CENTRE FOR RESEARCH INTO ENERGY DEMAND SOLUTIONS
Environmental Change Institute, University of Oxford, OUCE,
South Parks Road, Oxford OX1 3QY, UK
www.creds.ac.uk

Energy-related products - call for evidence

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The Centre for Research into Energy Demand Solutions (CREDS) responds to consultations and calls for evidence from government, agencies and businesses, providing insight and expertise to decision-makers.

This response was created for BEIS' call for evidence on energy-related products.

The consultation response written on behalf of CREDS by

- Fiona Brocklehurst, Ballarat Consulting (Associate)
- George Bennett, University College London
- Brenda Boardman, Environmental Change Unit, University of Oxford
- Nick Eyre, Environmental Change Unit, University of Oxford
- Tina Fawcett, Environmental Change Unit, University of Oxford
- Samuele Lo Piano, University of Reading
- Stefan Smith, University of Reading
- Jacopo Torriti, University of Reading

Please note: this pdf includes the responses that have been submitted via the online portal (ANON-377K-GJJV-W). In addition it contains supplementary evidence (section 1) which was not possible to include because of the constraints of the online format.

UK Research and Innovation
Engineering and Physical Sciences Research Council
Economic and Social Research Council

1. UK policy priorities for energy related products

This part of the response is outside the format of the Call for Evidence and was not part of CREDS' online submission.

Summary

The three major options for the UK to increasing energy savings from products are:

1. enhanced enforcement of the existing regulations (described briefly below; as detailed in responses to call for evidence section 4, Strengthening UK market surveillance)

2. using existing regulations as a basis for additional UK-specific policy action (described briefly below; as detailed in responses to call for evidence section 5, Exploring other policy levers)

3. developing UK-specific regulations.

The expense, complexity and time taken to fully realise savings from these options increases markedly moving down the list. In addition, there are considerable risks to UK consumers and manufacturers in moving away from EU standards (option 3), as shown in the table below. Therefore, CREDS would strongly recommend fully exploiting the savings potential of options 1 and 2 before considering option 3.

Option	Timescale to implement	Cost (£) to implement	Actors and Skills needed	Risks
1. Enhanced enforcement	Months	Tens to hundreds of thousands	Office for Product Safety and Standards, Local authority trading standards	None
2. Additional supporting policy	Months - years	Depends on policy, less than option 3	Central government, policy makers, technical expertise	Resistance from business, depending on measure

Option	Timescale to implement	Cost (£) to implement	Actors and Skills needed	Risks
3. UK-specific regulations	4 years plus	Several million	Central government policy makers, deep technical expertise	Serious trade issues, additional costs to UK consumers, additional costs to manufacturers.

Option 1 - Enhanced enforcement

There is considerable scope for improved and increased market surveillance of the ecodesign and energy label regulations in the UK. A particular area of concern is that the UK appears not to be checking compliance of the energy label online or in store (via Trading Standards), when evidence from EU Member State are that levels of the former in particular are low. This reduces the effectiveness of the energy label to change consumer behaviour.

There is also room for improvement in terms of ecodesign market surveillance, including:

- making it easier to report non compliance,
- making greater use of technical documentation inspection
- greater transparency of the actions undertaken
- making information on enforcement action more accessible.

All of these actions should increase the effectiveness of existing policies at relatively low cost.

Options 2 - Additional supporting policy

The UK took unilateral action in relation to the early phasing out of the energy-inefficient, incandescent light bulbs from January 2008 onwards. These actions resulted from voluntary agreements with industry and were deemed successful. Whatever trade agreement exists between the EU and the UK from January 2021, these actions in advance of EU implementation are always available, are cheap to implement and often welcomed by manufacturers.

Additional policy levers we consider should be a priority are:

Communications campaigns - an essential part of transforming the market for energy efficient products and there are particular opportunities in the near future with engaging with consumers and retailers on the new energy label and in providing information to consumers at point of sale digitally via the QR code on the energy label.

Government procurement - which has huge potential to pull forward the market for more efficient products, providing an incentive for manufacturers to develop and sell more efficient goods and generating sufficient market volume to reduce any initial upfront cost differential of more efficient products.

Finally, there is an equity and justice element to product standards. Most new appliances are bought by better-off households, as poorer consumers will purchase second-hand equipment. This inevitably means that the fuel poverty gap widens, as the lowest income families have to continue to use more energy in inefficient appliances than those who have higher incomes. Supporting policies, such as financial incentives, can be targeted at low income households bringing energy justice and product policy together.

Option 3 - UK specific regulations

We recognise that the ambition as stated previously by the Government and in this Call for Evidence is that UK specific regulations should be more stringent than that adopted in the EU, however if UK standards fall below these (for example due to delays in adopting UK regulation after that in the EU) there is a risk of dumping in the UK of less energy-efficient products. This could reverse the progress that has already been made and make UK Carbon Budgets even more difficult to achieve.

We consider that the most effective strategy for the UK will be not to deviate from current or future EU Ecodesign or energy label regulations, in order for standards and labels to have maximum market impact, energy and carbon savings, and resource efficiency improvements. While there is room to improve the ecodesign and energy label process and add or improve individual regulations, their achievements to date and the scope for additional savings and improvements in resource efficiency are considerable. The additional costs of commissioning UK specific preparatory studies, project supervision, stakeholder engagement and so on are not justified by the expected limited effect of more stringent/additional measures in the UK over and above what is already in place or planned by the EU. The real savings will come from the policies that enforce and build on these EU standards within the UK market.

We lay out the reasoning behind this recommendation below:

Achievements of EU Ecodesign and energy label regulations to date

The Ecodesign and Energy Labelling Directives have generated significant energy savings, contributing to climate goals, and will continue to do so from existing measures into the future. For the EU-28, the savings by 2020, (in comparison with business as usual projections) are considerable [1] and include:

- Energy: reductions of 428 TWh of delivered electricity from power stations and an additional 678 TWh of direct fuel saving;

- Carbon: 306 $MtCO_2$ equivalent (7% of 2015 EU-total) lower greenhouse gas emissions;
- Other benefits include: savings in drinking water, saving on consumer expenditure, as well as reductions in SO_2 and NOx-emissions and additional jobs for industry, wholesale, retail and installation sectors.

For 2030 these results increase by over 60% (a regulation on the standard of products sold continues to be effective for many years, as new cohorts of customers buy the products.)

Continuing scope for additional energy, carbon and materials savings from EU regulations in future

There is scope for further savings from continuing to adopt EU regulations in future:

1. Revising regulations on products already covered.
   The coverage of existing regulations is extensive: as listed in the Call for Evidence the EU legislation on ecodesign is applicable on 31 product groups and 15 product groups require an energy label. These are not static requirements; recognising the scope for innovations and changes in technology most EU regulations have a target date for review. Most of the early adopted regulations have been reviewed and replaced by more stringent energy requirements but there are many product groups still to be reviewed. Also it is likely that there will the opportunity to repeat these revisions again[1]. In addition recent revisions have started taking account of resource efficiency by adding obligations on reparability and recyclability of appliances.
2. Regulating new product groups.
   The Ecodesign Working Plans set out an indicative list of product groups that are considered as priorities for the adoption of implementing measures. The current plan is for 2016-2019 [2], which identified seven high priority product groups. The preparatory study to inform and assist the Commission in preparing the Ecodesign and Energy Labelling Working Plan 2020-2024 is currently underway[2] with 11 product groups currently under consideration.

Risks and additional costs of separate UK ecodesign and energy label regulations

It would require significant political/administrative investment by the UK government to develop similar systems in the UK to those being created in the EU.

The EU system is summarised in the Figure 1 below

[1] For example US regulations for domestic refrigerators and freezers were first adopted in 1989, have been updated three times since then and are due for further review, source https://appliance-standards.org/product/refrigerators-and-freezers

[2] https://www.ecodesignworkingplan20-24.eu/

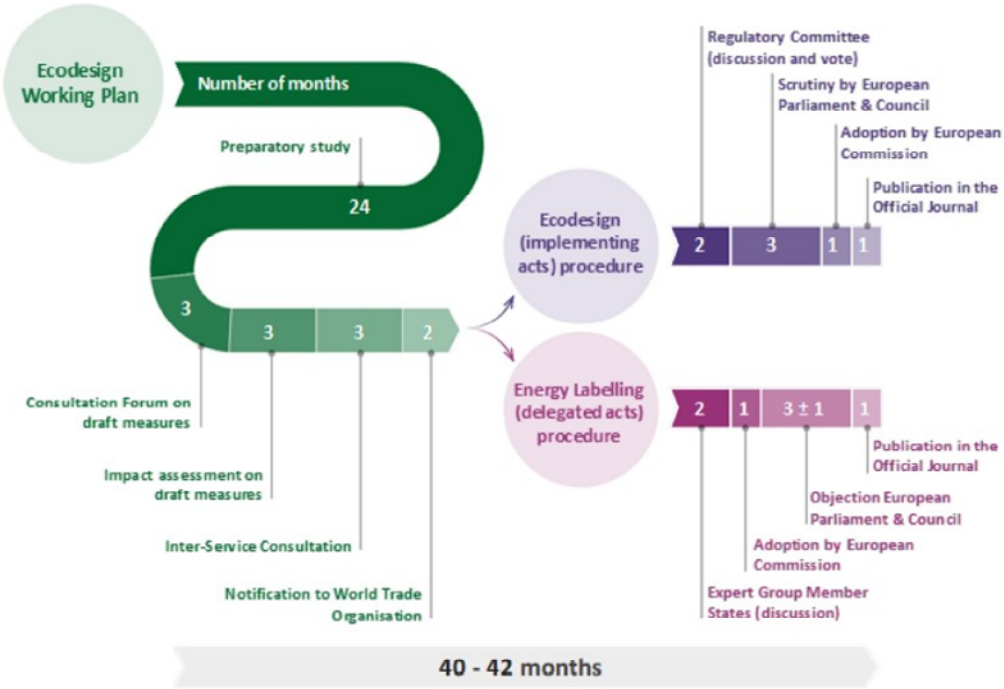

FIGURE 1 THE ECODESIGN AND ENERGY LABELLING PROCESS EUROPEAN COURT OF AUDITORS (ECA) [3]

This is a long process, however these steps are all required in order to achieve the required transparency and robustness for such powerful regulation, demanding time for consultation with industry, consumers and civic society (recognised by the best practice guide for standards and labelling [4] and followed, for example in the USA[3] and Australia).

