| Title: Impact Assessment of Proposed Ecodesign and Energy Labelling Requirements for Household Refrigeration, Commercial Refrigeration, Household Dishwashers and Household Washing Machines/Washer-Dryers.<br>RPC Reference No: RPC-4480(2)-BEIS<br>Lead department or agency: Department for Business, Energy and Industrial Strategy<br>Other departments or agencies: Department for Environment, Food and Rural Affairs | Impact Assessment (IA)<br>Date: 04/03/2021<br>Stage: Post-Consultation<br>Source of intervention: Domestic<br>Type of measure: Secondary legislation<br>Contact for enquiries:<br>Policy lead: Lucy Birt (Lucy.Birt@beis.gov.uk)<br>Analytical lead: Chris Nash (Chris.Nash@beis.gov.uk) |
|---|---|
| **Summary: Intervention and Options** | RPC Opinion: Green |

**Cost of Preferred (or more likely) Option** (in 2016 prices, 2017 present value year)

| **Total Net Present Social Value** | **Business Net Present Value** | **Net cost to business per year** | **Business Impact Target Status** Qualifying provision |
|---|---|---|---|
| £290m | £68m | -£4m | |

**What is the problem under consideration? Why is government intervention necessary?**
Household refrigeration, commercial refrigeration, household dishwashers and household washing machines/washer-dryers have a substantial environmental impact and present significant potential for improvement in terms of energy performance, as large numbers of these products are placed on UK the market annually. In Winter 2018/2019, when it was an EU Member State, the UK voted in favour of updated ecodesign and energy labelling requirements for household refrigeration, dishwashers and machines/washer-dryers and new ecodesign and energy labelling requirements for commercial refrigeration. In order to implement these requirements in Great Britain, domestic legislation is required. The measures carry significant benefits in relation to realising the Government's Carbon Budget and Net Zero targets, which would not be realised to the same extent without intervention. The costs and benefits of the proposed GB ecodesign requirements have been analysed separately on a product-by-product basis but are included together in this impact assessment.

**What are the policy objectives and the intended effects?**
Ecodesign legislation requires manufacturers of energy-related products to meet minimum requirements that result in the improvement of energy efficiency and environmental impacts of their products. Energy labelling requires manufacturers to provide information on energy consumption (and other parameters) to allow consumers to make informed choices based on the energy efficiency of the products. This helps to achieve the UK's objectives of reducing energy bills for businesses and consumers, reducing carbon dioxide ($CO_2$) emissions, minimising the adverse environmental impacts of products and ensuring effective regulation for businesses and consumers.

Updating the existing ecodesign requirements for household refrigeration, dishwashers, machines/washer-dryers and introducing new ecodesign and energy labelling requirements for commercial refrigeration is projected to further increase energy efficiency savings, reduce the UK carbon footprint and increase innovation and investments into the production of more energy efficient products.

**What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)**
The preferred option (Option 2) has been assessed against a Do Nothing option (Option 1).

Option 1 - Do Nothing. There is significant potential for energy efficiency and resource efficiency improvements for all the products. By not legislating, the UK would miss out on these energy and carbon emission savings.

Option 2 - Update ecodesign and energy labelling requirements for the products to reflect what the UK agreed at EU level as a Member State in December 2018 and January 2019. This would make it possible for the UK to realise the full energy and carbon emission savings from these products, contribute to the Government's Carbon Budget and Net Zero targets, and maintain high environmental product standards.

Self-regulation was not considered, as regulations already existed for all the products (apart from commercial refrigeration). Moreover, during the consultation the Government held with stakeholders before voting for the EU regulations, industry did not propose any self-regulation, nor expressed an interest in doing so.

| |
|---|
| **Will the policy be reviewed?** It **will** be reviewed. **If applicable, set review date:** 7 years from commencement of the draft regulations for household refrigeration, dishwashers and washing machines/washer-dryers and 5 years from commencement of the draft regulations for commercial refrigeration. |

| | | | | | |
|---|---|---|---|---|---|
| Does implementation go beyond minimum EU requirements? | | No | | | |
| Is this measure likely to impact on international trade and investment? | | No | | | |
| Are any of these organisations in scope? | **Micro** Yes | **Small Yes** | **Medium Yes** | **Large Yes** | |
| What is the $CO_2$ equivalent change in greenhouse gas emissions? (Million tonnes $CO_2$ equivalent) | | **Traded**: -0.90 | **Non-traded:** +0.05 | | |

***I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options***

Signed by the responsible Minister: Lord Callanan Date: 04/03/2021

**Description:** Update ecodesign requirements for household refrigeration, commercial refrigeration household dishwashers and household washing machines.

**FULL ECONOMIC ASSESSMENT**

| Price Base Year 2021 | PV Base Year 2021 | Time Period Years 30 | Net Benefit (Present Value (PV)) (£m) | | |
|---|---|---|---|---|---|
| | | | Low (-20%): 184 | High (+20%): 549 | Best Estimate: 367 |

| COSTS (£m) | Total Transition (Constant Price) | Years | Average Annual (excl. Transition) (Constant Price) | Total Cost (Present Value) |
|---|---|---|---|---|
| **Low (-20%)** | - | | - | 218 |
| **High (+20%)** | - | 30 | - | 327 |
| **Best Estimate** | - | | 12 | **273** |

**Description and scale of key monetised costs by 'main affected groups'**
Manufacturing costs make up 100% of all monetised costs which are based on UK sales figures along with the estimated additional costs for manufacturers to meet the increased energy performance requirements. These additional costs are assumed to be passed onto consumers through the supply chain but are offset by lower energy bills.

**Other key non-monetised costs by 'main affected groups'**
All non-monetised costs are assumed to be negligible compared with the manufacturing costs outlined above. The following are considered here: transitional/familiarisation costs of understanding the requirements; distributional impacts (although lower energy costs will offset the increased price of products); energy labelling; resource efficiency (considered disproportionate for all products – predicted resource efficiency savings were very modest compared to the predicted energy savings); and enforcement and compliance.

| BENEFITS (£m) | Total Transition (Constant Price) | Years | Average Annual (excl. Transition) (Constant Price) | Total Benefit (Present Value) |
|---|---|---|---|---|
| **Low (-20%)** | - | | - | 511 |
| **High (+20%)** | - | 30 | - | 767 |
| **Best Estimate** | - | | 35 | **639** |

**Description and scale of key monetised benefits by 'main affected groups'**
Net energy savings are expected to account for 88% of all monetised benefits leading to reduced energy bills for consumers (commercial and household). Reduction in $CO_2e$ and improved air quality levels account for the remaining monetised benefits.

**Other key non-monetised benefits by 'main affected groups'**
A key non-monetised benefit is that requirements for all four products will be consistent with those in the EU. Additional benefits include a likely increase in innovation due to UK manufacturers having to make substantive improvements to their products.

| Key assumptions/sensitivities/risks | Discount rate (%) | 3.5% |
|---|---|---|

Most quantified costs and benefits have been provided by the Energy Using Products Policy model (described in Annexes 2 & 3). Sensitivities in the key input variables include product costs, sales/stock, use (hours/year), energy use and lifespan. The model assumes all costs appear at the point of purchase and changes to costs do not affect sales values. Non-monetised costs and benefits as well as modelling assumptions are considered to, collectively, have a positive effect on NPV.

**BUSINESS ASSESSMENT (Option 2)**

| **Direct impact on business (Equivalent Annual) £m:** | | | **Score for Business Impact Target (qualifying provisions only) £m:** |
|---|---|---|---|
| **Costs:** | **Benefits:** | **Net:** | |
| 2.5 | 7.0 | **-45** | -23 |

# Table of Contents

# 1 Problem under consideration and the rationale for intervention

21. The ecodesign framework sets minimum energy performance standards (MEPS) and other environmental requirements that energy-related products must meet to be placed on the market. This pushes industry to improve the energy efficiency and reduce the environmental impact of products and thereby removes the worst performing products from the market. Ecodesign requirements are currently in place for 28 energy-related product groups including domestic products such as washing machines and TVs, and commercial ones like professional refrigeration and power transformers.
22. Ecodesign and energy labelling requirements have historically been set at EU level through the Ecodesign legislative framework[1]. In December 2018 and January 2019, the UK, as an EU Member State, agreed and voted in favour of updated ecodesign and energy labelling requirements for washing machines/washer-dryers ('washing machines')[2], household dishwashers ('dishwashers')[3], refrigerating appliances ('household refrigeration')[4] and the introduction of ecodesign and energy labelling requirements [5]for refrigerating appliances with a direct sales function ('commercial refrigeration')[6]. The UK Government consulted stakeholders and carried out a cost-benefit analysis (CBA) prior to voting in favour of these requirements; this showed the substantial environmental impact within the UK and the potential for improvement in terms of energy performance.

