling was recommended in the paper by Mudie et al which quantified some of the potential energy savings from different product types.

Smartphones
Whilst the potential energy savings from regulating smartphones may be lower than for some higher consuming products, labelling that communicates the level of repairability, durability and resource efficiency of smartphones could be a key instrument to improving recovery of critical raw materials and increasing circularity.

Commented [EC3]: and increasing product lifetime?

Windows
Energy labelling for windows could be introduced – an impact assessment is ongoing. Existing schemes in the UK include voluntary labelling through bodies such as the BFRC, which are well established and recognised. The EU Ecodesign Working plan (2016-19) identifies windows as having one of the higher energy savings potentials, with anticipated primary energy savings of 40 TWh/year in 2030 (from energy labelling only). Schemes in the UK could be made mandatory.

Electric heaters
Electric heaters are not included alongside other local space heating products (such as solid fuel heaters) in the scope for the regulation of energy labelling of local space heaters. This could be included, utilising the same scale as for other product types. A position paper from

	ECOS[35] suggests that 18 million units are expected to be sold in 2020, making electric heaters a popular product. Of the 94TWh/year primary energy savings expected for local space heaters in 2030, 63TWh/year (i.e. 67%) are from electric heaters[36]. The lack of labelling means that consumers are not informed of the high energy consumption of these products. Electric heaters using resistance are an extremely inefficient heating technology and can contribute to high demand peaks in winter, requiring fossil-based plants to come online to match this demand.
Improving the UK energy label	
37. Are existing energy labels effective in encouraging the purchase of the most energy efficient products? Please choose one of the below and provide further evidence and/or data: • Very • Somewhat • Not very	Somewhat The existing EU energy labels (ie the current format, that precedes the new format that will be introduced for 6 product categories from March 2021 and other categories later) have seen reduced effectiveness in encouraging the purchase of the most energy efficient products in recent years due to a high proportion of products achieving the top classes. For example, with refrigerators, washing machines and dishwashers, the minimum class on the market has been A+, which is confusing, as this would be expected to be one of the most efficient models. In the example of washing machines, many products have for the past few years been clustered around the top class, A+++[37]. This has made it difficult for consumers to differentiate between products. Additionally, over the past few years with the energy labelling system and test methods for TVs have not kept pace with the degree of technology change in the TV market towards those using UHD and HDR technology. The EU energy label is recognised by 93% of consumers according to Special Eurobarometer 492. It is a positive development therefore that the issued outlined above have now been addressed by means of the rescaling of the EU energy label back to A-G, with a view to ensuring that scales are suitably future proofed to allow space for innovation and energy efficiency improvements. This rescaling is expected to improve consumer understanding of

[35] Stricter regulations are needed for electric heaters, ECOS, 2 September 2019
[36] Ecodesign Impact Accounting, Overview report 2018
[37] Energy efficiency of White Goods in Europe: monitoring the market with sales data – short summary version, 3rd June 2015

energy efficiency and be more representative of the breadth of efficiency seen in product markets.

As a tool in general, consumer understanding of the current energy label is considered to be high – 85% of consumers are reported to use it in their purchasing decision, and high understanding of the design of the new label is expected to continue, with it benefitting from the outputs of the 2014 evaluation process that was required for the existing label. In terms of the design of the energy label, icons, and information contained, the current design is considered an effective tool. Various studies have assessed consumer understanding of the label. A 2013 study by CLASP[38] explored consumer comprehension of the label and found that most consumers were able to identify the most and least efficient products from the label. The meaning of icons were generally well understood, with noise, capacity and water use reported as the best understood. However, some icons were also reported as not being well understood by consumers (for example TV on-mode power, which was mistaken in many cases for standby power). Additionally, in the example of washing machines, the CLASP report states that many survey participants would have preferred to know water use per cycle, rather than per year, as use patterns may vary. This has been considered in the icons for the 'new' energy label design, which broadly moves back to reporting per cycle consumption, rather than by attempting to determine a 'consumption per year' figure. As part of the energy label evaluation, consumer understanding was also explored[39] - an 'alphabetic closed scale' was deemed to be the best understood model. Outputs from this study helped inform the updated design for the new energy label.