This consultation process is vital; despite the EC having included this extensive consultation legal challenges (generally made by industry e.g. Dyson on the vacuum cleaner energy label[4] and APPLiA on the revised energy labels for white goods[5]) can arise and slow or derail the process.

Each step of this process requires resources from the Government (UK or EU) and all stakeholders:

- setting priorities for product groups to study (the EU working plan),
- studies for selected product groups to assess the suitability for regulation and initial suggestions for where regulations should be set (preparatory studies),
- further consultation once regulations are proposed (consultation forum),
- accompanied or followed by preparation of an impact assessment

[3] https://www.energy.gov/eere/buildings/regulatory-processes
[4] https://www.which.co.uk/news/2018/11/dyson-wins-eu-vacuum-appeal-energy-label-annulled/
[5] https://applia-europe.eu/applia-media/press-releases/285-europeans-favourite-products-contributing-to-the-circular-economy-2

- and then formal adoption, which includes World Trade Organisation notification.

Some of these resources are external costs: to consultants to undertake studies; to purchase market data to inform preparatory studies and impact assessments. But perhaps a greater constraint is the time and resources required by Government to manage the process. A review of the ecodesign and energy labelling process [5] identified the limited capacity (availability) of Commission staff as one contributor to the significant delays that have arisen. It also noted the disruptive effect of changes in supervising staff partway through the process. This is a highly technical area and a degree of understanding and knowledge is required to manage the process effectively. (For example the ECA [3] noted that two review studies did not include all the information that the Commission needed to develop a legislative proposal, so further studies needed to be commissioned causing delays. It is possible that this is due to lack of resource and/or continuity in Commission desk officers). It is our experience that the UK government suffers at least as much as the European Commission from limited access to technically skilled civil servants and struggles to maintain continuity so it is a concern that a lack of government resources could reduce the speed and effectiveness of UK specific regulations.

But it is not just Government whose resources are required – as previously noted the process requires considerable stakeholder involvement. The products covered by the legislation are generally for a regional (European) or global market so European and/or global stakeholders need to be represented. The consultation process is not just about getting 'buy in' by the manufacturers to the resulting standards; as Siderius [5] notes, manufacturers are an important source of the data required at each stage of the process; if they withhold data, for whatever reason, this can delay or increase the cost of the process. It may be that industry stakeholders outside the UK may be reluctant to engage with a separate UK process in addition to the resources they already invest in the EU, and this could weaken UK regulations. There are two additional risks of UK specific regulation:

One is that it will cause an increase in costs and complexity for manufacturers, UK and beyond, if they are required to meet different sets of standards for a variety of markets (e.g. the US, the UK, the EU). This may mean that there is additional resistance from industry to adoption of these standards;

The other is that if UK standards fall below the EU standards (for example due to delays in adopting UK regulation after that in the EU) there is a risk of dumping in the UK of less energy-efficient products, with associated additional costs to consumers and environmental damage.

Conclusion

The UK Government should concentrate its efforts on increasing the impact of existing regulation through enhanced enforcement, transforming the UK market using other policy tools at their disposal and increasing the stringency of EU measures by supporting UK industry in their involvement with the EU process[6] and via trade negotiations. The UK adopting its own ecodesign and energy labelling regulations should be a lower priority if at all - the potential environmental benefits of adopting may be outweighed by the additional costs and risks.

Sources

1. Leo Wierda, René Kemna, Sanne Aarts, *Ecodesign Impact Accounting Annual Overview Report 2018*, 2019 VHK for the European Commission
2. COMMUNICATION FROM THE COMMISSION Ecodesign Working Plan 2016-2019, 2016, European Commission
3. Special report: EU action on Ecodesign and Energy labelling: important contribution to greater efficiency reduced by significant delay and non-compliance, 2020, European Court of Auditors
4. Energy efficiency labels and standards: a guidebook for appliances equipment and lighting – 2nd edition, 2005, Stephen Wiel and James E McMahon, CLASP
5. Speeding up adopting ecodesign and energy labelling measures – analysis, challenges and solutions, 2013, P.J.S. (Hans-Paul) Siderius, eceee summer study)

2. Raising ambition for UK Ecodesign

2.1 Better regulation for existing Ecodesign measures

1. Apart from the products listed in Table 2 and in sections 2.1.1 – 2.1.8, are there other 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.

The EU ecodesign and energy labelling process includes a regular review of product coverage; it includes a succession of five-year working plans which set priorities for new product groups (or products groups which have been paused in the process, for example while suitable test standards to be developed) to be regulated. This is process involves gathering market data and widespread stakeholder consultation. The preparatory study for the new working plan, 2020-2024 is currently underway (https://www.ecodesignworkingplan20-24.eu/) and is expected to complete by the end of the calendar year.

[6] non-EU manufacturers are involved where it is recognised that they have market influence eg US IT suppliers

As stated in our response titled 'UK policy priorities for energy related products' (see email submission) we think that the most effective (and cost-effective) approach for the UK will be:

1. enhanced enforcement of regulations and
2. using existing regulations as a basis for additional UK-specific policy action

rather than the UK extending ecodesign coverage unilaterally.

2.1.1 Cooking appliances

2. Could better minimum energy performance standards, than those which currently apply, be set for cooking appliances to save more energy in the UK and facilitate a transition towards net zero?

YES

There is an ongoing Ecodesign review study due to complete in 2020 (https://susproc.jrc.ec.europa.eu/product-bureau//product-groups/424/home)

Also initial analysis of small scale cooking appliances included in draft report of TASK 3 Preliminary Analysis of Product Groups and Horizontal Initiatives, preparatory study for the Ecodesign and Energy Labelling Working Plan 2020-2024 (https://www.ecodesignworkingplan20-24.eu/). This will be refined in task 4, due to be complete by the end of 2020.

2-3 years

Based on the time taken from completion of an Ecodesign preparatory study and adoption of a regulation.

3. 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 cooking appliances in the UK?

No data

4. To what extent are energy efficient products and practices taken up in the catering sector?

No data

2.1.2 Lighting

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

No data

6. 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 lighting products in the UK?

No data

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.

No data

2.1.3 Water pumps

8. Could better minimum energy performance standards, than those which currently apply, be set for water pumps to save more energy in the UK and enable a transition towards net zero?

YES

An ecodesign review study was completed and published Dec 2018 (see https://www.ecopumpreview.eu/). A draft revision report was published in Sep 2019 (accessed via https://www.eceee.org/ecodesign/products/electric-pumps/)

12-24 months

Based on the time taken from completion of an Ecodesign preparatory study and adoption of a regulation.

9. 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 water pumps in the UK?

No data

10 Does the UK provide any water pumps services (including research & development, repair and/or design etc.)?

No data

11. Is there scope for introducing systems-level Ecodesign regulations for water pumps in the UK? Please provide evidence and/or data.

No data

2.1.4 Boilers

12. For the different heating systems discussed, what are the potential benefits, technical barriers, costs and impacts on UK businesses and consumers? Please provide evidence and/or data.

No data

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

YES

However the definition of testing to determine the efficiency of the appliances is important in determining the usefulness of a single energy efficiency metric like the 92% efficiency for boilers. Currently testing procedures, which provide the data for energy labelling, are necessarily simplified to be practical in a laboratory testing setting. However, the dynamic nature of real world heating systems means that the steady state testing of EN15502 is not representative. Currently the heat load and flow/return temperatures are fixed in the testing standard whereas the intermittent heating schedules and changing heat loads within the day and throughout the year mean that heating systems are dynamic in nature.

The energy efficiency of appliances providing Domestic Hot Water (DHW) is governed by EN13203-2, which is already dynamic due to its standardised daily tapping profiles. However, coupling the choice of profile type (S-XXL) to the intended application is critical to ensuring that real world DHW efficiency is achieved. In order to do this a deeper understanding of occupants use of hot water is required.

Pushing the product standard minimum energy efficiency standard above 100% will necessitate the hybridisation of the boiler with a HP, although this may not be the only technological solution. Hybridisation, in whichever form it may take, will place additional importance on the role of the control algorithms within the appliance as they will determine during operation which part (e.g. boiler or HP) operates which will in turn determine the overall efficiency. Allowing the energy efficiency testing regime to be, as far as possible, technology and algorithm neutral would go some way to addressing this issue. Additionally, with regards to boiler/HP hybrids, due to the increasingly contradictory nature of gas and electricity prices then a more energy or carbon efficient operation may not result in reduced bills.

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?

Boiler systems do not achieve the labelled product efficiency performance of the central boiler installed. The discrepancy is well known to be approximately 10% and the primary reasons for under performance of boilers in practice have been attributed to return temperatures being too high and boiler oversizing [1] [2].

Boilers are reaching the limit of what is possible within the current testing/product standard regime. Simply increasing the required efficiency without addressing the relevance of the test standard on which it is based is unlikely to deliver any emissions savings. With a focus on product labelling that more accurately reflects real world use then the technical performance gap [2] can be reduced. Simulation studies mimicking field studies [3] [4] have shown a potential of 5-10% savings. However, it should be noted that this is relative to the real world performance rather than the theoretical 92% efficiency which is not reached in practice.

A system approach to the minimum energy efficiency of boiler SYSTEMS, is key. The efficiency of the boiler is driven primarily by the return temperature [5] as well as start up and shutdown losses during cycling. These factors are dependent on the system components (emitter sizes, control type) and design (set point temperatures, sizing of boiler and emitters). The effect of these factors on cycling and efficiency is clear in modelling and field studies [3], [4],[6], [7]. Any change to minimum standards that does not consider the installed system, and factors such as boiler sizing, will not deliver reliable carbon savings.

Sources

1. Space and combination heaters Ecodesign and Energy Labelling Review Study Task 4 Scope–Technologies FINAL REPORT, 2019, VHK for DG ENER
2. In-situ monitoring of efficiencies of condensing boilers, 2009, Energy Saving Trust
3. Effect of boiler oversizing on efficiency: a dynamic simulation study, 2020, George Bennett, Cliff Elwell, Building Services Engineering Research and Technology
4. Space heating operation of combination boilers in the UK: The case for addressing real-world boiler performance, 2020, George Bennett, Cliff Elwell, Tadj Oreszczyn, Building Services Engineering Research and Technology
5. Performance of High-Efficiency Gas Boiler. 1985. HAM, J. & DUBBELD H. Batiment, International, Building Research and Practice, 13, 85-93.
6. Heating systems through the lens of the boiler: Detailed case studies to inform current and future heating system design, 2019, Bennett, G, Building Services Engineering Research and Technology.
7. The Importance of Heating System Transient Response in Domestic Energy Labelling. 2016. Bennett, G., Elwell, C., Lowe, R., & Oreszczyn, T. Buildings, 6, 29.