[1] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0125.
[2] Ecodesign regulation (EU2019/2023) on household washing machines
[3] Ecodesign regulation (EU2019/2022) on household dishwashers
[4] Ecodesign regulation (EU2019/2019) on household refrigeration
[5] Energy labelling regulation (EU) 2019/2018 on commercial refrigeration
[6] Ecodesign regulation (EU2019/0352) on commercial refrigeration

23. As most of the new and updated EU requirements will apply from 1 March 2021 for these products, they will not automatically apply in Great Britain after the transition period ends on 31 December 2020.
24. Whilst EU requirements on ecodesign and energy labelling for these products will not apply in Great Britain after the transition period ends, the proposed GB regulations reflect what the UK agreed and supported at EU level.
25. The UK has always taken a leading role in pushing for both ambitious and realistic product requirements, and this new ecodesign and energy labelling regulation reflects this. The UK voted in favour of the new EU requirements as a Member State following a UK specific cost benefit analysis and informal consultation with stakeholders. Furthermore, the measures carry significant benefits in relation to realising the Government's Carbon Budget and Net Zero targets and implementing them in GB law means that we can reap these benefits after the end of the Transition Period. This approach also reflects the commitment made in the Clean Growth Strategy to maintain common high standards or go further where it is in the UK's interests.
26. This Impact Assessment examines the proposal to make product-specific regulations, to be in place after the transition period, using powers set out in the Ecodesign for Energy-Related Products Regulations 2010, as amended by the Ecodesign for Energy-Related Products and Energy Information (Amendment) (EU Exit) Regulations 2019[7].
27. This is consistent with the Government's intention to uphold common high product standards wherever possible and appropriate, or even exceed them where it is in the UK's interests to do so, following the end of the transition period.
28. The draft Regulations will apply in Great Britain only. In accordance with the Northern Ireland Protocol ("NI protocol"), EU Ecodesign and Energy

[7] The Ecodesign for Energy-Related Products and Energy Information (Amendment) (EU Exit) Regulations 2019 No. 539. Available at: http://www.legislation.gov.uk/uksi/2019/539/contents/made

Labelling Regulations will continue to apply in Northern Ireland post-transition period. The costs and benefits in this Impact Assessment are currently calculated on a UK basis. The effect of the NI protocol will be included in the final version of this impact assessment following consultation.

## 2 Policy Objective

29. Ecodesign requirements help to reduce the energy and resource consumption of energy-related products by setting minimum mandatory requirements on energy efficiency and resource efficiency. This removes poor performing products from the market and drives the market towards more energy and resource efficient products, thereby promoting a sustainable environment through regulation.
30. Energy labels help consumers make more informed decisions to choose more energy efficient products by presenting easily understood information on energy efficiency and product performance at the point of sale.
31. Together, these policies represent a cost-effective way to reduce energy bills and carbon emissions. Current estimates from The Department for Business, Energy & Industrial Strategy (BEIS) show that existing ecodesign and energy labelling requirements will lead to savings of 8 million tonnes of $CO_2$ in 2020[8].
32. Updating ecodesign and energy labelling requirements for household refrigeration, household dishwashers, household washing machines/washer-dryers and commercial refrigeration (for which energy labelling requirements will be introduced for the first time), are key to making the UK more energy efficient and to supporting innovation, contributing in particular to the objectives set out in the Clean Growth

[8] BEIS estimates – savings in relation to having no products policy measures.

Strategy (CGS)[9] ('accelerating clean growth' and 'helping business become more productive') and the Secretary of State for BEIS' priorities. Updating these requirements will:

- minimise energy bills for businesses;
- reduce greenhouse gas emissions;
- reduce the adverse environmental impacts of products;
- allow consumers to make more informed decisions on energy efficiency;
- ensure effective regulation for industry; and
- drive innovation and support the transition to a low carbon economy.

# 3 Background

33. Household dishwashers are currently regulated under the ecodesign regulation (EC) No 1016/2010[10] and the energy labelling regulation (EC) No 1059/2010[11].
34. The scope of both these regulations includes electric mains-operated household dishwashers and electric mains-operated household dishwashers that can also be powered by batteries, including those sold for non-household use and built-in household dishwashers. Dishwashers not in the scope of the regulation are listed in Annex 5.
~~35.~~ The overall energy consumption of dishwashers in the UK has increased by around 400 GWh in the last ten years, whilst the number of appliances owned by UK households has increased by around 4 million units[12]. The

[9] Clean Growth Strategy available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf

[10] European Commission, ecodesign requirements for household dishwashers (2010) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1521114716820&uri=CELEX:32010R1016

[11] European Commission energy labelling requirements for household dishwashers (2010) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010R1059

[12] Household Dishwasher consumption data from ECUK (2019) Electrical Products Tables – average used is the mean average. Available at: https://www.gov.uk/government/statistics/energy-consumption-in-the-uk

ratio of total energy consumption to total number of appliances has fallen by about 20%, suggesting that most dishwashers in use in the UK are more energy efficient than they were ten years ago. Figure 5 shows that most dishwasher now reside in the upper 3 energy rating classes (A, A+, and A++).

~~36.~~ For household refrigeration these are currently regulated under ecodesign design regulation (EC) No 643/2009[13] and the energy labelling regulation (EC) No 1060/2010[14].

37. The scope of household refrigeration covers electric mains-operated refrigerating appliances with a total volume of more than 10 litres and less than or equal to 1 500 litres. Household refrigeration not in the scope of the regulation are listed in Annex 3.

~~38.~~ An estimated 2.4 million household refrigerating appliances units are sold in the UK annually[15], with a total average of 40 million appliances being owned by UK households since 1980[18.] However, the energy consumption of these appliances has declined annually since 1995 from around 25,000GWh a year to around 11,000GWh a year[16].

39. Household washing machines/dryers are currently regulated under the ecodesign regulation (EC) No 1015/2010 [17]and the energy labelling regulation (EC) No 1061/2010[18].

40. UK energy consumption of washing machines has declined by around 500 GWh over the last ten years, despite the total number of household

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[13] European Commission, ecodesign requirements for household refrigeration (2009). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009R0643

[14] European Commission, energy labelling requirements for household refrigeration (2010). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32010R1060

[15] Estimate based on Energy Using Products Policy model - see Assumptions log (Annex 3) for further detail.

[16] Domestic refrigerating appliance energy consumption data from ECUK (2019) Electrical Products Tables – average used is the mean average. Available from: https://www.gov.uk/government/statistics/energy-consumption-in-the-uk

[17] European commission, ecodesign requirements for washing machines & dryers (2010). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32010R1015

[18] European commission, energy labelling requirements for washing machines & dryers (2010). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32010R1061 &

appliances remaining constant[19]. Information on the energy consumption of these products is limited but average annual consumption is estimated to be around 11 TWh in the UK with the stock continuing to increase.

41. This is the first time that commercial refrigeration will be regulated under the ecodesign and energy labelling framework. The scope of the regulations will include mains-operated refrigerating appliances with a direct sales function, including appliances sold for refrigeration of items other than foodstuffs. Commercial refrigeration not in the scope of the regulations are listed in Annex 2.

42. Figure 1 to 3 below show the evolution of the UK domestic White Goods market in terms of total stock, total energy consumption, and average yearly energy consumption per appliance[20]. Figure 4 and Figure 5 show the stock of washing machines and dishwashers respectively separated by energy rating class[20].

[19] Energy consumption data from ECUK (2019) Electrical Products Tables – average used is the mean average. Available at: https://www.gov.uk/government/statistics/energy-consumption-in-the-uk

[20] Consumption and energy rating data from ECUK (2019) Electrical Products Tables – average used is the mean average. Available at: https://www.gov.uk/government/statistics/energy-consumption-in-the-uk