Use of a QR code to provide further information is considered a positive move. There is a limit to the amount of information that can be provided on the label, and digital means can provide further information on a products' energy use.

The changes to the EU energy label regulations changes make provision for better digital communication alongside a newly introduced product database - as of 1 January 2019, suppliers (manufacturers, importers or authorised representatives) must register appliances

[38] ENERGY LABELLING- The New European Energy Label: Assessing Consumer - Comprehension and Effectiveness as a Market Transformation Tool, May 2013
[39] Study on the impact of the energy label – and potential changes to it – on consumer understanding and on purchase decisions – interim report

	that require an EU energy label in the European Product Database for Energy Labelling (EPREL), before selling them on the European market. These developments offer the chance for consumers to access more product information digitally, including at point of sale, via their smart phones which will help consumers to compare products and select an efficient one. In collaboration with partners across the EU, Energy Saving Trust has led the way in the development and testing of innovative digital communications through the EU Horizon 2020 funded Digilabel project (2016-19). The project encouraged consumers to buy more energy-efficient and cost-effective home appliances. Information was provided via a web tool (PocketWatt), instore via QR codes and / or on retailer websites through an online widget. Information was available on smart-phones and tablets both in store and online, offering easy to understand information to complement the EU energy label at the point of sale, thus enabling consumers to make better informed purchase decisions.
38. Can energy labels be used to promote more energy efficient in-use practices by consumers? Please provide evidence and/or data	Energy labels are a useful tool for making a purchase decision, but have limits in terms of how they can affect a consumer's efficient in-use operation of an appliance or product. In many cases, the mode of an appliance that is used to determine its energy rating may not be used by the consumer. For example, the energy rating for dishwashers for the current energy label is derived from a test cycle on the 50˚C 'eco' setting, whereas there are typically many other cycles available on a dishwasher that may also be used. The report 'Closing the Reality Gap[40]' explores how test methods used to determine energy label ratings are not always reflective of actual use patterns, or selection of modes. The energy label cannot take into account all use patterns, and can only realistically provide a standardised system to differentiate between models, on the most important metrics. Energy labels, for example cannot encourage consumers to ensure refrigerator doors are kept closed as much as possible, that lights are switched off when not in use, that kettles are appropriately filled, or that heating controls are correctly understood and used, or products

[40] Closing the 'Reality Gap' – ensuring a fair energy label for consumers

are not left in standby. However, one useful addition to the labelling regime for particular products could be a label which indicates the typical/optimal size an appliance should be, e.g. for a family of four, to ensure that ecodesign-related efficiency savings are actually delivered. Energy efficiency savings made in recent years for individual fridges have been partially offset by an increasing demand among consumers for larger fridges than are necessary.

Other instruments such as information campaigns, advice provision, use of smart meters and in-home displays, built in product power management and gamification are considered to be better tools to encourage better energy efficiency in appliance in-use, or advise on better times to run appliances. For example, real time displays that show when the carbon intensity of the grid is low, and suggest a good time to run appliances could also be considered as a useful addition to energy labelling. If effective, this could help to lower emissions and peak load, and enable consumers to take advantage of lower tariffs. In future, smart appliances would be expected to have this functionality built in, but a device that showed this information could be a useful tool. This could be built into an app, smart meter or real time display. This has been suggested already through the Energy Lollipop tool[41].

Alternatively, a scannable QR code or the name of a website could be provided that would direct consumers to more detailed information regarding energy saving practices, as demonstrated by the previously cited EU H2020 Digilabel project, led by the Energy Saving Trust.