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?

Minimum energy performance standards for individual products play a small role in the transition. In order to drive energy demand reduction then the factors that effect the performance of the system must be robustly included in the minimum energy performance standards.

The gap between minimum efficiency standards of boilers and that of the installed boiler system was explored in the response to Question 14. The robustness of boiler efficiency to adverse installations has to a certain extent masked the importance of the system in achieving real world energy demand reduction.

The target energy performance of the installed system, together with a practical understanding of the interaction of the sub components, should be used as the driver for the standards of the products. The mechanism for an 'installer package label' already exists within Ecodesign but has proven relatively ineffective [1] due to the combinations of manufacturers and products possible. It favours solutions from one manufacturer. However, the system efficiency plays the primary role in the transition to net zero and should be pursued. Even now, a system label efficiency that considers the known effect of boiler output size relative to emitters and building heat load (so-called Plant size Ratio) [2] and the minimum thermal output (linked to modulation range) would deliver short term benefits.

Product standards represent the as tested efficiency of a new product under standardised lab conditions. How the energy demand of that product, in a working system, changes with time is an aspect of the transition to net zero that needs to be considered. The National Energy Efficiency Demand Framework report from June 2020 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/895140/National_Energy_Efficiency_Data_Framework_NEED_report_summary_of_analysis_2020.pdf) highlights the reduced savings achieved by condensing boilers since their installation, dropping to approximately 80% of the initial saving after 7 years. Although this gross gas saving figure contains a complex interaction of technical and social aspects, the roll of maintenance, servicing and smart in-situ monitoring should be considered in future product standards to alleviate some of the long-term loss of energy demand reduction.

Sources

1. Space and combination heaters Ecodesign and Energy Labelling Review Study Task 1 Scope–Policies & Standards FINALREPORT, 2019, VHK for DG ENER
2. Effect of boiler oversizing on efficiency: a dynamic simulation study, 2020, George Bennett, Cliff Elwell, Building Services Engineering Research and Technology

16. What regulatory product standard changes could be put in place to reduce cycling and improve the performance of boiler installations?

Linking system design and implementation aspects which are known to impact cycling and efficiency should be included in conditions under which the product standard is valid. Cycling is driven by the inability of the boiler to provide the heat load that is required at that time, the most common cause of this is that the minimum output of the boiler is above that of the building heat load, inducing cycling. In combination boilers where the maximum output is determined by DHW need and the modulation range is fixed then the minimum output is commonly above that of the building [1], this is expanded upon in the response to Q17. Changing the standard to a more dynamic demand driven test where the boiler must react to the demand as best it can (within the limits of its output, modulation and response rate) would drive technological improvement in this area, and is transferable to other technologies. In the short term, addressing oversizing and its effect on the expected efficiency of boilers within the SAP methodology would give visibility to the primary cause of cycling and an incentive to install appropriately sized heating systems [2].

Sources

1. Space heating operation of combination boilers in the UK: The case for addressing real-world boiler performance, 2020, George Bennett, Cliff Elwell, Tadj Oreszczyn, Building Services Engineering Research and Technology
2. The Importance of Heating System Transient Response in Domestic Energy Labelling. 2016, Bennett, G., Elwell, C., Lowe, R., & Oreszczyn, T. Buildings, 6, 29

17. Would wider modulation boilers address the performance issues in combination boilers?

Wider modulation range of boilers is a technological solution to the issue of cycling of boilers in real heating systems. Most current combination boilers have a high hot water power output and a fixed modulation range, which effectively limits the minimum power output for space heating, thereby creating inefficient cycling in homes [1] [2] when the building heat demand fall below the boiler minimum output. Wider modulation range would allow the combination boilers to maintain their current maximum output therefore still comfortably meet peak hot water demand while also meeting space heating demand over a wider range of conditions and avoiding cycling. Since current testing standards in EN15502 and SEDBUK only consider the 100% and 30% boiler output (and at fixed flow and return temperatures), then the real world benefit of a wider modulation boiler is not seen in the product standards.

However, the current product standards do not recognise the benefits of wider modulation, or any other technological solution, which could address the cycling issue. As outlined above the steady state, fixed output efficiency testing negates any technological innovation in the boiler market that could address

Sources

1. Space heating operation of combination boilers in the UK: The case for addressing real-world boiler performance, 2020, George Bennett, Cliff Elwell, Tadj Oreszczyn, Building Services Engineering Research and Technology
2. Effect of boiler oversizing on efficiency: a dynamic simulation study, 2020, George Bennett, Cliff Elwell, Building Services Engineering Research and Technology

2.1.5 Heat pumps

18. Could better minimum energy performance standards, than those which currently apply, be set for heat pumps to save more energy in the UK and enable a transition towards net zero?

YES

The energy performance standards for heat pumps have the potential to further drive up savings but, like boilers, the assumptions within the standards need to be addressed and made more in line with the real world dynamic behaviour. As shown in the Renewable Heat Premium Payment Scheme RHPP the performance of HPs in situ does not reflect either the product labelled efficiency not the calculated Seasonal Performance Factor. The assumptions in the testing and calculation standards are too optimistic considering the current state of HP installations and the way they are being run. The actual real-life seasonal average supply temperature is the determining factor for achieving the projected seasonal space heating efficiency, and is determined by both the emitter capacity and the pump/temperature controls in the building. These parameters can constitute the difference between a seasonal efficiency of 85% or 174%. Boilers efficiency is also dependent on the system temperature but the robustness of the efficiency has masked the issue but the inherent sensitivity of HPs will expose a lack of control of these key issues.

12-24 months

This should be sufficient to change testing standards to better represent real world dynamic use and for the new standards to be introduced into the market. During this time manufacturers should be adapting current models to perform under the new, more realistic, tests rather than the current optimisation for current steady state standards. Note that the development of this 'use case' testing standard can and should be done to be harmonised with the boiler equivalent with the aim of forming a relatively technology agnostic testing regime [3].

Sources

1. Case Studies Report from the RHPP Heat Pump Monitoring Campaign. Analysis of data from Heat Pumps installed via the Renewable Heat Premium Payment Scheme, 2017,

LOWE, R., CHIU, L. F., OIKONOMOU, E., GLEESON, C., LOVE, J., WINGFIELD, J. & BIDDULPH, P., UCL Energy Institute
2. Space and combination heaters Ecodesign and Energy Labelling Review Study Task 4 Scope–Technologies FINAL REPORT, 2019, VHK for DG ENER
3. Space and combination heaters Ecodesign and Energy Labelling Review Study Task 6 Scope–Options FINAL REPORT, 2019, VHK for DG ENER

19. 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 heat pumps in the UK?

No data

20. Could better measures be delivered under Ecodesign regulations to improve product design, such as better integration with smart systems?

No data

21. Should different product standards apply to higher temperature heat pumps which may be required for hard-to-treat homes?

No data

2.1.6 Electric motors

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

No data

23. 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 electric motors in the UK?

No data

2.1.7 Space cooling

24. Could better minimum energy performance standards, than those which currently apply, be set for space cooling products to save more energy in the UK and enable a transition towards net zero?

YES

Ecodesign review study completed May 2018. (Report available via https://hal-mines-paristech.archives-ouvertes.fr/hal-01796759/document)

Preliminary proposals for regulations were published July 2019 (accessed via https://www.eceee.org/ecodesign/products/airco-ventilation/)

12-24 months

Based on the time taken from completion of an Ecodesign preparatory study and adoption of a regulation.

25. 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 space cooling products in the UK?

No data

2.1.8 Ventilation

26. Could better minimum energy performance standards, than those which currently apply, be set for ventilation units to save more energy in the UK and enable a transition towards net zero?

YES

An ecodesign review study is ongoing, due to complete in 2020 (https://www.ecoventilation-review.eu/)

2-3 years
Based on the time taken from completion of an Ecodesign preparatory study and adoption of a regulation.

27. 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 ventilation units in the UK?

No data

Expanding the scope of the UK Ecodesign and Energy Labelling framework

2.2.1 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.)

No data

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.

YES

There is an existing EU wide voluntary water labelling scheme which includes taps and showers (see http://www.europeanwaterlabel.eu/). It is operated by the European Bathroom Forum (EBF), a platform made up of 57 European manufacturers and 9 Trade Bodies and associations from the bathroom industry, operating since March 2019. As well as the label there is an online searchable product database and a link to an online water use calculator for consumers (http://www.thewatercalculator.org.uk/).

The effectiveness of the label could be improved by promotion and awareness campaigns to consumers, retailers and installers and fitters and incorporation in Government procurement practice.

Waterwise (an NGO) advocate a mandatory water label (https://waterwise.org.uk/knowledge-base/why-we-need-a-mandatory-water-label-waterwise-briefing/).

There is an EU ecolabel and associated Green Public Procurement (GPP) criteria for taps and showers published in 2013 (details in https://ec.europa.eu/environment/ecolabel/documents/Sanitary%20Tapware%20Factsheet.pdf and https://susproc.jrc.ec.europa.eu/product-bureau//product-groups/431/documents). It is possible that this needs to be updated. They could be made more effective by widespread dissemination. If the GPP criteria were adopted by the UK Government and other public bodies (eg NHS trusts) then it is possible that this could have a substantial effect.

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

No data

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:

No data

2.2.2 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?

Research on DSR has been unable thus far to consistently quantify the environmental benefits of shifting electricity consumption from periods of higher carbon intensity of the grid to lower carbon intensity [1]. It is expected that smart appliances will be set according to parameters which will include electricity tariffs, pre-programmed schedules, weather forecast, and grid carbon intensity (https://standardsdevelopment.bsigroup.com/projects/2019-01576#/section). In principle, the prioritisation of the latter parameter through regulation of smart appliances may unlock higher environmental benefits. The WMO and WHO are proposing greater incorporation of localised, 'tailored', information in relation to weather and associated environmental risks into urban and health services (https://public.wmo.int/en/media/news/congress-approves-urban-and-health-plans).