*Figure 1: Total UK stock of domestic White Goods*

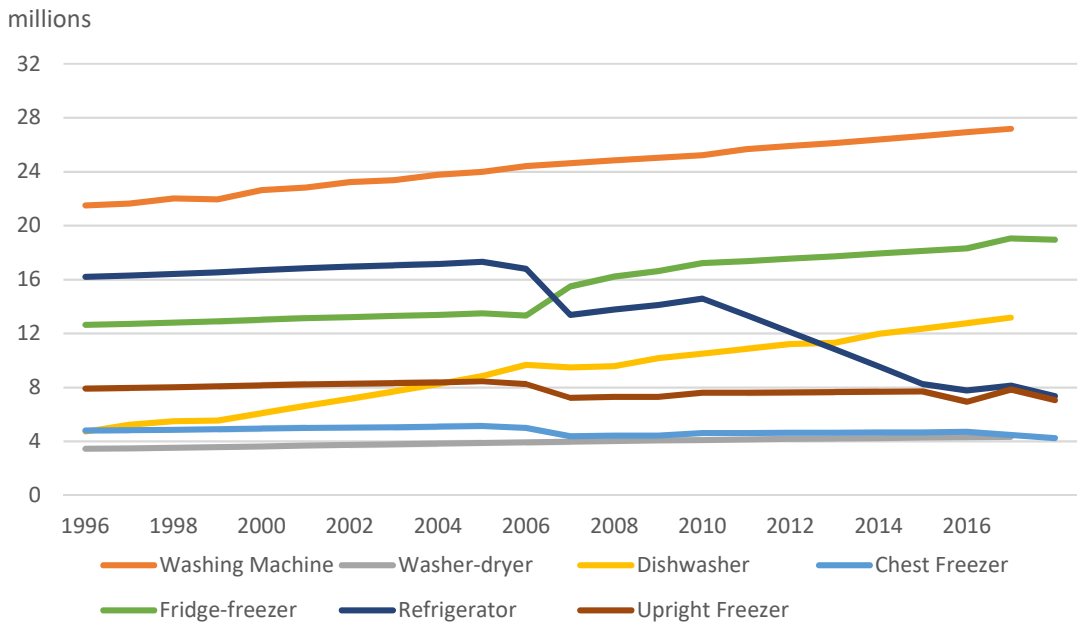



*Figure 2: Total UK energy consumption of domestic White Goods.*

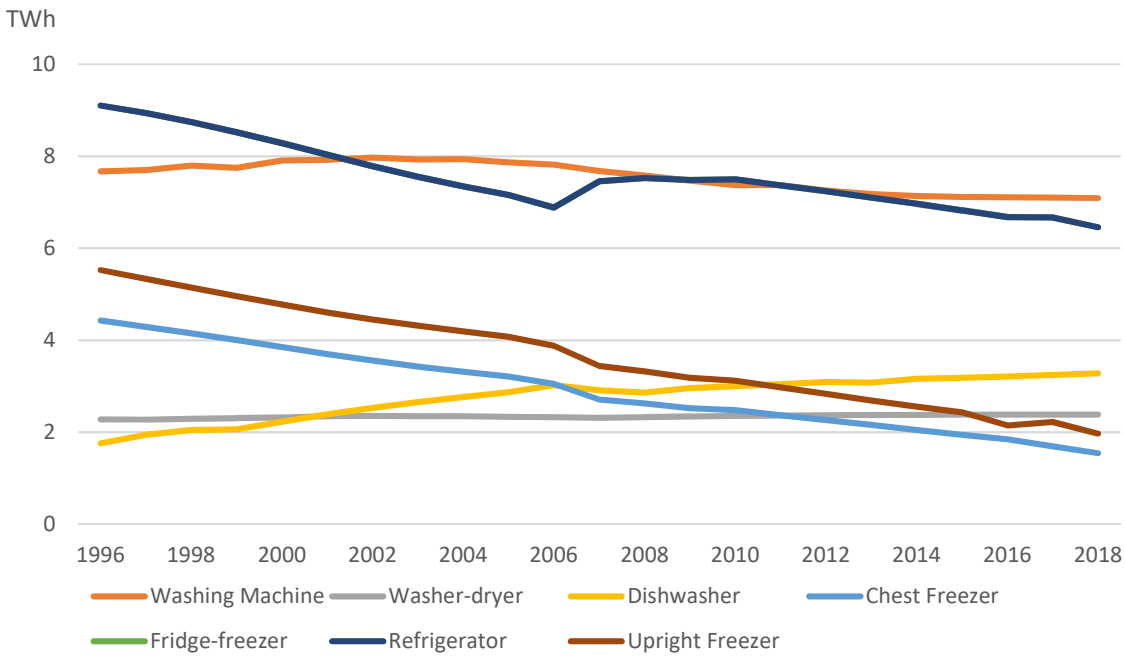


*Figure 3: Average energy consumption of UK domestic White Goods.*

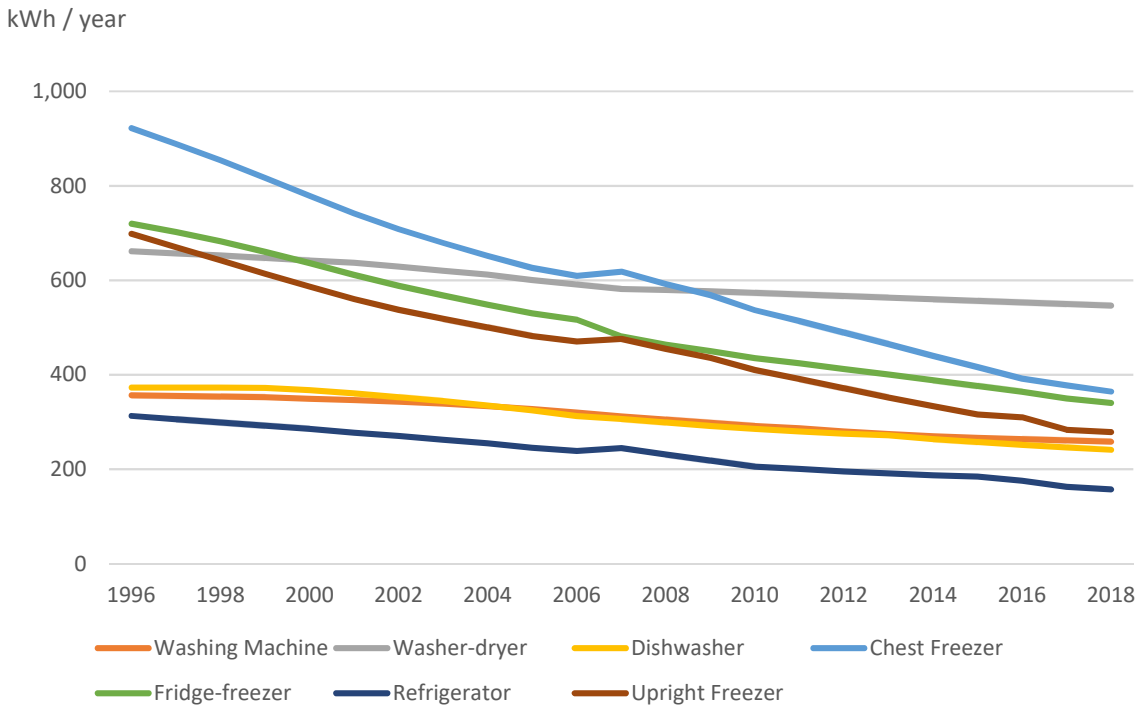


*Figure 4: UK domestic washing machine stock by energy rating.*

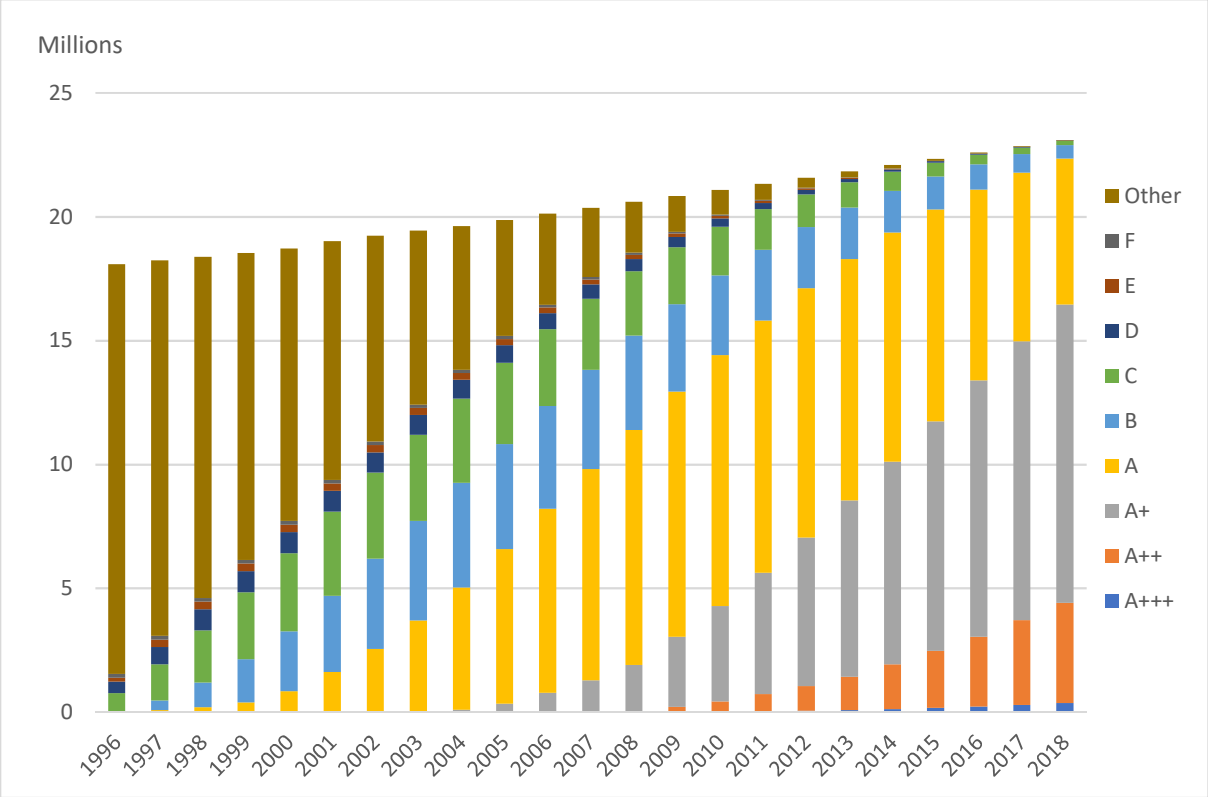
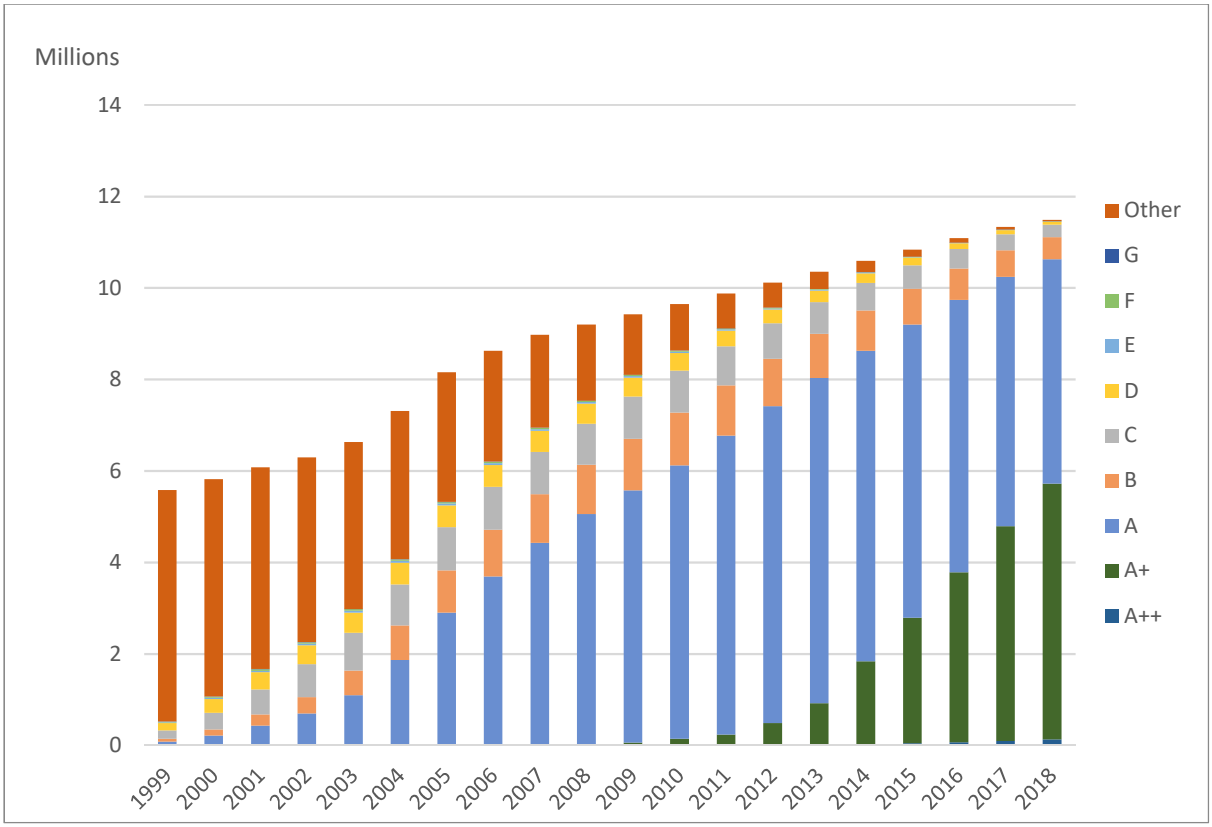