EST has extensive experience of implementing a holistic and integrated set of instruments. We administered the Energy Saving Recommended (ESR) Scheme and the associated consumer information and awareness raising efforts for a 10-year period spanning 2000-2010. The ESR was a UK energy-efficiency product certification scheme, designed to improve energy efficiency standards in home products by showcasing the best performing products. At its height ESR covered 37 different product categories, including appliances, consumer electronics, heating, insulation, glazing, IT and lighting. Over 7500 products were certified

[41] https://energylollipop.com/

	and able to carry the ESR mark against regularly reviewed performance criteria, with over 900 of these independently tested to ensure compliance; more than 250 companies participated as either a certified manufacturer or partnering retailer. In addition, we carried out extensive monitoring and verification activities to ensure that the mark was not used incorrectly on non-certified products. The scheme was promoted through national marketing and communications campaign in partnership with retailers and manufacturers (online, in-store, at consumer and trade events like the Ideal Home Show and Lighting Show, national TV, radio & print advertising "look for the logo") and supported by telephone advice and information services – national hotline and network of local advice centres).
39. What impact would expanding the scope of energy labels, to include information about resource efficiency, have on consumer purchasing decisions? Please provide evidence and/or data.	Inclusion of resource efficiency metrics, such as repairability, recyclability and footprint of materials used has been proposed for inclusion in energy labels. ECOS has recommended that the energy label could be expanded to include durability, repairability and environmental impacts ratings, and development of a European scoring system for repairability is already in progress. DG Justice's behavioural study on consumer engagement in the circular economy describes how effective this could be in shifting purchasing decisions towards products with greater durability and reparability. It is considered that including these metrics would be welcomed by consumers, given figures recently cited on consumer attitudes towards product durability. A 2014 Eurobarometer survey found that 77% of EU consumers would rather repair their goods than buy new ones. Furthermore, 8 in 10 Europeans think manufacturers should be required to make it easier to repair electronic devices or replace parts to extend the lifetime of their products, according to a 2020 Eurobarometer survey. Whilst there is limited research available on how well resource efficiency information could be conveyed alongside other information on the label, or what would constitute suitable metrics and icons to display this information, it appears that there is appetite from consumers for greater focus, responsibility on manufacturers and information provision on resource efficiency. This suggests that information on resource efficiency would positively influence consumer purchasing decisions. 'Expanding the scope of energy labels' in this case could include displaying resource efficiency data as part of the further information linked to through the label's QR code.

40. How can energy labels be made more useful for UK consumers (e.g. by including a product's average lifetime energy costs, by using more/less text or imagery etc.)? Please provide evidence and/or data.	Various factors have been considered for how energy labels can be more useful for consumers, taking into account recent studies looking at the understanding of the energy label by consumers. These include: • the 2013 CLASP consumer comprehension study • the 2014 Energy Label Evaluation Study by London Economics and Ipsos • a 2013 study by Waide et al[42] • and a 2018 study on the impact on consumer understanding and purchase decisions of energy labels for lighting products[43], by Elshout et al. **Evaluation study** One of the key findings from the 2014 Evaluation study, which fed into the new EU energy label design is that consumers generally understand the 'scale' display, could identify the most efficient products and were in general prepared to pay a higher price for a more efficient product. Both numeric and alphabetic designs were trialled in the study, with alphabetic being the best understood option. **Waide Study** The study by Waide et al also backed up the finding that consumers generally understand the format of the label. Other broad findings were that consumers find the label useful, can identify most efficient products, and are prepared to pay more for an efficient product. The Waide study suggested that icons used are generally understood by consumers, particularly those associated with well understood aspects of products (such as appliance size/capacity), and aspects such as noise, but some are always found to be problematic and less well understood (eg dish drying efficiency on a dishwasher). Some confusion was reported from the use of different languages on the label (which was the case for the format used at the time). Recommendations from the Waide study also included that the problematic icons should be reviewed, and that consumer understanding of icons should be tested prior to using them in