Sources

1. A review of the costs and benefits of demand response for electricity in the UK. 2013. Bradley, P., Leach, M., & Torriti, J. Energy Policy, 52, 312-327

33. Are there any technical barriers in achieving these benefits? Please provide evidence and/or data.

In practice, the co-existence of criteria such as interoperability, data privacy, grid stability and cyber security may hinder the full prioritisation of the environmental benefits associated with a minimum carbon parameter or other environmental and health parameters, e.g. urban heat exposure. Forecasting and nowcasting ability and associated monitoring infrastructure/network development and management present real technical challenges [1]. Consequently, the margins for the UK international leadership in this area might be limited.

Further to that, inertia of demand-response events should be factored in [2], especially for thermal systems [3]. This aspect limits the potential of these kind of appliances in real-time responses, for instance to erratic generation (e.g. from photovoltaics in the UK due to variable weather).

Sources

1. The urban climate of Ghent, Belgium: A case study combining a high-accuracy monitoring network with numerical simulations. 2020. Caluwaerts, S et. al Urban Climate, 31, 100565
2. Demand Side Flexibility and Responsiveness: Moving Demand in Time Through Technology, 2018. Curtis, M., Torriti, J., & Smith, S. T. In A. Hui, R. Day, & G. Walker (Eds.), Demanding Energy: Space, Time and Change (pp. 283–312). Springer International Publishing.
3. Demonstration of heating demand peak shaving in smart homes ,2019, Beltram, L., Christensen, M. H., & Li, R. Journal of Physics: Conference Series, 1343, 012055.

34.Would leading in the regulation of smart appliances allow the UK to develop economic benefits from DSR?

Smart appliances do not operate in isolation, but within an environment in which domestic appliances are connected to the following entities: (i) a controlling entity (e.g. aggregator); (ii) the transmission system operators; (iii) distribution system operators; and (iv) electricity meter controlling organisations. The information received, and used, by smart appliances for DSR represents an even wider network of entities and supporting technology. In order for economic benefits to be exploitable in an export market, compatible market conditions need to be met.

2.2.3 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:

Heat emitters are critical to the performance of heating appliances in practise. As outlined in the responses to questions in sections 2.1.4 and 2.1.5, the efficiency of both boilers and heat pumps is dependent on the ability of the complete heating system to operate at low temperatures. Since it is the ratio of emitter capacity to building heat load that determines the lowest running temperature the system can operate at (and therefore the max potential efficiency) two avenues are open in this area.

12-24 Months: By reducing the fundamental heat load of the building through insulation then the temperature of the heating system can be reduced and the efficiency increased, which now only has to satisfy a reduced heat demand. This would represent a double win for the customer's heating bill. However, this represents a more potentially more disruptive and costly option, albeit with larger benefits.

6-12 Months: Alternatively, the heating emitter capacity can be increased providing a more short-term primary energy reduction through lower flow temperatures although the underlying building heat load remains the same.

3. 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.

The EU ecodesign and energy labelling process includes a regular review of product coverage; it includes a succession of five-year working plans which set priorities for new product groups (or products groups which have been paused in the process, for example while suitable test standards to be developed) to be regulated. This is process involves gathering market data and widespread stakeholder consultation. The preparatory study for the new working plan, 2020-2024 is currently underway (https://www.ecodesignworkingplan20-24.eu/) and is expected to complete by the end of the calendar year.

As stated in our response titled 'UK policy priorities for energy related products' (see email submission) we think that the most effective (and cost-effective) approach for the UK will be:

1. enhanced enforcement of regulations
2. using existing regulations as a basis for additional UK-specific policy action (see our responses to questions 45 and 46)

rather than the UK extending energy label coverage unilaterally.

3.1 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:

• Somewhat

Defra/WRAP commissioned a review of existing evidence on how the provision of factual information about the environmental impact of a product influences more sustainable purchasing [1]. It found that the influence of the EU Energy Label on appliance purchases had been explored most frequently out of the existing labels in the evidence base from Rapid Evidence Assessment, with eight sources. The review concluded that there was evidence, with a high degree of confidence that EU Energy Label positively influences the purchase, choice, or intentions, towards more energy efficient appliances. This was in contrast to other energy labels (eg US ENERGY STAR, Australian Energy rating label) where the quantity of evidence was less and the findings were weaker or contested.

Sources

1. The Effectiveness of Providing Pre-Purchase Factual Information in encouraging more Environmentally Sustainable Product Purchase Decisions: Expert Interviews and a Rapid

Evidence Assessment, 2019, Dr. Colin Whittle, Fiona Brocklehurst, Catriona McAlister & Prof. Lorraine Whitmarsh, WRAP

38. Can energy labels be used to promote more energy efficient in-use practices by consumers? Please provide evidence and/or data.

While some authors have posited that including information on energy labels can influence consumer use, for example [1] we are not aware of any evidence showing this to be the case.

Sources

1. Rescaling the energy label for washing machines: an opportunity to bring technology development and consumer behaviour closer together, 2020, Alicia Boyano, Nieves Espinosa & Alejandro Villanueva, Energy Efficiency (2020) 13:51–67

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.

Evidence

Defra/WRAP commissioned a review of existing evidence on how the provision of factual information about the environmental impact of a product influences more sustainable purchasing [1]. This work was expanded on in a conference paper [2] on the findings of four studies identified in the Rapid Evidence Assessment (REA) on the effect of provision of information on different non-energy sustainability aspects for energy using products. This found that Information on a range of sustainability impacts (carbon label, eco-label, lifetime) were found to be effective, for audiences in Europe and Asia, across an assortment of products (eg lightbulbs, washing machines, TVs), for most products.

However, in line with conclusions of the full REA [1]:

- not all sustainability impacts are equal in the minds of consumers; so a positive response to information on one impact may not guarantee a similar response to information on another.

And

- information on the same sustainability impact may be perceived differently depending on the product.

So that the recommendation was that further research will be needed to systematically test information across a range of products and consumer groups to determine which aspect of environmental sustainability will be most effective for which product and for which consumer group.

A subsequent study [3] (the search phase of the REA took place in September 2018) focused on providing information on the durability and repairability of five products (four energy using plus clothes) also found evidence to include this information. It included online behavioural experiments 6 EU countries to test different forms of durability and reparability information and their effects on consumers' product choices. They found that providing this information at the point of sale was very effective at increasing the likelihood that consumers would select the more durable or repairable product and recommended providing this information. However they recognised that further research was necessary on how best to present this information.

Conclusion

As presented in our response to Q40 there are good reasons:

a) to build on consumers' familiarity with the current (EU) energy label
b) not to add additional information on the label at the point of sale but provide the consumer with easy digital access to additional information

So we would propose using the EU Energy label format as far as is practicable (we recognise that this may require negotiation with the EU on this point, as the Commission have, effectively, copyright on the label). Further we suggest that if further studies find that additional information on resource efficiency is effective for particular products that this is provided digitally, via a QR code on the label which connects to an app (with information provided from a mandatory UK product registration database which includes these data).

Sources

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2. Can the provision of energy and resource efficiency information influence what consumers buy? A review of the evidence, 2019, Fiona Brocklehurst, Dr. Colin Whittle, Catriona McAlister & Prof. Lorraine Whitmarsh, eceee summer study
3. Behavioural Study on Consumers' Engagement in the Circular Economy – final report, 2018, LE Europe, VVA Europe, Ipsos, ConPolicy and Trinomics, DG Just

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.

Evidence

Familiarity and effectiveness of EU energy label

There is evidence that EU energy labels are consistently highly recognised, and widely understood by consumers and inform their purchasing decisions. For example:

- A survey in 2008 [1] found at least 80% of respondents recognised the label and more than 97% correctly identified the most efficient energy class.
- A consumer research study following the introduction of the revised energy label [2] found about 77% of participants were able to correctly identify the energy efficiency order of three appliances under a simple test where the energy consumption order matched the efficiency ranking order.
- A recent, comprehensive survey in all 28 EU Member States [3] found 79% of respondents recognise the label and know what it stands for and 79% said that the label had an influence on their choice of purchase of electrical appliances. (The evidence for the effect on consumer behaviour is addressed in detail in our answer to Q37).

This degree of familiarity and comprehension may partly be attributed to the longevity of the label, with some appliances having been labelled since 1994 (https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/about_en).

However, it also reflects efforts made by national and regional governments, consumer and environmental groups and others over the decades to educate and inform consumers about the label and to encourage them to use this information when purchase energy using goods. Examples of EU part-funded campaigns include:

- Promotion 3e [4] which promoted the labels and more efficient goods in eight Member States via retailers
- Come On Labels [5], which promoted energy labels to consumers in 13 Member States
- The current LABEL 2020 project (https://www.label2020.eu), which is an awareness campaign for the new, revised energy label in in 16 countries including the UK (https://energylabel.org.uk/).

In addition some sections of industry have also put resources into promoting the energy label, notably the white goods industry. Currently APPLiA is also working to inform manufacturers, retailers and consumers on the changes to the energy label due to come in in 2021 (https://www.theenergylabel.eu/)

It seems reasonable that familiarity with a label increases its comprehension and effectiveness. We are not aware of any evidence supporting that correlation for energy labels in general or for the EU appliance energy label in particular. However, a study on the car labelling options for the EU [6] found that labels usage (that is, how much attention

consumers pay to labels in their purchase decisions) is mostly explained by the familiarity respondents have with existing labels, and on how much they trust them. In another area of labelling, a paper on front of pack good labels on food [7] found that familiarity with the labelling scheme affects whether the consumer likes the labelling scheme and whether this affects their product choices.

This understanding of the benefit of a high level of familiarity with a label design can also be inferred by the adoption of the EU appliance energy label design by some member States for energy related labels for other 'product types':

When providing consumers with information on the fuel consumption and CO_2 emissions of cars some consistent aspects have to be presented but Member States have considerable choice in what the label looks like and what other information is included. A 2011 review [8] which looked at the car labels in eight Member States found that six of these had used a design based on the EU appliance label. A more recent study which reviewed all 28 Member States [9] found that 13 Member States had graphic labels based to some degree on the EU appliance label. Similarly, a review of the implementation of Energy Performance of Buildings Directive in 12 Member States [10] found that nine of them used an alphabetical scale and colour coding, adopted from the appliance label.

This suggests that the UK moving away from the EU Energy label design risks degrading its effectiveness.