*Figure 5: UK domestic dishwasher stock by energy rating.*



43. Figure 3 shows that the average energy consumption of all products concerned has been consistently decreasing but that energy reduction has started to plateau. Most household washing machines and dishwashers now fall within the top two energy labelling classes (A+ or higher)(see Figure 4 and Figure 5). Updating the ecodesign requirements would allow consumers to benefit from further cost-effective energy savings from products which exceed the current efficiency standards. Improving energy labelling by rescaling the higher tiers would allow consumers to make more informed choices by delineating more distinctly between the most efficient products, therefore unlocking potential energy savings.
44. According to the European Commission's impact assessment for commercial refrigeration[21], there is a clear untapped improvement potential of energy efficiency of the cabinets currently sold and expected in the market in the next years. A comparison of base cases current performance, as assumed for the BAU, and best available technology shows that further to the installation of the well-known improvement technologies that result in low life cycle cost, significant additional technical improvements are still possible. Without taking additional specific action on commercial refrigeration cabinets, the market transformation towards more efficient appliances would take place only very slowly, and negative impacts on the environment would continue.

45. In 2017 the EU completed a review[22] on the performance of the current EU ecodesign regulations[23] for washing machines/washer-dryers[24] and estimated significant energy savings would be achieved by the current

[21] European commission impact assessment of commercial refrigeration. (2019) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019SC0352
[22] Follow study preparatory study ecodesign and energy label household washing machines and household. (2017) Available at: https://ec.europa.eu/jrc/en/publication/follow-study-preparatory-study-ecodesign-and-energy-label-household-washing-machines-and-household
[23] European Commission ecodesign requirements for household washing machines & washer-dryers (2010) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1521114859612&uri=CELEX:32010R1015
[24] European Commission energy labelling requirements for household washing machines & washer-dryers (2010) Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010R1061

regulation.

46. However, the energy savings from dishwashers, washing machines/washer-dryers, and household refrigeration would stall unless there was an update to requirements that accounts for new, more efficient products, as most household refrigeration, dishwashers and washing machines/washer-dryers now fall within the top three classes (A+ or higher). The current requirements also lack contributions to circular economy objectives which would reduce resource waste if implemented.

# 4 Options Considered

47. For the purpose of this consultation stage Impact Assessment, two policy options – (1) Do Nothing and (2) set requirements that reflect what the UK agreed at EU level before exit – have been considered. The preferred option of (2) setting requirements as agreed by the UK has been assessed against the Do Nothing option.

## 4.1 Rejected Options

48. Under the Ecodesign for Energy-Related Products Regulations 2010, as amended by the Ecodesign for Energy-Related Products and Energy Information (Amendment) (EU Exit) Regulations 2019, the Secretary of State must not regulate an energy-related product that is the subject of self-regulation. For a product to be the subject of self-regulation it must meet certain non-exhaustive criteria which evaluate the effectiveness of such self-regulation. Industry representation for these products has, to date, not proposed any self-regulation or voluntary scheme that meet these criteria.

49. Voluntary agreements (VAs), a form of industry self-regulation, were discarded as an option for household refrigeration, dishwashers and washing machines. With minimum mandatory requirements already in place, there is a risk of manufacturers/suppliers not signing up to the VA (free riders) if this replaced the existing minimum mandatory requirements. These free riders may reintroduce inefficient products back into the market.

Therefore, this option was discarded.

50. As regards commercial refrigeration appliances, under this option, existing trends regarding size and use of appliances sold in the UK would continue. There have been significant changes in the market in recent years including a gradual but very moderate efficiency increase. Under this option, the market and regulatory failures would persist, harmonised information on energy consumption would not be systematically generated other than through a voluntary industry scheme and consumers would not be able to differentiate between high-efficient and low-/average-efficient appliances. This option was discarded as the UK industry did not put forward a proposal for self-regulation prior to or during the EU's Consultation Forum on 2 July 2014.
51. We are not proposing at this time to exceed the ecodesign requirements for these products which reflect what the UK agreed at EU level as a Member State as we have yet to determine the technical potential for going further and the associated carbon and bill savings to be gained. To do so, we would need to engage extensively with stakeholders to gather the evidence required and ensure that more ambitious requirements offer a significant additional net benefit to the UK. Given that the new EU requirements for these products apply from 1 March 2021, our priority is to provide clarity and legal certainty to stakeholders and to realise the associated energy and carbon savings these requirements would bring. We are actively exploring how to set better ecodesign and energy labelling regulations in GB in the future, including where it would be beneficial to exceed EU standards.

### 4.2 Option 1 – Do Nothing

52. Under Option 1 no update would be made to the existing ecodesign requirements for household refrigeration, dishwashers, washing machines and no ecodesign or energy labelling requirements would be introduced for commercial refrigeration. This would include repealing the EU requirement that applies from 1 November 2020 to supply new labels with products.
53. For white goods, the main reason why this option has not been pursued

further is that, without regulation, manufacturing decisions and consumer behaviour would likely be dictated by performance and cost rather than energy efficiency or resource efficiency. Several market failures show this to be the case.

- Firstly, without standardised information on energy and resource efficiency, consumers may not be able to compare products and make better and more informed purchasing decisions. The necessary technical information affecting energy efficiency may be available somewhere (for example on a website or in technical documentation) but is hard to locate and/or to understand, or requires additional calculation (for example, the life cycle cost of a product).
- Secondly, most users often prioritise performance and low purchasing cost over reducing energy costs or increasing environmental savings during the use phase[25].
- Thirdly, split incentives between owners of white good appliances and clients, who cover energy costs, mean buyers have little concern about energy efficiency.

### 4.3 Option 2 – Update ecodesign requirements for domestic refrigeration, dishwashers & washing machines/dryers; and introduce ecodesign and energy labelling requirements for commercial refrigeration.

54. Under Option 2, existing ecodesign for household refrigeration, dishwashers and washing machines/washer dryers would be updated and ecodesign and energy labelling requirements for commercial refrigeration will be introduced. This reflects what the UK agreed at as a Member State at EU level in December 2018 and January 2019.
55. These requirements would apply from March 2021 for all products.

[25] EuP Netzwerk Preparatory Studies. Available from: https://www.eup-network.de/product-groups/preparatory-studies/completed/ (see Lot 12 for commercial refrigeration, Lot 13 for household refrigeration and Lot 14 for household washing machines and dishwashers).

Manufacturers will have to ensure that products placed on the GB market from this date comply with these requirements.

56. Products already placed on the market before March 2021 that comply with the existing ecodesign requirements can continue to be sold.

57. Option 2 consists of updating existing ecodesign requirements for household refrigeration, dishwashers and washing machines/washer-dryers and introducing ecodesign requirements for commercial refrigeration. It also includes introducing energy labelling requirements for commercial refrigeration, which reflect what the UK and other Member States agreed in January 2019.

58. The new labels for commercial refrigeration will see a return to a homogenous A-G scale, removing the A+, A++ and A+++ categories. This will harmonise the scale across the different product groups and make it easier for consumers to understand. Once energy classes become redundant because the MEPS have removed them from the market, they will be required to be greyed out on the label allowing consumers to see the actual range of energy classes on the market.

59. In accordance with the EU regulations, these new rescaled labels must be supplied with products along with the existing labels from 1 November 2020. This requirement will apply in the UK and be retained at the end of the transition period. However, other requirements such as the obligation on retailers to display labels in shops will apply from March 2021 and so will not automatically from part of UK law. Option 2 therefore includes introducing legislation to ensure that the new labels are visible in shops from 2021 (this change will be made in a separate Statutory Instrument).