[42] The new energy label: assessing consumer comprehension and effectiveness as a market transformation tool
[43] Study on the impact on consumer understanding and purchase decisions of energy labels for lighting products

	a new label design, and that educational communication campaigns should accompany the label. **Elshout study** For lighting products, the Elshout study looked at whether reducing the size of the label or using a black and white label reduced its effectiveness, and whether adding a coloured arrow for the lightbulb's rating on the package (alongside the full scale) reduced effectiveness. The study found that a reduced size of the label resulted in fewer participants selecting a lightbulb with the highest energy class, that there was minimal difference between coloured and black and white versions of the label, and that the presence of the arrow made little difference, with a slight positive effect on understanding energy class, but a slight negative effect on understanding energy consumption. **CLASP study** One aspect considered here looked at consumer preferences between displaying energy use on the label 'per cycle' and energy use 'per annum'. Four participants showed a general preference for 'per cycle', with one preferring 'per annum'. Reasons cited included that the usage patterns to determine per year usage could be very different between different household sizes. Additionally, it was reported that use of the word 'annum' was not well understood. Most of these recommendations appear to have been taken into account for the design of the new energy label. Information on whether the label has too many or too few icons was not available, but studies appear to broadly support the formats used. Further studies on consumer comprehension, and provision of any other information that could positively influence purchase choice towards efficient models, are recommended to be ongoing alongside the new label deployment from March 2021. More information can be now provided alongside the energy label through digital means, both by linking the QR code to the EPREL database, as well as through tools devised by environmental and consumer groups such as the PocketWatt tool. Further research is also

	recommended into making these supplementary channels more useful, and determining whether they can also help to influence better in-use, efficient operation of appliances. Other factors that are key are energy sufficiency, and ensuring that consumers understand that two products with the same efficiency rating may have very different sizes and absolute consumption. Tools to advise on consumers buying the best sized appliance for their needs could also be beneficial. **Lifetime cost display** Including a product's lifetime energy cost would be expected to be a useful tool for consumers when choosing an appliance. The former Department for Energy and Climate Change and the retailer John Lewis ran a trial in 2014 to include appliance running costs alongside the energy label[44], shown as in the Annex here. This trial did show some link between displaying the running costs on washer dryers, and increased uptake of efficient models (although less of a correlation was seen for washing machine and tumble dryers included in the trial, perhaps as lifetime running costs are generally higher for washer dryers). Having a more tailored approach to determine energy use per year could also be beneficial. This was made possible by the PocketWatt tool[45], developed within the Horizon 2020 Digilabel project, led by Energy Saving Trust, that ended in 2019. The tool enables a user to scan a code on an energy-using appliance's label to bring up energy consumption information, and add in aspects such as the number of washes per week run, to get a more accurate estimate of running cost.

[44] Evaluation of the DECC/John Lewis energy labelling trial

[45] http://pocketwatt.eu/

	As well as these recommendations concerning an A-G energy label and possible EU alignment, we would also urge the Government to consider the following: Introduction of independent 'best in class' - A 'best in class' mark with the year or period it was awarded. This could be a useful addition, with this sticker incorporating both energy and resource efficiency elements and awarded by an independent body. This would allow consumers to 'cut through' the different label information provided whilst also helping to address the issue of old products still appearing to have optimal efficiency even when out of date. This could be modelled on the Energy Saving Recommended mark which was a feature of the ESR scheme that ran from 2000-10 and had considerable consumer recognition. Lessons could also be learnt from the U.S. Energy Star or Japanese Top-Runner Scheme. Icons conveying resource efficiency metrics - Include icon(s) that help consumers buy more durable, repairable products, such as infomration on the the free warranty period offered by the manufacturer, spare parts availability or repair score. DG Justice's behavioural study on consumer engagement in the circular economy describes how effective this could be in shifting purchasing decisions towards products with greater durability and reparability some possible additions to a typical energy label are provided by ECOS here: https://ecostandard.org/publications/the-energy-label-should-go-circular-ecos-postcard/. A measure of the durability of a particular product could also be a useful addition to a label given that the durability of many white goods has reduced in recent years – offsetting much of the energy efficiency gains in that period. See Braithwaite N. and Densley-Tingley D's work on the potential to include durability labels for washing machines here: https://www.plateconference.org/energy-labels-washing-machines-expanded-include-durability-rating/ and last year's CoolProducts report into the climate benefits of lifetime extension here: https://mk0eeborgicuypctuf7e.kinstacdn.com/wp-content/uploads/2019/09/Coolproducts-report.pdf