Improving energy label design - adding information

EU Energy labels prior to the most recent revisions (that is the revised framework directive2017/1369) had tended to add information beyond the energy label class and energy usage: for example the washing machine label included: the annual water usage in litres, the washing capacity in kg, and the noise emissions when washing and spinning, using a combination of icons (the label needs to text as it needs to be universal for the many EU member state languages) and numbers. The rationale for adding this information is clear – these are all features of the washing machine, say, that consumers are likely to want to know when buying a product and this is all information that the regulations already require suppliers to provide (so there is no additional cost to them). However, there was a flaw with choice/design of some of these icons in that many consumers didn't understand them [11].

More fundamentally various studies have indicated that more information is not necessarily better – too much information can 'crowd out' the critical information – in this case the energy class and use – and may reduce the label's effectiveness.

For example, one paper by economists [12] argues that "information provision differs from information impact" – a large amount of information may be difficult to process for

consumers and decrease the quality of consumers' decisions. They conclude that to communicate effectively, it may be advantageous to limit the provided information. This was a conceptual paper (with environmental examples). The study on car labelling referenced above [6] found this to be idea to be true in this particular case: they attempted to use different behavioural nudges to move consumers towards better fuel efficiency but found few statistically significant effects. They hypothesised that the nudges they tested were to some extent overloaded with information and had mixed effects. This was supported by the fact that of the two information approaches they used, a label and promotional material, the latter had fewer elements and was more effective. Finally, an empirical study which looked at US eco-labels [13] found that one of seven determinants of success was label clarity; again, less information was generally more effective.

Adding information – benefits of presenting energy costs

A 2018 study [14] reviewed the literature (eighteen studies published on experiments and field trials of operating costs labels of appliances and cars since 2011) and found a complex and quite fragmented picture: studies looked at diverse products, with different proportions of up front and operational costs. Further, researchers had presented consumers with information on a variety of operational costs: for one, five or ten years, for a given usage or over the product's expected lifetime. The results were also mixed; most but not all studies found a statistically significant increase in sales of more efficient products from providing energy cost information. The author concluded that there was insufficient evidence to make a case to add operational cost data routinely.

Subsequently Defra/WRAP commissioned a review of existing evidence on how the provision of factual information about the environmental impact of a product influences more sustainable purchasing [15]. The Rapid Evidence Assessment (REA) found eight pieces of evidence of providing operating cost information on large appliances. It found specifically that:

- There is contested evidence for the addition of monetary running costs to the EU Energy Label.
- There is contested evidence for the influence of monetary running costs compared to energy consumption on consumer behaviour.

It is possible that one reason that the operational cost data is not more effective in increasing consumers' to buy cost-effective products is that they don't think that the average cost data presented on a label accurately represents their own costs – their usage and their energy costs/kWh may differ considerably from that assumed. One piece of evidence we know of from the US partially supports this hypothesis [16]. The main metric for the US mandatory appliance energy label, EnergyGuide, is annual energy cost, based on average national energy

usage and energy price. The authors conducted an online experiment in which energy use and cost was tailored to the state in which the consumer lived. They found that state-specific labels lead to significantly better choices. Consumers chose to invest about the same amount overall in energy-efficiency, but the allocation reflected possible savings more accurately - with more investment in high-usage high-price states and less investment in low-usage low-price states.

Improving consumer access to additional data – providing easily accessible data digitally

Technology can offer a way forward through the competing requirements to provide a simpler label that is effective at supporting consumers in selecting more energy efficient products and making more detailed and customised information available for consumers who are interested in the details.

All of these approaches rely on an effective database product of regulated products which contains all the information required by the regulations and which is widely accessible via the internet so a high quality, regularly updated UK products database would be essential.

One solution is to develop an online tool and or/app which consumers can use to compare different models of an appliance/lamp and calculate the running costs. Examples are the Australian Light Bulb app, the Australian Energy Rating Calculator App (https://www.energyrating.gov.au/apps) and the Indian BEE star label app (https://www.beestarlabel.com/Home/MobileApp).

Another solution can provide the same information but has the advantage of working at the point of sale (online or instore) with the specifics of the model that the consumer is considering – that is adding a QR code to the energy label. China is the first country to take this approach, implemented in 2016 [17] - when the consumer scans the code with their mobile phone they are taken to a web page where a wide variety of information on the product is presented, accessed from the central products registration database. As well as the 'standard' information on the printed label the consumer gets more details on the appliance including an estimate of the energy costs. They may also be able to access operating instructions, tips on maintenance, and details on repair and recycling, increasing awareness of resource efficiency issues. The Chinese saw advantages of the QR code [18], for three main protagonists:

- For consumers, providing more information on the product, including explaining some of the terms on the label which may be more difficult to understand such as EEI
- For manufacturers, enabling them to provide more product details to promote them to consumers
- For market supervisor authorities, giving easy access to information, speeding up market inspections.

The China Energy Label QR code is considered a success – from implementation in October 2016 to a presentation in August 2017 [17], QR codes had been accessed 85 million times.

South Africa is considering using a combination of QR codes and/or smart phone app [19], similar to China, with the possible addition of product ranking and notifying users of incentive programmes.

The 'new' version of the EU energy label is to include a QR code which will access the consumer accessible data for that model in the European Product Database for Energy Labelling (EPREL).

An EU funded project, Digi-Label (2016 – 2019, www.pocketwatt.eu) developed and trialled a digital solution for the EU energy label, using product databases, QR codes and a web application. The project partners identified some of the difficulties for consumers with the 'basic' label format [20 and 21], and developed a tool to address them as follows:

Consumer difficulty	**Solution in Digi-Label**
Understanding the information on average annual consumption	Providing the assumptions behind the calculation
How to calculate running costs	Calculating running costs for that model using standard assumptions but also enabling users to customise this by entering their own usage and energy costs
The pictorial vocabulary (what the icons mean)	Explaining each of the icons, with examples where appropriate
The understanding the product fiche	Explaining technical terms
The energy label includes energy classes which aren't permitted to be sold under ecodesign regulations – possibly giving consumers a mis-leading view of where the model they are looking at sits in the range of energy performance on the market	Providing a ranking of the model's energy performance against other models with the same characteristics.

The tool also provided consumers with additional support, giving them guidance on how to select the size/capacity of appliance they need and how to use them in an energy efficient way. It was developed in an online and in-store version and successfully trialled in four countries [22].

Conclusion

The EU appliance energy label is familiar to consumers and generally well understood. The evidence suggests that part of the effectiveness of the label is due to its familiarity and this builds on a long history and extensive public awareness campaigns, some of which are ongoing (for the revisions to the energy label design, due to take effect in 2021). It therefore makes sense for a UK label to build on this situation as far as possible. Further there is evidence that adding more information to the label may actually dilute its effectiveness. We suggest that the UK Government take an alternative approach of adopting the energy label as is and giving consumers more information via an online solution. This should go beyond simply accessing the product database registration (the current EU solution) and provide a digital tool which allows interested consumers to explore the product features further, as developed in for the China Energy Label or under the Digi-Label project.

There remains a substantive issue with this proposed approach - whether the EU will be content to let a country which is not a Member State or a member of the European Economic Area use the EU energy label. As far as we aware the situation is currently unclear. Prospective accession states such as Montenegro are adopting equivalent to EU regulations and using the energy label. We understand also that Turkey is required to adopt EU energy label (and ecodesign) regulations as part of their trade agreement with the EU. We imagine that this will be a topic of discussion in trade discussions with the EU.

Sources

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3. Special Eurobarometer 492 report – Europeans' attitudes on EU energy policy, 2019, Kantar Belgium for DG ENER
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5. Come On Labels (Common Appliance Policy – All for One, One for All – Energy Labels) Final Publishable Report, 2013, for Intelligent Energy Europe
6. Testing CO_2/Car labelling options and consumer information, 2013, Cristiano Codagnone, Francesco Bogliacino, Giuseppe Veltri, for DG CLIMA
7. The role of familiarity in front-of-pack label evaluation and use: A comparison between the United Kingdom and The Netherlands, 2012, Erica van Herpen, Ellen Seiss, Hans C.M. van Trijp, Food Quality and Preference, Volume 26
8. Report on the implementation of Directive 1999/94/EC relating to the availability of consumer information on fuel economy and CO2 emissions in respect of the marketing of new passenger cars, 2011, Charlotte Brannigan, Ian Skinner, Gena Gibson and Duncan Kay for DG CLIMA

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11. Comprehensibility of the EU Energy Label – Results of two focus groups and a representative consumer survey, 2014, Elke Dünnhoff, Alexandra Palm for Ministry of Economic Affairs, Climate Protection, Energy and Regional Planning, Rhineland-Palatinate
12. Is more information always better? An analysis applied to information-based policies for environmental protection, 2007, Douadia Bougherara, Gilles Grolleau, Naoufel Mzoughi, International Journal of Sustainable Development, 10 (3), pp.197-213
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16. Does Better Information Lead to Better Choices? Evidence from Energy-Efficiency Labels, 2016, Lucas W. Davis, Gilbert E. Metcalf, Journal of the Association of Environmental and Resource Economists, Volume 3, Number 3
17. Best Practice of QR Code Application in China Energy Label, 2017, Dr. Yujuan Xia and Dr. Gao Aang, APEC Workshop on Facilitating Trade in ICT Products Through Encouragement of Electronic Labeling Best Practices, Ho Chi Minh City, Viet Nam
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19. Marching to Digital Era - Approach Report for Determine the Viability of Including a QR Code on the Existing South African Appliance Energy Label, 2019, Jiayang Li, for Department of Energy, Republic of South Africa
20. Digi-label D3.1 Critical analysis of the digital tools and solutions, 2018, Flora Soyez, Alun Jones, Nerea Ruiz Fuente, David Cattermole
21. Digi-label: Consumer Understanding of the Energy Label, 2016, Johanna Kardel
22. Digi-label D6.4: Report on rollout phase, 2019, Simon Hirzel, Uta Burghard, Elisabeth Dütschke

4. 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:

• Somewhat

Evidence

Best Practice

There are a number of guidelines for energy product policy (standards and labelling) which are available, relevant and we believe offer best practice. They include:

- An international guide, covering all aspects of market surveillance, including setting up a programme [1]
- The Australian standards and labels programme compliance policy [2]
- The guide for EU Market Surveillance Authorities (MSAs) in undertaking ecodesign and energy label market surveillance produced and refined over the course of two collaborative EU projects [3]

We have compared the UK programme against these.