60. Option 2 is our preferred option. Agreement at the EU level was reached for all the products at the end of a lengthy consultative process. The process for each product included:

    - a Review or Preparatory Study – at an EU level – which explored policy options, markets, users, technologies, the environment, economics, and product design. This process involved several public EU wide stakeholder meetings in which the UK participated;
    - initial ecodesign working draft regulations shared with Member States

(MS) and relevant stakeholders, (including UK stakeholders), for review prior to the Consultation Forum (CF);

61. A CF, attended by MS Officials, key manufacturers and non-governmental organizations (including from the UK);
    - notification of the draft regulation to the World Trade Organisation (WTO) for a period of 60 days;
    - publication of the draft regulation for the relevant product on European Commission's feedback mechanism portal;
    - Regulatory Committee meetings where the regulations were discussed and voted on by Member State Officials (including the UK).
62. The volume of expertise feeding into the studies, along with a substantive wide EU consultation, reduces the risk of the new regulations being disproportionate or unrealistic.
63. The Government also consulted with UK stakeholders and carried out a Cost Benefit Analysis prior to voting in favour of the regulations.
64. The UK is proposing to implement these requirements in GB law after the end of the transition period as they carry significant benefits in relation to realising the Governments Carbon Budget and Net Zero targets. This approach also reflects the commitment made in the Clean Growth Strategy to maintain existing high standards or go further where it is in our interests.
65. The Do Nothing option has also been considered and the impacts assessed. Under this scenario, the current EU regulations for washing machines/washer-dryers, dishwashers, and household refrigeration will be incorporated into GB law at the end of the transition period and the updates made in 2021 in the EU would not apply in GB. No ecodesign or energy labelling requirements would be introduced for commercial refrigeration. Most of the new and updated requirements agreed by the UK as a Member State at EU level in December 2018 and January 2019 would not automatically apply in GB after the transition period. The impacts of GB and the EU having different ecodesign requirements have been taken into account when assessing the Do Nothing option.

# 5 Overview of Costs and Benefits

66. This section outlines the costs and benefits examined in this Impact Assessment, including the costs to businesses. High-level figures are provided, along with general arguments as to the costs and benefits considered (and not considered). More specific information is provided in Sections: 6 Commercial refrigerating appliances, 7 Household refrigerating appliances, 8 Household dishwashers and 9 Household washing machines.
67. The draft Regulations will apply in Great Britain only. In accordance with the Northern Ireland (NI) Protocol, EU Ecodesign and Energy Labelling Regulations will continue to apply in Northern Ireland post-transition period. The effect of the NI protocol was tested during consultation and it was concluded that as regulations would be aligned across Great Britain, Northern Ireland and the EU, there will be no change to the impact of these measures as a result of the protocol.
68. Table 1 outlines the key costs and benefits that have been identified as relevant. The final column indicates how these have been considered in this Impact Assessment. A 30-year appraisal period (2021/22 to 2050/51) was chosen considering the average lifespans for the white goods products assessed. Data suggest that a typical lifetime for commercial refrigerating appliances varies from 8-9 years; household refrigerating appliances varies from 13-17 years; 15 years for household washing machines and 13-14 years for household dishwashers (see respectively Table 28 in Annex 2; Table 29 in Annex 3; Table 30 in Annex 4; Table 31 in Annex 5). Therefore, 30 years broadly represents a timeframe over which most of the existing stock of both products will be replaced with models that are compliant under the new requirements, and the full energy savings realised over their lifetime.
69. At present, we assume additionality of 25% for this Impact Assessment. Additionality reflects the adjustment we make to the overall costs and benefits of the policy intervention to reflect the fact that a proportion of these would occur in the counterfactual (in this case due to the fact that the regulations will be in force in the EU regardless of whether we implement

them or not, and the concerned markets are global ones). Therefore, we estimate that a quarter of the total costs and benefits to business and consumers would be realised.

70. This assumption was tested at consultation, where stakeholders indicated that UK manufacturers would follow standards in line with EU regulations for these products in the absence of GB regulation. An additionality of 25% reflects the effect of potential dumping of inefficient products onto the GB market by international manufacturers in the absence of GB regulation. A change in additionality factor causes the NPV to either decrease or increase proportionally, but it cannot result in the NPV becoming negative. For example, 25% additionality would reduce the NPV by four relative to the 100% additionality scenario.

### 5.1 Option 1: Do Nothing

71. The 'Do Nothing' option does not represent a policy change for household refrigeration, dishwashers and washing machines/washer-dryers nor regulation of commercial refrigeration. The existing EU regulations would continue to apply for these products. This option would, therefore, have no direct impact on manufacturers although there will be an indirect impact from having different requirements to the EU – potentially impacting on competitiveness and innovation. For those that sell solely in GB, the current regulations would continue to apply in the same way as before EU exit.

72. The main reason why this option has not been pursued further has been explained in Section 4.2. The Market Failures identified include consumer purchasing habits, split incentives and consumers understanding of the technical information.

73. Additionally, another key reason is the assumed UK proportion of white goods that are imported. Currently, BEIS desk-based research suggest that the UK imports almost all domestic and commercial white goods. Non-UK manufacturers who either choose not to plan or who fail to plan and adjust to the new EU regulations, may have an excess supply of products that do not comply with the new EU regulations. Thus, temporarily those products may reach the GB market and have carbon and energy bill

savings impacts.

74. UK manufacturers that export products to the EU, may face trade complications given that GB's requirements would not be the same as the EU's. If GB's requirements were to lag behind the EU for these products, the focus may change from innovation and quality to price. For UK manufacturers who export, the use of the current standard in ecodesign would result in double testing of the products (according to the GB standard and the EU/global standard), in which case UK manufacturers would be able to compete but at an increased cost (due to increased testing). Alternatively, it would result in testing of the products according to the current standard only, in which case they would not be able to compete on the EU market.
75. In a Do Nothing scenario, there may be scope to assume that UK manufacturers who do not export may be less motivated to innovate and produce products that comply with global requirements, as focus is likely to be shifted to price competition over increasing energy efficiency. Hence, the market and regulatory failures would persist, harmonised information on energy consumption would not be systematically generated and consumers would not be able to differentiate between high-efficient and low-/average-efficient appliances. So, the potential carbon emission and energy bill savings (see Section 0) would not be realised.
76. Under the Do Nothing option, there also may be scope for assuming that UK manufacturers would comply with the new EU requirements once they come into force due to economies of scale and the potential ease of meeting the requirements and/or because energy consumption is viewed as an important factor for such products. This would have the practical effect of GB having the same requirements as the EU without regulation. If this were to occur, broadly the same costs would still apply as under Option 2 (since enforcement and compliance costs are negligible compared with overall costs). However, there is a risk that businesses do not comply with EU requirements under the Do-Nothing Option.

### 5.2 Summary of costs and benefits of Option 2

77. The new requirements would impose a monetary cost (see Table 1) on

manufacturers of commercial and household refrigeration appliances, dishwashers and washing machines/washer-dryers. For the purposes of this Impact Assessment, we assume that manufacturers operate in competitive markets and increased costs are passed on to the end consumers through increased prices. This may be achieved through a marginal increase in the price of all products that are impacted, or through a more substantial increase to a sub-set of products that the manufacturer produces. If markets are not competitive, manufacturers may choose to absorb the increase in cost through reduced profits. However, we have no evidence that this would occur and therefore do not assume this is the case when undertaking our analysis. Consumers are still expected to purchase a new product at the end of its life cycle. A study found Domestic appliances to be relatively price inelastic meaning consumers are unlikely to change their demand for White Goods as the price changes.[26] Consumers also use relatively high implicit discount rates, when comparing appliance prices and appliance operating costs. Furthermore, as the increased cost to business is universal and we assume this to be a highly competitive market where businesses are unable to absorb the increased costs.

**Table 1: Summary costs and benefits of updating the ecodesign requirements for white goods (Option 2)**

| Group | Type of cost / benefit | Included in CBA or described qualitatively? |
|---|---|---|
| | **Costs** | |

[26] An Analysis of the price Elasticity of Demand for Household Appliances, accessed here: https://escholarship.org/uc/item/5qr2f2nz

| Group | Type of cost / benefit | Included in CBA or described qualitatively? |
|---|---|---|
| **Business/ industry** | Transitional (one-off) costs of implementing the policy, including familiarisation costs of understanding the requirements. These are likely to be minimal, however, as requirements for household refrigerating appliances, dishwashers and washing machines/washer-dryers already exist. Commercial refrigerating appliances meeting the new requirements are already on the market and investments in R&D already exist. | Included in CBA |
| | Labels will be applied to commercial refrigeration products for the first time so a small cost will be incurred. However, this is assumed to be negligible compared to the cost of manufacture, as energy labelling processes already exists for other, similar white goods products. | Described Qualitatively |
| | Increased manufacturing costs including any such transitional costs. These are assumed to be passed onto consumers - any increase in costs however would be offset by energy savings. | Included in CBA. |
| | **Benefits** | |
| | Product requirements consistent with EU requirements facilitating trade. | Described Qualitatively. |
| | Possible increased innovation leading to longer lasting, more efficient products in order to compete in the global market. | Described Qualitatively. |
| | Environmental benefits of improved resource efficiency for example, improved recyclability and repairability. | Described Qualitatively. |

| Group | Type of cost / benefit | Included in CBA or described qualitatively? |
|---|---|---|
| **Consumers (including businesses who purchase products)** | **Costs** | |
| | Higher price of products at the point of purchase (although offset by lower energy bills). | Included in CBA. |
| | Reduction in consumer choice (if some product types are removed from the market). Yet this is balanced against the benefit above of innovation, leading to new products on the market. | Described Qualitatively. |
| | **Benefits** | |
| | Lower energy bills over the lifetime of the product due to increased energy efficiency performance. | Included in CBA. |
| **Wider society** | **Costs** | |
| | Enforcement costs of imposing requirements. Costs are assumed to be negligible compared with the costs of products, especially since efficiency requirements already exist for household dishwashers, household washing machines, and household refrigerating appliances. | Described Qualitatively. |
| | **Benefits** | |
| | Lower electricity system costs – due to a reduction in energy use of the products. | Included in CBA. |
| | Carbon savings/reduction in greenhouse gas emissions. | Included in CBA. |
| | Air quality improvements. | Included in CBA. |
| | Possible creation of new jobs driven by the need to innovate and improve. | Described Qualitatively. |

78. Table 2 provides the high-level cost and benefit estimates of Policy Option 2 according to the costs and benefits outlined above for white goods. Option 2 (costed against the Do Nothing option) shows a Net Present Value of £367m with a benefit-cost ratio of around 2:1. Electrical energy

savings are expected to be around 10,000 GWh over the appraisal period (2021/22-2050/51) amounting to 0.8 million tonnes of Carbon Dioxide equivalent ($CO_2e$). More detail is provided in the sections which follow.