	Greying out empty classes - Greying out classes that are to be displayed once a bottom class has been emptied by the relevant ecodesign regulation or ratcheting up of standards. Otherwise, showing the full range of energy classes A-G provides little added-value to the consumer and could give the mistaken impression that an apparently middling appliance is the average rather than a relatively poorly performing product. Scannable QR codes with further information - EST has previously considered the practicalities of providing more information to consumers on the resource efficiency aspects of appliances as part of the Digi-label project. At the time concerns were raised that the resultant information could be complicated and the lack of available data was an issue. Introducing a scannable QR code which would take consumers to manufacturers websites and/or provide more information and disambiguations of the different measures used could be a way to address these concerns, provided that adequate data was made available by manufacturers. This would be a useful feature for those consumers looking to make the most informed decisions. - Adding a pictogram on the energy label to identify products that can be used with hot fill / heat fed. As these options can substantially reduce the electricity consumption of washing machines and dishwashers, it is therefore important they are promoted. Sustainable Refrigerant Pictogram - To include a pictogram in the energy label indicating if a product contains a natural refrigerant and/or lower-GWP (GWP ≤ 150) or a higher-GWP refrigerant (GWP > 150). It is our opinion that the refrigerant information label required by Regulation (EU) 517/2014 on fluorinated greenhouse gases does not properly reach consumers because it is displayed on parts of the product that are not visible, i.e. on the back panel and is not consistently and clearly communicated by manufacturers in their product infomration and technical manuals. Hence, consumers are unlikely to

	receive any information to allow comparison with more environmentally friendly appliances. Energy and Water Labels - There is very good evidence for introducing labelling and minimum standards for taps and showers, but there is equally good evidence for expanding that labelling to include other water using appliances. We therefore recommend that the UK Government takes a coordinated approach to labelling and regulation for household appliances and fittings. This should include both an energy label and a water label, with the water labelling covering a wide range of domestic water using fittings and appliances. None of our research has suggested any credible counterarguments to this approach, or any arguments for limiting the ambition of labelling schemes and minimum standards for any water using products. There is considerable international experience in both separate and combined energy and water labels, and this should be used to determine best practice and maximise effectiveness. The full report on our modelling can be found here: https://waterwise.org.uk/knowledge-base/water-labelling-taps-and-showers-only-comparison-est-2020/
Strengthening UK market surveillance	
41. How effective are existing UK market surveillance activities for Ecodesign and Energy Labelling? Please choose one of the below options and provide evidence and/or data: • Very • Somewhat • Not very	Somewhat Efforts in recent years by the UK market surveillance authorities (MSAs) to monitor the compliance of products' energy performance against ecodesign and energy labelling regulations were considered effective, and the UK authority for ecodesign (previously the National Measurement and Regulation Office, NMRO) were considered an active body. Various best practises in market surveillance have been documented, for example this best practice guidelines from the EEPliant project[46], which includes an example of the approach taken by the NMRO, with other good practice examples observed in Sweden and Denmark. The NMRO also previously published details of enforcement actions taken for non-compliant

[46] Best Practice Guidelines for Coordinated and Effective Ecodesign and Energy Labelling Market Surveillance

products. In recent years, the regulatory landscape has changed and the new MSA, the Office for Product Safety and Standards is responsible for market surveillance activity. Market surveillance reports are published in the UK, which include details of ecodesign compliance monitoring and enforcement.