Meeting best practice

As presented in programme plans and reports the UK programme under the Office for Product Safety and Standards (OPSS) has :

- Undertaken laboratory testing on a variety of product groups, returning to product groups where a high level of issues have been found and the reported the results of these at headline level [4], [5], [6].)
- Engaged with trade associations and other business representative organisations to disseminate information, including through presentations about the regulatory requirements and the OPSS work [4], [5]
- Requested and examined technical documentation prior to selecting models for testing [5], [6]
- Taken a proportionate response to enforcement, in line with the overall OPSS Enforcement policy [7] and included any ecodesign and energy regulation related statutory enforcement actions in the six monthly OPSS corporate reports (for example [8])

Divergence with best practice – areas for improvement

Compared to best practice, we recommend OPSS should:

- Improve transparency. Specifically:
    - Publish a forward programme of the market surveillance planned for the year and the rationale for selecting these product groups and activities. Example of good practice, Australia [9]
    - Present a communication plan for educating stakeholders, giving a rationale for selecting these stakeholders and approaches (ref recommendation from [1]

"Processes to facilitate compliance, including a communication plan to educate stakeholders about their obligations")

- Present an annual budget for energy related products work (ref recommendation from [1] "A budget for compliance activities consistent with the declared ambition of the S&L programme.")
- Publish details of enforcement actions of energy design and energy label regulations on a web page which is directed towards the product policy target audience, ie signposted from the BEIS and OPSS energy related product web pages. This should include details of the specific models that did not comply and any penalties imposed. In addition to transparency this greater visibility this is more likely to activate organisations' concern about corporate reputation which can act as an additional incentive to comply. Examples of good practice, USA [10] and Australia [11]

- Address all aspects of the regulations, specifically:
  - Actively co-ordinate with the Trading Standards Services (TSSs)and the Advertising Standards Authority who are responsible for, respectively, checking compliance with requirement to display the energy label in shops and the accuracy of advertisements. We can find no reference to any activity in this area. (ref recommendation from [3] "Label inspection is an important part of market surveillance and should be considered when establishing national inspection programmes" and "Label inspection can be a stand-alone activity. If the content of the label and fiche of a product do not meet the requirements of its corresponding regulation, then there is a non-conformance with the relevant implementing measure under the Energy labelling Directive."). What is more there is no reference to the role of TSSs on energy labelling in the section on Local Authority Regulatory Services in [12]. An example of good practice of a surveys of energy labels in shops is in Australia [13]
  - Undertake online energy label inspection. Please see our response to Question 42 for more detail on this.
  - Use technical document inspection as a compliance check in its own right, rather than just as a pre-amble to laboratory testing. This activity is much lower cost than the latter and can be an effective way to identifying manufacturers who are not complying. (ref recommendation from [3] "Document inspection is a stand-alone activity: if the documentation of a product does not meet the requirements of its corresponding regulation, the product does not comply with the relevant implementing measure under the Directive.")
- Co-operate more with other key actors:
  - With UK Customs. [12] acknowledges the significant role that Customs play in market surveillance but we can find no evidence of cooperation on energy related products specifically. (ref recommendation from [3] "MSAs should consider how to cooperate with national Customs authorities in market surveillance"). This aspect

will become much more important when the transition period is over, and even more so if the UK diverges from EU regulations.
    - With EU MSAs. Lack of involvement in EU funded projects EEPLIANT, EEPLIANT2 and EEPLIANT3, has resulted in less learning from these projects, as well as missing out on financial support for surveillance activities. Also there is a lack of public forward plan for co-ordination with EU MSAs after the end of the transition period when the UK will not have access to the ADCOs, and possibly the EU digital information systems, RAPEX and ICSMS. As many of the regulations will remain in common after the end of the transition period this is could be a significant obstruction to efficient operation. (ref recommendation from [3] "MSAs should cooperate and provide each other and the Commission with information to assist the application of these Directives e.g. through the ADCO3s and by electronic means of communication"
- Evaluate results:
    - We could find no evidence of an evaluation of the effectiveness of the UK market surveillance programme. (ref recommendation from [1] should include "Evaluation processes so that policy makers can assess programme outcomes, facilitate accountability of all participants, and guide improvements in programme design")

Conclusion

There is considerable scope to increase the effectiveness of UK market surveillance.

Sources

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12. National Market Surveillance Programme 2019-20, 2019, OPSS
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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:

• Not very

Evidence

Online labelling

We are not aware of any recent or regular UK surveillance activities in this area so it can not be effective.

We know of several surveys which have looked at compliance with energy labelling requirements for online sales in the EU, one of which included the UK:

1. MarketWatch

An EU funded project which covered 11 EU MSs including the UK, over 3 rounds of surveys over 2014 and 2015 found [1]:

	correctly labelled	
Product group	**Min**	**Max**
Refrigerating appliances (fridges and freezers)	38%	47%
Wine storage appliances	30%	44%
Washing machines	32%	50%
Tumble driers	28%	49%
Washer-driers	22%	59%
Dishwashers	32%	47%
Ovens	8%	33%
Vacuum cleaners	32%	48%
Air conditioners	7%	27%
Televisions	32%	53%
Household lamps	23%	66%

NB data was not published for each country individually

More recently:

2. NORDCRAWL 2

published results [2] from a snapshot of checking online shops in the Nordic countries (Denmark, Finland, Norway and Sweden) over a month (weeks 37-40) in 2018, undertaken for the Nordic Council of Ministers. The results are shown below.

Product group	**Average missing labels**			
	Denmark	**Sweden**	**Norway**	**Finland**
Fridge-freezers	3.7%	7.7%	2.2%	34.8%
Washing machines	5.3%	6.2%	3.2%	4.9%
Tumble driers	12.7%	15.4%	3.1%	19.1%
Dishwashers	4.5%	4.3%	2.4%	16.0%
Vacuum cleaners	9.9%	13.6%	40.7%	0.4%
Televisions	7.5%	15.1%	12.8%	8.1%

3. EEPLIANT2 [3]

Was an EU funded project which included reviewing 89 online shops for proper label display of Refrigerating appliances (fridges and freezers) in 10 EU countries (not including the UK) between September 2018 and February 2020. 20% of them were regarded as compliant, with 34% showing no energy labels at all and the rest incorrectly labelled in some way.

Conclusion

There does not appear to have been any regular checking in the UK so the level of compliance is unknown.

The evidence shows that the level of compliance (correct display of energy labels) varies by country, product group and possibly over time. However the levels overall are low (NB the Nordic data are only on whether the label is present – it does not present data on whether label data is complete or consistent, unlike the other two studies). There is no reason to

believe that the situation in the UK is significantly different to this and therefore we conclude that more effort is needed.

Compliance with Ecodesign based on information provided online

We know of very little evidence activity of checking compliance with ecodesign for online sales. There are two studies:

1. National Measurement Office

The National Measurement Office undertook a study, published in 2013 [4] to check compliance with Ecodesign performance indication requirements (PIR) for Electric Motors, Non-Directional Lamps and Televisions (from manufacturers and online retailers). They found that provision of PIR information by the suppliers, relative to what was actually required by the Ecodesign regulations, was estimated to be between 36% disclosed for Televisions, 42% for Non-Directional lamps and 47% for Electric Motors.

A Non-Compliance Index was also generated for each group which established non-compliance (NC) as a percentage against the PIR requirement. The index score was categorised by way of Severe (SEV. NC :> 75%), Significant (SIG.NC: 50-75%), Marginal (MAR.NC: 25-50%) and Satisfactory (SAT.NC :< 25%). Overall the survey found that 24% of Lamps and 34% of Televisions demonstrated a Severe (SEV) Non-Compliance Index, whereas Electric Motors 86% were Marginal. Lastly, only 2% of Lamps and 3% of Televisions managed a Satisfactory (SAT) level of non-compliance.

We are not aware of any systematic UK online surveys since this 2013 report, although we note in the OPSS 2017-18 report [5] to " failures to comply with requirements to publish performance information on free access websites." for chillers and condenser units resulting in " checks on the websites of a number of manufacturers and an assessment of the information included in installers' manuals. We found non-compliance in relation to the online information requirements and we worked with manufacturers to resolve these issues with a number of websites being amended"

2. Nordcrawl 2

The Nordcrawl study [2] also checked, where an energy label was provided whether the data on the label suggested that the product was non-compliant with the minimum energy performance requirements of Ecodesign (ie where the energy class was lower than allowed). The results are shown in the table below:

Product group	Min energy class	Denmark	Sweden	Norway	Finland
Washing machines	A+	0.75% (4)	1.36% (7)	0.44% (2)	0.67% (1)
Vacuum cleaners	D	1.86% (6)	0.6% (1)	0% (0)	5.22% (7)
Range hoods	F	0% (0)	0% (0)	0% (0)	0% (0)
Ovens	C	0% (0)	0% (0)	0% (0)	0% (0)
Refrigerator-Freezer	A+	0% (0)	0% (0)	0% (0)	0% (0)
Refrigerators	A+	1.19% (9)	0% (0)	0.83% (4)	0.36% (1)
Freezers	A+	0.22% (1)	0% (0)	0% (0)	0% (0)
Chest Freezers	A+	0% (0)	0% (0)	0% (0)	0% (0)

This suggests a high level of compliance with minimum standards – but as it could only check labelled products this may be misleading; it is possible that all the products without labels do not comply with ecodesign.

3. CLASP RfP

In July 2020 CLASP issued a Request For Proposals "Study to evaluate online compliance in the EU and provide suggestions and recommendations" (https://clasp.ngo/rfps/study-to-evaluate-online-compliance-in-the-eu-and-provide-suggestions-and-recommendations) for a project which would survey online shops for five product groups in a number of EU countries to check provision of energy labels, and cross checking that information with information from other sources. The indicative timeline is completion by the end of 2020 so potentially this could give an EU picture quite soon. To date the appointed contract has not been announced.

Conclusion

The evidence to date is very limited, with no recent data in the UK, but the evidence available suggests that compliance is low.

Sources

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3. PRESS RELEASE: Final Results of the EEPLIANT2 Joint Market Surveillance Action on ecodesign and energy labelling, 2020, ProSafe

4. Product Information Requirements of the Ecodesign Regulations: Non-Directional Lamps, Electric Motors and Televisions, 2013, National Measurement Office
5. Enforcement and Market Surveillance Annual Report 2017-2018, 2019, OPSS

43. How can the process of reporting non-compliant businesses and/or products to UK market surveillance authorities be improved?