**Table 2: Estimated Costs and Benefits of Policy Option 2, 2021/22 to 2050/51**

| Costs/benefits, £m | Commercial Refrigeration | Household Refrigeration | Dishwash-ers | Washing machines and dryers | Total |
|---|---|---|---|---|---|
| Costs to manufacturers (assumed to be passed onto consumers) | 35 | 84 | 88 | 62 | **269** |
| Costs of increase in non-traded CO2e emissions (extra heating)[27] | 0 | 2 | 0 | 1 | **3** |
| **Total Costs (A)** | **35** | **87** | **88** | **62** | **273** |
| Value of energy savings (net) | 133 | 116 | 130 | 186 | **565** |
| Value of reduction in CO2e emissions | 13 | 10 | 10 | 15 | **49** |
| Net benefits of air quality improvements | 9 | 0 | 7 | 9 | **26** |
| **Total Benefits (B)** | **155** | **127** | **147** | **210** | **639** |
| Net Present Value (B–A) | 120 | 40 | 59 | 148 | **367** |
| Benefit Cost Ratio (B/A) | 4 | 2 | 2 | 3 | **2** |

Data in the main body of this Impact Assessment are presented in 2021 prices and present value (and, therefore differ from those on the front page which are 2016 prices and 2017 present values). Total figures may appear to not add up due to rounding.

79. All calculations were sourced from the BEIS Energy Using Products Policy (EUPP) Model which takes into consideration the costs and benefits associated with updating existing ecodesign requirements for each product

[27] For household users, it is assumed that extra heating is required to replace the reduced heat-loss of more efficient products. For non-domestic users it is, instead, assumed that any extra heating is offset by reduced cooling costs. See Annex 1 for more details.

separately.

80. It is worth noting that the air quality benefits for household refrigeration are much lower because they are the net of the heat replacement effect (HRE)[36] impacts, which for household refrigeration, is a 25% HRE factor. This means that 25% extra heat is required to replace the heat loss that would have otherwise been produced by the other, less energy efficient household refrigerator. The gross air quality benefits (based on gross energy savings) are reduced based on the additional air quality costs, due to the extra heating (to make up for the lost waste heat from the more efficient product). The reason why benefits are lower is because:
    1) No HRE is applied to commercial sector products
    2) Household washing machines have much higher gross energy savings and a much lower HRE factor (5%), meaning less extra heat is needed
    3) Household dishwashers have similar gross energy savings but a much lower HRE factor (5%), meaning less extra heat is needed

81. The modelling takes into consideration different sub-technologies, using:
    - forecasted sales/stock figures;
    - estimates for additional costs arising from producing products compliant with new/updated regulations under Option 2 compared with Option 1;
    - forecasted level of usage (in hours/year);
    - estimates for the energy usage (in kWh/year/unit), again for products compliant with the regulations under Option 2 compared with Option 1; and
    - the expected lifespan of products (before a replacement is required).

82. High-level descriptions of the modelling approach are outlined in the following sections along with the outputs. More detailed descriptions are provided in Annex 1 to Annex 5, along with the key modelling assumptions.

### 5.2.1 Transitional costs

83. Generally, transitional (one-off) costs of implementing the policy, include familiarisation costs of understanding the requirements, and are inclusive of training staff and setting up IT.

84. For household dishwashers, household washing machines/washer-dryers, and household refrigeration, the proposed requirements would be an amendment of existing regulation, therefore transitional costs are expected to be minimal as the general processes are already established. Manufacturers are already required to provide technical details and the product information would be readily available to them. The EU's additional assessment[10,13,17] of their review study into existing regulations for these three products concluded that additional costs of updating the regulations such as approbation, changes in packaging, marking etc would be negligible.
85. For commercial refrigerating appliances, "there is currently no EU legislation specifically dealing with the energy consumption of commercial refrigeration equipment"[28]. This makes it difficult to qualitatively assess the potential transitional costs for commercial refrigerating appliance manufacturers resulting from policy Option 2. However, stakeholders commented on the expected negative impacts of the draft regulation proposed at an EU level and noted that such costs would have a low impact or would be insignificant, with no bottlenecks being identified[10]. But it was also noted that SMEs may have to invest in testing facility capacity to test/calculate the energy use of all product ranges, which may have a moderate impact/cost.
86. Comparatively then, these costs are small in relation to overall costs and benefits. Following feedback in the consultation we have included a small, one-off cost to monetise the impact of reading and understanding the legislation. This cost, valued at £408,000 in total for all UK businesses affected, will be realised in 2021 only. This transitional cost is calculated by multiplying the cost of half a day of labour by the estimated number of

[28] COMMISSION REGULATION (EU) - laying down ecodesign requirements for refrigerating appliances with a direct sales function pursuant to Directive 2009/125/EC of the European Parliament and of the Council. Available from https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2018-6068769_en

businesses that manufacture white goods.

87. A combination of national statistics and estimates based on the consultation and BEIS intelligence informs this transition cost.

- The number of GB businesses affected is estimated from the UK Business Count database for the relevant industries.[29]
- For hours taken, although the substance of the requirements is the same as the EU regs, the structure of the GB legislation will be different. This means that the requirements may be presented slightly differently in the legislation and so it may take businesses a bit more time to confirm that they are definitely compliant with the new regulations and to reassure themselves that the GB requirements are in effect identical to those in the EU. This has been estimated as three-quarters of a day's labour owing to the possibility that white goods manufacturers make more than one type of product.
- To estimate the price of labour it has been assumed reading and comprehending legislative text is unlikely to be low paid work. For small and micro businesses it is likely that the business owner will take responsibility. In large companies it is likely to be members of a legal department or an expert at interacting with Government. This is reinforced by job titles included in responses to the consultation.[30] The Annual Survey of hours and Earnings finds the median hourly earnings for full-time legal professionals and quality and regulatory professionals to be £23 and £19 per hour respectively.[31] As a result of this a £20 per hour cost of labour has been assumed. An opportunity cost equal to the transitional cost has been included to account for this member of staff being diverted from other duties.

[29] SIC codes: 2751. Data accessed here: https://www.nomisweb.co.uk/query/construct/submit.asp?menuopt=201&subcomp=

[30] Job titles include: Senior Product Specialist, Head of EU technical market access.

[31] Earnings and hours worked, occupation by four-digit SOC: ASHE Table 14 accessed here: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/occupation4digitsoc2010ashetable14. SOC codes 241 and 246

88. The EU expects transitional costs to be moderate, particularly for small and micro sized businesses (SMBs), given the increasing difficulty that manufacturers face in accessing new technologies and efficient components in the highly competitive market, for which prices are increasing. Based on this, we assume that UK SMBs are involved in the same market, so we expect their transition costs to be the same.
89. This cost has been calculated for the entirety of the white goods eco design package. Therefore, the figure only appears in the headline cost-benefit tables and not for the individual products. This is due to lack of sufficiently granular data.
90. There are certain caveats to the calculation of this cost that lead us to think of it as a high, or worst-case scenario cost estimate.
91. It is unlikely that all the businesses involved in the manufacture of domestic appliances produce products impacted by these regulations. This leads to the cost being overestimated.
92. This cost estimate does not account for the impact and influence of Trade Associations. Comments in the consultation suggested that a certain amount of knowledge sharing would take place. Trade associations will be able to help businesses to understand the new regulations. Businesses will also aid other businesses. If not every business needs to devote labour to reading the legislation then our cost estimate is again likely to be high.

## 5.3 Non-monetised costs and benefits

93. This section examines the additional costs and benefits that, for proportionality reasons, have not been monetised. To indirectly take these into account in the CBA, sensitivity analysis has been undertaken (in Section 0).

### 5.3.1 Resource Efficiency

94. Ecodesign requirements for resource efficiency are being introduced for the first time for these products through the regulations for white goods and will not conflict with the energy efficiency requirements.