Energy Saving Trust led a consortium of EU partners to deliver the Intelligent Energy Europe funded MarketWatch project (2013-16) and was a member of the EU consortium for the ComplianTV project (2012-15) funded under the same EU funding instrument. Around 10 per cent of energy savings from the Ecodesign and Energy Labelling Directives are thought to be at stake from non-compliant products. For MarketWatch, we led a pan-European 16 partner consortium as part of an extensive programme that deigned test methods, screened and tested over 120 energy-using household products and checked the display of the energy label of more 100,000 products in 737 shops. This initiative was hugely successful in accelerating compliance amongst retailers in energy labelling, and gave an extensive body of evidence to present to national compliance authorities and policy makers. For ComplianTV, we led the work stream that tested over 170 televisions in order to improve manufacturing policy and test methods.

EST gained valuable experience and insight into working with market surveillance authorities during the MarketWatch project. The results of the project suggested that working alongside manufacturers early on to identify problems, (ie a proactive rather than reactive, preventative approach) and checking manufacturer's compliance systems and processes, was considered a beneficial approach. Check-testing and taking a risk-based approach were also considered valuable. In terms of deterrents and penalties, issuing proportionate fines and public reporting of non-compliance where considered appropriate instruments.

It appears this practice has continued, as suggested by the OPSS Delivery Report 2019 Annex on Energy Efficiency[47], although it is not known as part of this response if budgets for testing and surveillance have changed over the past few years.

[47] OPSS Delivery Report 2019: Annex D Energy Efficiency

	The establishment of the EPREL product registration database, with a dedicated market surveillance portal (utilising the Information and Communication System for the pan-European Market Surveillance (ICSMS), is expected to assist MSAs in their work. Fostering increased collaboration and information sharing between national MSAs in the EU is considered to be a key aspect of effective market surveillance and is a key goal of the EU Horizon 2020 funded EEPLIANT3 Concerted Action, which coordinates the monitoring, verification and enforcement activities of 24 Market Surveillance Authorities and 5 other organisations across the EU Single Market and Turkey. UK MSA are currently set to lose access to the compliance section of the EPREL database as a result of the UK leaving the EU if this is not addressed in the terms of its departure deal[48]. This would be expected to hinder market surveillance efforts as a result of reduced access to key compliance-related documentation (eg declarations of performance, test reports, etc) Market Surveillance to address labelling in stores has been shown to be variable. The aforementioned MarketWatch project, led by EST, conducted store inspections, finding overall compliance levels across all pan-EU project partners of over 70%[49]. EST participated in this exercise in the UK and found a varied level of compliance and engagement between retailers. Some (usually larger retailers) were able to dedicate high levels of resource towards compliance, but some smaller retailers showed low engagement. As part of the project EST worked with the UK MSA, regional trading standards offices. As with the retailers, the knowledge and priority given to energy labelling varied between the different local authorities. Anecdotal evidence suggests more can be done to ensure a higher level of energy label compliance, with stronger market surveillance and potentially stronger sanctions for non-compliant retailers. Further to the above, we also propose the following market surveillance regime improvements:

[48] Guidance - Meeting climate change requirements from 1 January 2021 (updated 19 August 2021)
[49] MarketWatch final report - Involvement of civil society in market surveillance of Ecodesign and Energy Labelling (in-store labelling results, p5)

	• Create a dedicated independent research programme to assess product performance before products reach the market – addressing the slow pace of current system. • This testing should be performed *in situ* to more reliably report on performance • Be able to review standards sooner than is strictly required - allowing for new product types or areas to have preliminary standards set whilst more robust data is gathered and analysed. • Streamlining: work streams for specific product categories – allowing *ad hoc* reviews of standards and recalibrations. • Greater access to large data sources (e.g. from ERPEL, GFK)
42. How effective are existing UK market surveillance activities for products that are purchased online? Please choose one of the below options and provide evidence and/or data: • Very • Somewhat • Not very	Not very Some data[50] and experiences are available on the level of compliance of products sold online. Data from the IEE MarketWatch project (2013-16), that EST led a consortium of EU partners to deliver, found that compliance in line labelling during this period was low - under 50% of products checked in online stores were labelled correctly, compared to higher compliance rates of over 70% in physical stores. This is the last publicly reported figure that the Energy Saving Trust (EST) is aware of. EST was the co-ordinator of the MarketWatch project, and previously has also conducted online labelling checks in September 2015 as part of the ComplianTV project[51]. As a result of these projects, EST has gained experience and anecdotal evidence of the compliance with online labelling regulations, and the priority of this area for MSAs. Ethical Consumer in 2018 published an article[52] which suggested that issues with online labelling compliance were still widespread. Issues with compliance for online energy labelling of products are still observed, but anecdotally appear to have improved since the checks carried out under the IEE