At present the way of reporting non-compliances to OPSS is not obvious: in particular there is no mention of how to do this on the web page providing guidance on ecodesign products: https://www.gov.uk/guidance/placing-energy-related-products-on-the-uk-market and or energy labelling https://www.gov.uk/guidance/the-energy-labelling-of-products

We suggest adding simple and accessible text to both these pages and any other Government web page which references these regulations along the lines of those used by the Australian Greenhouse and Energy Minimum Standards regulator (GEMS) web page on this specific topic (which is easily found using an internet search engine) https://www.energyrating.gov.au/suppliers/compliance/allegations-suspected-non-compliance as quoted below

> "The GEMS Regulator receives allegations of suspected non-compliance with the GEMS Act from a variety of sources.
>
> If you would like to contact the GEMS Regulator with information about suspected non-compliance, please contact us at compliance@gems.gov.au.
>
> Your email should be as detailed and complete as possible and include information about:

- the product – please identify and include the model number
- where it is being supplied – name, address and contact details if possible
- why you believe it does not meet GEMS requirements.

> Unless you wish to remain anonymous, please provide your contact details to enable the GEMS Regulator to communicate with you, if necessary, to clarify the information provided."

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.

No data

5. Exploring other policy levers

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?

Evidence

Public procurement

Green Public Procurement (GPP or Sustainable Public Procurement SPP) can be a massively effective market transformation tool for products, including energy using products. Korea's GPP programme is widely recognised as a world leader in terms of both programme implementation and measuring its impact, with results reported annually. A study for UNEP [1] reports that in Korea in 2017:

- The total expenditure on green products by all public institutions was USD 2,945 million
- The number of certified products increased from 2,721 in 2005 to 14,647 in 2017.
- the reduction of CO_2 equivalent emissions was estimated at 665,000 tons
- the economic benefits linked to the reduction of several environmental impacts (such
- as CO_2 emissions, noise and so on) from total green purchases executed by PPS were USD 35.4 million,
- and 4,415 new jobs were created in the green economy.

The UK procurement system does not appear to be strong Government priority at present: Government buying standards for IT products (https://www.gov.uk/government/publications/sustainable-procurement-the-gbs-for-office-ict-equipment) were last updated in 2012 and those for electrical goods (https://www.gov.uk/government/publications/sustainable-procurement-the-gbs-for-electrical-goods) in 2015. The system for monitoring their use and checking compliance are not transparent. It is possible that UK procurement could be made a more effective policy lever by learning from some of the guidance and practice identified below:

- A guide to best practice for GPP has been published by the OECD [2], and SEAD have produced guidance on monitoring and evaluation of GPP [3].
- A further example of a national GPP, China is described in [4] and [5]. The latter includes specific recommendations on how to improve the GPP programme, which may be of use to the UK.
- A number of multi-national projects supporting green procurement of energy related products have been funded by the EU which might provide product (eg street lighting, imaging equipment) and customer (mostly local authorities) specific insights – a good starting point for these is a summary report of recent projects [6].

- Existing sustainability GPP criteria (beyond energy use and/or energy efficiency) are the EU GPP criteria (https://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm) which include several energy related products: computers and monitors; data centres; imaging equipment; road lighting and traffic systems; water heaters.

Obligation schemes

Energy supplier obligation schemes are widely used and often include policies relating to energy related products – including financial incentives and communication campaigns. We would like to draw attention to the following selected pieces of evidence on this topic:

- A review of Energy Efficiency Obligations in five EU Member States [7] which found that these were cost-effective.
- An Evaluation of The British Energy Efficiency Commitment 2002-2005 [8]; this found the policy to be effective and cost efficient.
- A study by Oxera for Defra on Policies for energy efficiency in the UK household sector [9] found that the obligation on energy suppliers to persuade households to adopt energy efficiency measures is much more effective than the subsidy levels they offer would suggest alone. They thought that the suppliers' success could probably be attributed to the level of access to, and skill with which they reach, customers, inform them, and trigger a decision to invest in energy efficiency. They found that empirical evidence suggested that the suppliers' role is crucial, and that the key value of the EEC's design is, in fact, its involvement of suppliers.
- More specifically for energy related products, the Energy Efficiency Innovation Review [10] found that EEC had transformed the cold appliance (fridge and freezer) market

Lighting and electrical appliances were the original focus of GB energy supplier obligations, when introduced in 1994, and played a significant role in these obligations until 2012 [11]. The main schemes supplied low energy lamps, discounted appliances through electrical stores and the replacement of old, inefficient cold appliances for low-incomes households. The overall savings were highly cost-effective, i.e. the cost of electricity saved was much lower than even the wholesale price of electricity [12]. The decision to end these schemes and focus on heating in the energy supplier obligations was never satisfactorily explained [13].

A new variation on obligation schemes which has been used in the US is the Retail focused supplier program or Retail Products Platform, the ENERGY STAR Retail Products Platform [14]. The concept is based on two central strategies: shifting incentives to the retailers with a midstream program model, and coordinating nationally to make the scale of the program large enough to transform markets [15]. However we are not aware of any evaluations of this new approach.

Fiscal incentives

A range of schemes have been and continue to be used to incentivise consumers to buy more efficient lights and appliances. Many of these have been evaluated and there is an extensive literature on this topic which we will not attempt to summarise here. Instead we will refer to two reviews and a few examples to illustrate one of the less common variations that is available and may be worth consideration if and when the UK is contemplating introducing financial incentives:

One was a study for the EU specifically on tax incentives [16]. This looked at direct fiscal incentives (subsidies, tax credits to consumers, tax credits to manufacturers) for four product groups: refrigerators, washing machines, boilers and compact fluorescent lamps. They found that incentives could be effective but that "the effectiveness and efficiency of incentive instruments depends largely on the market conditions prevailing in the country, on the design of the instrument and the nature of products. These should be always carefully assessed, when the subsidy policy is introduced".

Another study looked at wider incentives (including rebate programmes) [17]. A general finding was that financial incentives programs have greater impact when they target highly efficient technologies that have a small market share. Similarly to the study on tax incentives they found that that the benefits and drawbacks of different program design aspects depend on the market barriers addressed, the target equipment, and the local market context. The key to successful program design and implementation was a thorough understanding of the market and effective identification of the most important local factors hindering the penetration of energy-efficient technologies.

Many financial incentive schemes offer a grant or other financial incentive to consumers directly. An alternative approach is a 'mid-stream' incentive – where the incentive is provided to a distributor or retailer of equipment rather than the customer. Two studies in the US [18] and [19] looked at specific examples of these for high efficiency heating, ventilation and air conditioning (HVAC) equipment. They found that using a mid-stream incentive was a good way of engaging the supply chain and that this in turn increased the uptake of schemes.

Communications campaigns

Communications campaigns are a critical component in any market transformation programme.

As stated in our response to question 40, high familiarity with an energy label is a crucial part of its effectiveness and we consider that communication campaigns are an essential part of increasing familiarity. So we would strongly support ongoing campaigns by the UK

Government to raise awareness and understanding of the Energy Label, particularly when any changes are coming into effect.

Guidance on how to design and implement a communications campaign specifically for a standards and labels programme is included in [20]. Guidance on more general energy efficiency information programmes is in [21].

Communications campaigns need to be targeted at particular audiences in order to be effective and we would suggest one particular audience as being particularly important for energy related products – retailers and retail assistants. There is evidence that retail assistants can be influential on consumer purchases [22] and [23]; training them in energy efficient appliances can have a significant effect on the market. This has been demonstrated in an EU funded projects Promotion3e [24]. The project partners trained retailer staff in 401 stores in eight countries and the project achieved a significant average increase in the market share of energy-efficient domestic appliances (energy label classes A++, A+, and A) in the participating stores.

The importance of high awareness and involvement of retailers has been recognised by other national programmes – for example the South African programme includes retailer training (www.savingenergy.org.za/asl/retailers/retailer-training/)

Advice in implementation

We are aware of a number of initiatives which have provided expert knowledge and advice relating to lighting during the (ongoing) transition from incandescent and fluorescent to LED lighting.

- In Australia specialist stores were identified as a key player and partner to educate homeowners contemplating new lighting systems (e.g., in renovation or major refurbishment situations). Australia developed a lighting training manual [25] focused on lighting design and options, which was available for and promoted to specialist retail lighting stores (a video and online training module were prepared as well).
- An EU funded project [26] in 12 countries provided support to consumers in selecting energy efficient lamps that met their needs, via various tools (flyers, detailed information brochures, animated presentations) at the point of sale, and e-learning tools, videos as well as apps that supported consumers in the product selection online. In some countries retailer training was also provided.
- A follow-on EU project [27], addressed a professional audience - activities were tailored to address entrepreneurs, representatives from the public and financial sector as well as professionals (architects, engineers, installers and others) from the public and private sectors. The project partners developed procurement criteria and guidelines for

indoor and outdoor lighting, which were disseminated via workshops and seminars as well as electronically.

- As reported in [28] for over 10 years, the French Agency for Energy and Environment (ADEME) sponsored a continuous education programme for specifiers and installers of street-lighting (e.g., municipal, institutional, and utility staff). The 3-day programme included such topics as lighting design and energy efficient technologies including LEDs. The education programme contributed to a steady increase in LEDs in street lighting applications in France, which rose from less than 1% penetration in 2014 to over 2% in 2015

More generally, advice services are generally synergistic with the availability of better technology. They have been evaluated to provide significant additional savings [29]. In England and Wales, advice services have been significantly reduced since 2012, with telephone and face-to-face advice have been largely replaced by web-based services. Whilst on-line services can clearly play a bigger role than historically, some segments of consumers would still benefit from the availability of publicly-funded advice.

Award schemes

LBNL under took a review of prizes looked at efficiency awards in the US, Japan and China with a view to then making recommendations on improving China's prize scheme [30]. China's Leading Energy Efficiency Program (LEP) was launched in 2014, as described in [31]. The LEP selects and releases the catalogue of the most efficient end-use energy consuming products available in the market to create an energy efficiency benchmark for the same categories of products and provides policy support to its recognized products, encourages consumers and users to purchase LEP products. Initial product groups included were: variable speed room air-conditioners, household refrigerators, household washing machines and TVs.