95. Resource efficiency covers requirements such as those to ensure that white goods are designed in such a way as to facilitate reuse, repair and recycling of the product. Resource efficiency also includes information requirements where specific information is required in instruction manuals and on free to access websites. This includes the manufacturers name, product type, and parameters related to energy efficiency. Resource efficiency is an important aspect as these measures, can increase the lifespan of the product and reduce its end of life environmental impact. Information requirements can also fundamentally affect the consumption rate of refrigerants and cleaning liquids, which can be expensive to produce and to dispose of.
96. The overall savings of resource efficiency requirements on it however were not quantified. These savings were assessed qualitatively and predicted to be modest in comparison to the respective energy savings.
97. Resource efficiency requirements require white goods to be designed in such a way that spare parts can be accessed and removed with commonly available tools. How much exactly this change in design will change manufacturing cost is uncertain, as well as the extent of design change for different types of white goods product. However, significant costs related to resource efficiency were not identified by stakeholders during consultation so these costs potential costs have also not been quantified.
98. An unavoidable impact of achieving the policy goal of longer product lifetimes is a corresponding decrease in the number of new products sold, which negatively impacts manufacturers. The expected increase of repairs (after expiry of the legal guarantee) would offset this to a certain extent.
99. Retailers who act only as intermediaries between manufacturers and consumers could expect to be negatively impacted by lower annual sales volumes due to longer product lifetimes. This would be compensated in part by the expected corresponding increase in the market for spare parts, which retailers can also profit from. Also, given the fact that the market for white goods is not saturated, the effects on sales would be expected to be lower. The overall impact on retailers is expected to be neutral to slightly negative.
100. One objective of the resource efficiency measures is to improve the

competitiveness of independent repairers and facilitate a more open playing field in repair activities. The impacts of proposed measures on these businesses, mostly SMEs[32], is expected to be positive. Increases of 15%-20% in repairs were observed after the consumption law came into force in France[33].

101. Measures requiring availability of spare parts and access to repair information should help independent repairers to overcome barriers currently limiting their capability to compete, widening the range of products which they could repair. This is expected to greatly outweigh the potential negative effect of lower profit margins caused by increased competition between repair services. Additionally, lower costs for repair are expected to drive up the overall demand for repairs, as studies show that consumers currently cite (perceived) high costs as the main reason to not repair but replace appliances. Overall, the impact on repair businesses is expected to be positive (see Section 10).

102. Longer product lifetimes would have an evident positive impact on second-hand retailers. Better and cheaper repair options would benefit businesses that combine repair and second-hand sale of appliances. Overall, the effects of proposed measures on second-hand retailers are expected to be positive.

103. Longer product lifetime could mean less availability of discarded machines to recyclers, which would be a negative impact. However, the requirements for disassembly will facilitate extraction of valuable materials from discarded devices and make it easier to depollute materials. This will cause a positive effect in the long term (once devices reach recycling facilities). Improved extractability of the key components due to better disassembly will increase the recovery rate of copper and precious metals

[32] See Section 10, Table 26.

[33] The Consumption Law of 17 March 2014, effective as of March 2015, has placed an obligation on product retailers to inform the customer about how long spare parts will be available for the products in the market.

such as gold, palladium and silver, with an estimated yearly potential economic benefit of £5.3m - £5.5m[34] (similar results are expected for the washing machine and refrigeration sectors). The overall impact on recycling businesses is expected to be positive.

### 5.3.2 Enforcement and Compliance Costs

104. Enforcement and compliance costs are not easily quantified. Enforcement action would be undertaken where the market surveillance authority believed there was sufficient risk-based justification to do so, in line with their enforcement policy[35]. Additional costs are, however, considered minimal given that requirements already exist for dishwashers, household washing machines/washer-dryers, and household refrigerating appliances and would continue to apply under the Do Nothing Option.

105. The energy label requirements will be new for commercial refrigerating appliances, so a small administrative burden is expected, but costs are expected to be low compared to the ecodesign requirements under Option 2.

106. Testing costs may increase under Option 2 but any potential extra cost is expected to be absorbed by the respective industry. For any UK manufacturers of commercial refrigerating appliances, the frequency of testing may increase due to the introduction of an energy labelling scheme thereby increasing testing costs. However, regardless of the proposed measures, manufacturers will be obliged to test products under the Do Nothing Option or under Option 2 (except manufacturers of commercial refrigeration appliances), otherwise they will not be able to compete.

107. Moreover, because UK imports of white goods are expected to be nearly 100%, the overall testing costs that would fall on to the UK white

[34] Ardente, F. & Talens Peirò, L. (2015). Environmental Footprint and Resource efficiency Support for Product Policy: Report on benefits and impacts/costs of options for different potential resource efficiency requirements for Dishwashers. Available at http://publications.jrc.ec.europa.eu/repository/bitstream/JRC95187/lb-na-27200-en-n.pdf .

[35] OPSS enforcement policy, May 2018. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/712141/safety-and-standards-enforcement-enforcement-policy.pdf.

goods sector would be minimal. Rather, the expected increase in frequency of testing or cost of testing, is expected to positively benefit UK SMBs involved in this sector, who would have the opportunity to profit from the increased demand. Finally, at present, BEIS desk-based research indicates that there are few, if any, UK manufacturers of white goods, so an increase in testing costs would not have a large-scale effect. However, in any case, any such costs may fall disproportionately on to smaller businesses and are therefore considered in the Small and Micro Business Assessment (SaMBA) (see Section 10).

108. As suggested in HM Government's OIOO (One-In, One-Out) Methodology[36], the cost and benefits calculated have assumed 100% compliance since we have no evidence to suggest it would be otherwise. Lack of compliance would, however, impact on both costs and savings. Given the uncertainty, and the scale of the impact, differing levels of compliance are implicitly investigated through the Sensitivity Analysis (see Section 0 and the corresponding sections for each white goods product).

### 5.3.3 Distributional Impacts

109. In setting ecodesign requirements, the EU Commission took distributional impacts into account. A key constraint in setting requirements is that those should have no significant negative impact on consumers as regards to the affordability and the life cycle cost of the product[1]. Although more efficient products may have marginally higher up-front cost, businesses and consumers will see savings from their energy bills.

### 5.3.4 Trade Impacts

110. In terms of impact on UK trade with the EU, the proposed Ecodesign requirements are expected to facilitate UK-EU trade of white good

[36] HM Government's OIOU (One-In, One-Out) Methodology, July 2011. Available at: http://ec.europa.eu/smart-regulation/refit/admin_burden/best_practice_report/docs/5.pdf.

products[37]. In terms of estimated total import and export quantity (tons), the UK imports 48% of white goods from the EU and exports 87% of electronic displays to the EU. But in terms of estimated monetary value (£), 52% of the UK's total imports of white goods are imported from the EU, and 78% of the UK's total exports of white goods are exported to the EU. The remaining majority of UK imports and exports of white goods (for both quantity and value) are largely comprised of UK-US and UK-Asia trade. For context, total UK imports and exports of White Goods are worth £1.9 billion and £285 million respectively.[38]

111. Therefore, UK imports and exports large quantities of white goods from and to the EU, and the value of trade with the EU is very high, given around half of UK imports and around three quarters of UK exports are attributed to trade with the EU. Since the EU will be committing to the proposed Ecodesign requirements, UK imports of white goods in terms of both quantity and value, will likely not change significantly, given that prices are not expected to rise significantly. For similar reasons, UK exports too are likely to not change significantly, as it would most likely not be in UK businesses' best interest to forego nearly three quarters of the sector's export value, unless there was certainty that this value of trade could be achieved elsewhere.

### 5.3.5 Further Impacts

112. We have not attempted to monetise the direct costs, under Option 2, of the potential effect that the UK's increasing requirements for commercial and household refrigeration, washing machines/washer-dryers and dishwashers could have on innovation. Requiring UK manufacturers to improve efficiency would create considerable opportunities to innovate,

[37] All trade data was sourced from the International Trade Centre (ITC) Trade Map using the following 6-digit level HS codes: 841430; 841810; 841821; 841830; 841840; 841850; 847621. For quantity, 2016 figures were used, as this was the most recent year in which comparable data existed. For value, a 2016-2018 average was taken. ITC Trade Map available at: https://www.trademap.org/

[38] ITC Trade Map accessed here: https://www.trademap.org/Index.aspx?nvpm=1%7c%7c%7c%7c%7c%7c%7c%7c%7c%7c%7c%7c%7c%7c%7c%7c%7c%7c%7c

which has possible benefits such as improved consumer choice, investment in industry, and knowledge spill-over. However, it was considered disproportionate to quantify this given the complexity and the uncertainty in the level of innovation that might be achieved.

113. For the same reasons, it was considered disproportionate to attempt to quantify the additional benefit of Option 2 in setting the same requirements as for EU manufacturers (such as for ease of trade with the EU) or, similarly, the costs of Option 1 in manufacturers having different requirements to comply with.

114. The potential benefits of energy labelling for commercial refrigeration were not monetised because it is extremely challenging to directly attribute any energy savings to labelling policy. However, there has been a huge increase in the number of products in the higher efficiency classes (see paragraph 63) since requirements were introduced for other products, suggesting that labelling has a positive effect on energy savings.

115. We also recognise the importance of energy labelling, which is recognised globally as one of the most effective policy tools in the area of energy efficiency[39]. The energy label allows UK industry to distinguish itself based on quality and innovation rather than solely on price. For consumers, the energy label offers a unique opportunity to make an informed choice as to which products offer the best environmental and energy performance allowing them to save money in the long run. Studies show that across Europe, 69% of consumers consider environmental issues such as energy use as the most relevant with respect to purchasing White Goods products[40]. Due to the current overpopulation of the top energy classes, energy efficiency improvement cannot be shown to consumers and will therefore not be rewarded in the price of the product. It

[39] IMPACT ASSESSMENT - laying down ecodesign requirements for refrigerating appliances with a direct sales function pursuant to Directive 2009/125/EC of the European Parliament and of the Council. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2019.315.01.0313.01.ENG&toc=OJ%3AL%3A2019%3A315%3ATOC

[40] The case for the “A.I.S.E. low temperature washing” initiative, Substantiation Dossier / June 2013

is expected that the policy will give sufficient incentive for manufacturers to improve the energy efficiency of their products as to reach the new A and B levels that can then be sold at a higher price.