[50] MarketWatch final report - Involvement of civil society in market surveillance of Ecodesign and Energy Labelling (online labelling results, p5)
[51] ComplianTV online labelling checks
[52] Energy Efficiency Label – Ethical Consumer, 10th February 2018

	MarketWatch and IEE ComplianTV projects in 2015. Larger retailers generally appear to have systems in place for this, and smaller retailers have had time since this aspect of legislation was introduced to implement better online labelling. In terms of market surveillance carried out, EST has had some anecdotal experiences of the priority attached to energy label compliance activities (both in-store and online), which have suggested that this area is of relatively low priority to the UK MSAs for energy labelling. This falls under the responsibility of local authority trading standards services who have undergone significant reductions in their capacity over the previous 10 years. Best practice exists from other EU MSAs, for example in Ireland where there are guides and clear instructions produced by the MSA on how to effectively label products online[53] - this enables a consistent approach to be taken. As regional trading standards offices are responsible for enforcement in the UK, there may be very differing levels of knowledge on the topic, resourcing and budget between different local authorities.
43. How can the process of reporting non-compliant businesses and/or products to UK market surveillance authorities be improved?	More use of digital tools, dedicated reporting platforms and a role for environmental and consumer groups alongside MSAs could improve the process of reporting non-compliant businesses. A good example of digital tools is the use of tablets to record and collate figures on in-store energy labelling, generate a report and communicate with the retailer by the Sustainable Energy Authority of Ireland, which has been demonstrated to be an efficient and thorough approach.
44. Would the provision of UK Ecodesign and Energy Labelling regulations and guidance in languages other than English help improve levels of compliance? >IF YES, which language(s) should be prioritised? Please provide evidence and/or data. >IF NO, why not? Please provide evidence and/or data.	Unsure – sufficient evidence is available. There may be some benefit to providing guides in other languages for improved energy labelling compliance if a shop owner or responsible staff member's first language is not English.
Exploring other policy levers	

[53] SEAI – A Retailers Guide to Online Energy Labelling

Table 5: Policy levers to increase the benefits of products policy in the UK[43]

Public procurement	Regulatory criteria for national or local government procurement which creates demand for more energy and resource efficient products	South Korea, Green Public Procurement – regulations for purchasing products based on environmental or social criteria
Obligation schemes	Regulatory mechanism requiring obligated parties to meet quantifiable energy savings targets across their customer portfolio	Denmark, Energy Companies' Efficiency Efforts – these measures cover appliances
Fiscal incentives	Discounts, loans or other measures to reduce the price premium barrier of more energy and resource efficient products	US, Energy Star – this programme provides fiscal incentives for selected high energy efficient products
Communications campaigns	Messaging to produce simple and actionable content that is relevant to consumers and motivates to save energy	US, Community Based Outreach – information on environmental product and services is disseminated through community networks
Advice in implementation	Specific campaigns disseminating expert knowledge and advice on appropriate tools and technologies	California, US, Home Energy Report – provides consumers with an easy breakdown of their energy usage and tailored recommendations to reduce energy use and social comparison
Award schemes	Awareness raising measures to increase the visibility of manufacturers of energy and resource efficient products to stimulate consumer demand	US, Energy Star Most Efficient programme – awards for manufacturers for producing highly efficient products for the domestic market
Technology deployment and diffusion	Bespoke programmes to demonstrate capability and remove non-technical barriers to adoption, such as fiscal incentives, awareness raising etc.	China, Golden Carrot / Efficiency Awards – awards, training and incentives provided to improve the efficiency of refrigerators and compressors

45. Which of the policy levers listed in Table 5 would be the most effective in making energy-related products more energy and resource efficient in the UK?