The Super-efficient Equipment and Appliance Deployment Initiative (SEAD) global efficiency medals (https://superefficient.org/Global-Efficiency-Medal) are an international initiative, with the UK being one of the six participating governments. The competition has been run for five product groups to date:

- Televisions, 2013
- Displays 2014
- Motors 2015
- Lighting 2017
- Connected Efficiency 2017

Depending on the product group, medals may be awarded for international winners, and winners in four regions: Australia, Europe, India and Norther America, in recognition of the differences in the manufacturing base and consumer markets in these regions. An assessment

for the TV medals [32] found that the results demonstrated significant efficiency improvement potential - the award-winning models are 22-59% and 32-71% more efficient than TVs with comparable technology (LED backlit LCD TVs) and conventional technology (CFL backlit), respectively. They also found evidence that the competition had stimulated manufacturers to continue making energy efficiency improvements – one manufacturer had improved the energy efficiency of its award-winning model by approximately 30% since winning the award.

A longstanding project which operates similarly to an award scheme is TopTen – whereby consumers can find information on a web portal which lists the most energy efficient products in a product class in their country. This project started in the EU, (https://www.topten.eu/) with EU funding; with 'offshoots' now operating in China (http://www.top10.cn/en/ with co-funding from WWF), Argentina and Chile. The product coverage varies from country to country – at present the UK site (http://www.toptenuk.org/) includes fridge freezers, TVs, tumble dryers, LED GLS lamps and fans.

An impact assessment of TopTen in 2015 [33], found that TopTen plays a major role as a provider of up-to-date information on the most energy-efficient technologies and due to its efforts to shed light on new saving potentials. These activities provide a strong incentive for producers to invest in the development of products with improved energy efficiency and they facilitate the introduction of innovative products on the market, thereby accelerating market transformation towards more energy-efficient technologies. It also found that it contributed to energy and CO_2 emission savings in Europe, via increased consumer awareness and policy advocacy work.

Technology deployment and diffusion

There are some schemes which go beyond award schemes – here we present two examples, both from the US.

An early example is the US refrigerator prize, the Super Efficient Refrigerator Program or SERP [34]. The SERP Program featured a $30 million bid competitively awarded to the refrigerator manufacturer that could develop, distribute, promote, and sell the most energy-efficient, CFC-free refrigerator/freezer in the most cost-effective manner possible. In some area sales were also supported by a utility rebate. A paper which assessed the market transformation effect of the Program [35] concluded that SERP did succeed in transforming refrigerator market from the technology perspective - it led to the design, production, and sales of an entirely new refrigerator unmatched by comparable units. However, there was no evidence that it changed the entire refrigeration manufacturing industry or made major changes in the retailer and consumer markets. The paper made recommendations for future market transformation programmes.

A more recent (2008-2011) US competition, for an LED replacement for 60W incandescent lamps (https://www.energy.gov/eere/ssl/l-prize-60w-replacement-competition) also involved a technical competition and market support, with a number of partner electrical utilities across the US offering consumer rebates on the winning products. While we have not been able to identify an evaluation study or impact assessment of this prize. US DoE's assessment of the programme's impacts [36] states that the winning entry helped catalyse market competition and pushed the whole industry toward a clear target, setting the bar for consumer satisfaction and success. The winning manufacturer estimated that this family of products reached sales representing more than $51.3 million in energy savings in the first two years alone.

Conclusions

All the policy levers listed in Table 5 have been used to increase the take up (and therefore benefits) of more efficient products – although the examples we have identified have been focused on energy rather than resource efficiency or boarder sustainability impacts. All of them build on the framework provided by the combination of mandatory energy performance standards (Ecodesign) and mandatory energy labels – for example most of the financial incentive schemes use an energy label class to set the threshold for meeting scheme requirements.

It is widely recognised that the effectiveness of each of these policies is increased if they are used as part of a co-ordinated programme, rather than in isolation [37].

The suitability of each policy needs to be considered for each product group, taking into account the market situation and the status of technology development; a policy which may be appropriate and cost-effective in one situation may not in another.

It is also important to take into account the influence that a single country/market can have on a product group: many products have global supply chains and markets and some policies may best be pursued in an international collaboration – we suggest that is the case for award schemes and that continuing UK involvement in the SEAD global efficiency medals is an appropriate way forward. Another option may be negotiating continuing access to TopTen and widening the UK product coverage. If these are adopted then we suggest considering incorporating both TopTen listings and the SEAD medal winners into Government procurement practice to increase their impact.

There are two policies which we would suggest are top priorities for the UK, across all product groups:

1. Public procurement (national, regional and local) seems to present a substantial opportunity for the UK; there is a scope for substantial cost savings and market

transformation with associated broader economic benefits. This should build on guidance and practice from other countries.
2. Communications campaigns are required for energy labels to be effective but can also have a direct impact in their own right. We suggest that campaigns for retailers should be an additional focus for the domestic appliance market.

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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?

Evidence

Interest free loans to public sector

There are (Government supported) zero interest 'low carbon' loans available for public sector organisations in England, Scotland and Wales via Salix (see for example https://www.salixfinance.co.uk/loans). An evaluation of the scheme in England is underway and an interim report has been published [1]. This found that projects undertaking lighting refits showed a statistically significant reduction in energy use and that there were co-benefits such as enabling leverage of internal and external funds to support energy efficiency work for necessary ancillary works (e.g. roof/ceiling works for lighting projects). More broadly a finding was "Insights from this work point towards interest free finance having a continued significant role to play in tapping into outstanding energy efficiency potential."

Endorsement labels

Voluntary endorsement labels can and are widely used alongside mandatory energy labels in many countries [2]. They have two advantages to energy labels: they are simple for consumers to process and can be more effective [3]; they can take into account the broader environmental impact of products, including resource efficiency (ecolabels).

There are two UK exclusive schemes which operate as endorsement labels for energy related products:

1. Energy Saving Trust (EST) registered products (https://energysavingtrust.org.uk/est-register), which operates for a mix of consumer and business facing products. The website shows a few hundred products are currently registered.

2. The Energy Technology List (https://etl.beis.gov.uk/), which is business facing. (This was originally a supporting policy for the Enhanced Capital Allowance (ECA) scheme, whereby products bought from the list qualified for a 'tax break'. The list is continuing although the ECA scheme ended in April 2020.) The website states that over 14,000 qualifying products are included on the list in 56 technology groups.

Both of these relate to energy only and do not take account of lifecycle or resource issues.

There are dozens of ecolabels which operate in the UK (see http://www.ecolabelindex.com/ecolabels/?st=country,gb). Of these there are a number of 'full' ecolabels (which consider lifecycle impacts of products) of which two are most long established and well known in Europe are Germany's Blue Angel (https://www.blauer-engel.de/en) and the Nordic Swan (http://www.nordic-ecolabel.org/), both with wide product coverage that includes energy related products. Also well established but with a narrower product brief is EPEAT, (https://epeat.net/) which covers IT equipment and some consumer electronics; based in the US; it is focused on commercial and public sector purchasers rather than Individual consumers.

UK manufacturers and service providers can, we presume, apply for certification under these and other schemes, although if UK consumer awareness and trust in these labels is low the benefit of this is likely to be low also.

The EU Ecolabel (https://ec.europa.eu/environment/ecolabel/) currently operates in the UK (http://www.eu-ecolabel.uk/). To date the label has only applied in countries in the EU or EEA, so presumably UK membership would have to be negotiated at the end of the transition period. There are EU Ecolabel criteria for only a handful of energy related products at present.

A study to support evaluation of the EU Ecolabel [4] found that:

- The Ecolabel has contributed to setting targets for better environmental product performance;
- It has influenced the demand for suppliers to meet high environmental standards;
- Companies participating in the EU scheme use the Ecolabel in their marketing campaigns;
- Neither users or non-users of the Ecolabel want to see the label abolished;
- The concept of the EU Ecolabel is preferred to that of national labels.

However:

- There is a low awareness and uneven geographic take-up of the label;
- There are insufficient product group categories;
- It suffers from cumbersome procedures and organisational structures - i.e. bureaucracy which limit the Scheme's ability to grow and respond to opportunities;
- Fees and cost of getting the label are perceived as barriers;

- There is a lack of perceived public purchasing benefits.

We are not aware of any equivalent evaluations of the Blue Angel or Nordic Swan ecolabels or EPEAT.

Conclusions

The evidence suggests that interest free energy efficiency public sector loans are effective, at least for lighting, and we encourage the UK, Welsh and Scots Governments to continue this policy and support wider public sector uptake of the loans.

With regard to endorsement labels for energy related products:

The value of the Energy Technology List as de-facto endorsement label is recognised by the intention for the scheme to continue after the end of the ECA scheme, the original reason for its existence, as proposed in BEIS's recent consultation on the scheme (https://www.gov.uk/government/consultations/energy-technology-list-scheme-its-future-direction-and-technical-changes-to-the-2020-update). We welcome the suggestion, made in the consultation, that the scheme be enhanced, through: improving the digital platform, facilitate networking between manufacturers and buyers and to developing the links to other government policies and to commercial schemes to increase its effect. We would also suggest that where appropriate the ETL criteria are included in Government procurement policy; it was disappointing that this possibility was not explicitly listed in the BEIS consultation.

The policy options are less clear for broader ecolabels that include resource efficiency considerations. A well run and recognised ecolabel operational could fill a gap in the current policy mix by taking account of impacts beyond those related to energy and offering a simple indicator for consumers. We do not recommend that the UK should start its own national ecolabel as this would take considerable time and resources. A better option would seem to be to negotiate access/involvement in one of the established ecolabels and then jointly promoting this in the UK. We suggest that this approach is investigated further.

Sources

1. Evaluation of the public sector energy efficiency loan scheme - Interim Evaluation Report, 2018, for BEIS
2. Energy Standards and Labelling Programs throughout the World in 2013, 2014, Lloyd Harrington and Melissa Damnics, for Department of Industry, Australia
3. Eco-labeling for energy efficiency and sustainability: a meta-evaluation of US programs, 2003, A, Banerjee,. and B. D. Solomon, Energy Policy 31: 109-123
4. Project to Support the Evaluation of the Implementation of the EU Ecolabel Regulation, 2015, Louise Evans, Chris Nuttall, Simon Gandy, Fabio Iraldo, Michele Barberio, Anna Paglialunga, Federica Gasbarro, Bennedetta Nucci, Directorate-General for Environment