Different policy levers are considered more appropriate for certain products than others.

Fiscal incentives are recommended for efficient technologies that are not yet cost competitive, for example as has been the case with heat pumps under the RHI. Products that are more resource efficient may carry a higher price premium and could be subsidised.

Additionally, to encourage householders to upgrade older technology, for example very old refrigerators, ovens, boilers and water-using equipment that may be in the home, a 'scrappage' type scheme that discounts an efficient version and ensures the appliance being removed is dismantled/recycled could have benefit to improving the efficiency of old stock.

Communications campaigns are recommended for product whose in-use phase may be subject to highly variable energy performance, eg appliances with multiple operating modes. This can also be effective for encouraging the use of newer technologies such as heat pumps, and products for which labelling schemes have changed recently, to avoid consumer confusion.

EST has extensive experience of implementing a holistic and integrated set of instruments. We administered the Energy Saving Recommended (ESR) Scheme and the associated consumer information and awareness raising efforts for a 10-year period spanning 2000-2010. The ESR was a UK energy-efficiency product certification scheme, designed to improve energy efficiency standards in home products by showcasing the best performing products. At its height ESR covered 37 different product categories, including appliances, consumer electronics, heating, insulation, glazing, IT and lighting. Over 7500 products were certified and able to carry the ESR mark against regularly reviewed performance criteria, with over 900 of these independently tested to ensure compliance; more than 250 companies participated as either a certified manufacturer or partnering retailer. In addition, we carried out extensive monitoring and verification activities to ensure that the mark was not used incorrectly on non-certified products. The scheme was promoted through national marketing and communications campaign in partnership with retailers and manufacturers (online, in-store, at consumer and trade events like the Ideal Home Show and Lighting Show, national TV, radio & print advertising "look for the logo") and supported by telephone advice and information services – national hotline and network of local advice centres).

	EST experience and research findings from a range of stakeholders has shown that Ecodesign and energy labelling is enhanced and made most effective alongside the provision of advice and communication campaigns. The European Commission **funded ENSPOL project (2013-2016),** which EST was a partner in carried out an in-depth study of the interaction between, and effectiveness of, the different policy measures (the "policy mix") in place in EU Member States. Its report "*Combining of Energy Efficiency Obligations and Alternative Measures*" provides useful insight. It assesses the compatibility of different combinations of policy measure and proposes three possible interactions between policies - complementary, neutral, and overlapping. The report concludes that information and awareness, product labelling and minimum standards are "complimentary" policy. **Public procurement** may be best for non-domestic products such as non-domestic lighting, cooking, water-using products. This can enable bulk buying, and remove the need to go through processes to develop labelling schemes, if defining efficiency criteria can be established more quickly through this means. instruments across all sectors - interacting positively with all other measures. Despite the known difficulties in evaluating the impact of information and awareness, such measures should always be encouraged in terms of ensuring the maximum effectiveness of the "policy mix".
46. Are there additional policy levers, which have not been listed in Table 5, that could be effective in market energy-related products more energy and resource efficient in the UK?	Big data will likely be important into the future as a means of capturing both macro and micro trends in the market; monitoring the improvements, movements, and changes to products. This will be increasingly important as 'smart' appliances disseminate further. The UK should seek to position itself so that it is ready to capitalise on these trends. Consumer organisations we liaise with support the idea of product passports, noting that they go further than the Ecodesign and labelling legislation. This approach would involve the creation of a central database/system housing all the information about a product related to compliance checking (i.e. information on safety, WEEE, RoHS, CE marking etc.).