116. Whilst there is a potential cost as labelling is being introduced for the first time for Commercial Refrigeration, most manufacturers of these products already produce energy labels for other products they produce.

117. For manufacturers and retailers, the energy label is one of the main market drivers and an important quality feature, as energy labels are a powerful tool to help drive innovation because they secure recognition for the best performing products. For consumers, the energy label offers a unique opportunity to make an informed choice as to which products offer the best environmental and energy performance allowing them to save money in the long run.

## 5.4 Sensitivity Analysis

118. Annex 1 provides an overview of the model used for the CBA. Several modelling assumptions have been made which carry varying levels of uncertainty. These are explained in detail for each product in Table 28, Table 29, Table 30, and Table 31

119. Table 3 below indicates the relative sensitivity of a variable and how this affects the overall costs/benefits. A variable with a 'high' risk rating has 1.5 times the percentage uncertainty of a 'medium' risk rating variable, and a 'low' risk rating variable has half of the uncertainty of a medium risk variable. Variables used in the modelling are proportional to the NPV, therefore those with a higher risk rating are more sensitive to variations in modelling.

120. From Table 3, Cost and Energy Use are the variables which are likely to have the biggest impact on NPV and could change by ±10%. In isolation, either one would change the NPV by the same percentage. The other variables are less likely to change so would therefore affect the NPV less.

*Table 3: Outline of the sensitivity of the model by variable*

| Variable | Risk rating | Impact on Costs | Impact on benefits | Comment |
|---|---|---|---|---|
| Cost (£) | Medium | The cost value could change by up to ±10%, resulting in a ±10% change to overall costs. | None. | The model assumes Costs and Stock/Sales figures are independent, therefore, a change in the cost of products has no impact on the volume of products sold/in stock. Benefits therefore remain unaffected. |
| Sales/Stock | Low | The sales/stock value could change by up to ±5%, resulting in a ±5% change to overall costs. | The sales/stock value could change by up to ±5%, resulting in a ±5% change to overall benefits. | Overall costs and benefits are directly proportional to the size of the Sales/Stock. |
| Use (hours/year) | Low | None. | The use value could change by up to ±5%, resulting in a ±5% change to overall benefits. | The number of hours in a year a product is used has no effect on costs (since use does not affect the lifetime in the model nor on sales/stocks) but is directly proportionate to the overall energy use, and hence benefits. |
| Energy Use (kW) | Medium | None. | The energy use value could change by up to ±10%, resulting in a ±10% change to overall benefits. | The power used by a product has no effect on costs (to buy the product) but is directly proportionate to the overall energy use, and hence benefits. |
| Lifespan | Low | Related. | Related. | The products' lifespan in the model affects both the costs and benefits but not proportionately. The shorter the lifespan, the greater the costs and benefits (due to the older stock being replaced more quickly). |

| | | | | |
|---|---|---|---|---|
| Additionality | High | Directly related. | Directly related. | A change in the additionality assumption has a proportional effect on the costs and benefits, and therefore NPV. We consider it possible that additionality of each product could vary by +/- 25%[41]. |

A change of ±10% in the variables is used as the base uncertainty which is then multiplied by the risk factor (1.5 for high; 1 for medium; 0.5 for low risk) to obtain the percentage impact change.

121. A range of costs and benefits were considered to model potential divergence in the actual input variables from those estimated by the model. These consider both divergence in future values from those estimated as well as un-monetised costs and benefits, including compliance.

122. Whilst the total benefit to cost ratio (BCR) is high, at 2.0, this value varies across the four products which make up the White Goods grouping. Domestic Refrigeration has the lowest BCR at 1.5. Total domestic refrigeration costs would still need to rise by £40 million (46%) to tip the BCR negative. Therefore, despite the variation, the four products covered by these regulations have sufficiently positive BCRs to be economically viable by themselves.

## 5.5 Risks

123. In the following sections, we consider the specific risks associated with the models behind the white goods products. In general, however:

- Figures assume all costs will be incurred by UK consumers. Some costs may be absorbed by non-UK businesses (manufacturers and/or retailers in the supply chain) which will reduce the costs to the UK.

[41] The variation in our additionality estimate will primarily depend on the extent to which the ecodesign requirements under Option 2, and the effect of the NI protocol, prevent less energy efficient products reaching the UK.

- Future sales figures are, perhaps, the most uncertain of the input variables. However, as described in Annex 1, these affect both costs and benefits in the same proportion. While any such changes may well affect the scale of the NPV, they alone should not result in the NPV becoming negative.
- Similarly, lower than 100% compliance figures would likely affect costs as well as benefits. Although some consumers may still end up buying products which do not meet the requirements, they are likely to do so at a lower cost.
- The costs included in Table 3 do not include those incurred by businesses potentially adhering to multiple requirements (under Option 1) or the additional benefits that ease of trade with the EU under this option would bring. Further, there are additional benefits of Option 1 with respect to innovation and increasing competitiveness, in line with the UK's Industrial Strategy. While hard to monetise, their impact (of increasing the NPV for Option 2) cannot be ignored when considering these scenarios.
- The energy consumption modelled under Option 1 does not consider a potential increase in stock of less efficient products entering the GB market under this scenario. The realised benefits of Option 2 are, therefore, likely to be an underestimate.
- Although future energy costs are uncertain, changes would affect both options considered in the CBA.
- The model does not account for the link between costs and sales. However, if the manufacturing costs were higher than expected, the possible corresponding reduction in sales would constrain the scale of the impact on the overall costs.

124. For those reasons, we consider a reduction in the NPV for all products unlikely.

## 5.6 Impact on UK businesses

### 5.6.1 Direct Costs and Benefits to UK Businesses

125. This section considers the costs and benefits of the proposal to UK businesses. It is restricted to UK-based manufacturers and UK business purchases of white goods. The proposed requirements have no impact on

products manufactured in, and then exported from the UK, since manufacturers are only obliged to meet the requirements of the country they are exporting to.

126. As per the guidance from BEIS[42], we consider only the *direct* costs to businesses here. These then include manufacturing costs which, elsewhere, are assumed to be passed onto consumers.

127. The costs imposed by these regulations can be considered direct because they clearly fulfil two of the three criteria laid out in case studies.[43] First, the impact falls on businesses subject to the regulation and accountable for compliance. Second, the impacts are generally immediate and unavoidable. Increased minimum energy performance standards will lead to an instant, and permanent shift in the supply curve for manufacturers of products which fall beneath the new standards.

128. These measures could also lead to indirect costs and benefits. The removal of lower performing products could drive innovation in energy efficiency. These would both be considered indirect impacts of the policy.

129. Currently, we are able to identify information that provides evidence of the existence of few UK manufacturers involved in the white good sector, but we do not currently have sufficient evidence that could provide a more definitive figure. In Table 4 below, we present the direct costs for the range 90% to 100%. All three scenarios show a positive Business NPV within the range £74m to £98m. Analysis suggests that the crossover to a negative total NPV occurs when the percentage of imports is around 50%. Given that 95% is currently considered a conservative estimate, we are confident that the true proportion is not lower than 50% and that the impact on businesses is, therefore, positive overall.

130. For UK-based manufacturers selling within the UK, the direct costs

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[42] Business Impact Target: statutory guidance, 2019. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/776507/Busines_Impact_Target_Statutory_Guidance_January_2019.pdf

[43] RPC case histories - direct and indirect impacts, March 2019. Accessed here: https://www.gov.uk/government/publications/rpc-case-histories-direct-and-indirect-impacts-march-2019

determined to be in scope are the:

131. Ongoing costs of producing policy-compliant products. These include the increased variable costs of, for example, more expensive component parts and/or more advanced/expensive manufacturing processes.

132. Short-term, transitional costs of changing manufacturing processes and becoming familiar with the regulations. Manufacturers will have to invest resources (staff costs) into understanding how this affects them as well as the physical resources required to adhere to the regulation, including testing equipment and new IT/software purchases. A one off transition cost has been monetised in paragraph 86.

133. Given that commercial refrigeration covers non-domestic products, we consider all purchase costs for UK business consumers of commercial refrigerating appliances to be direct business costs, since the requirements would increase the cost of their purchases. However, these business consumers would also see reduced energy costs. Since these energy savings would be automatic through use of their compliant purchases – and not from a change in behaviour – we also consider these to be direct. When considering business purchases from UK manufacturers, we need only consider either the manufacturing or purchase costs to avoid double-counting.

134. Reduction in GHG emissions and improvement in air-quality are assumed to be benefits for the wider society and have, therefore, not been considered for businesses.

### 5.6.2 Other costs and benefits to business

135. Other benefits of Option 2 to manufacturers (see Section 1.1) include maintaining consistency with respect to these particular products with EU manufacturers and a likely increase in innovation, raising competitiveness. Since these are indirect costs, they have not been considered here. It is not possible to say that manufacturing costs will be absolutely zero, even under a 100% import scenario. Therefore, for all domestic white goods (household refrigerating appliances, dishwashers and washing machines/washer-dryers), we estimate costs to be near to zero. During consultation stakeholders were invited to provide evidence of white goods

manufacturers present in the UK, but no evidence has been provided to alter our assumptions. Table 4 below shows the overall benefits to UK business. Sections 6, 7, 8, and 9 provide greater detail for each individual product.

136. Table 5 below shows the related Business Net Present Value and Business Impact Target Score. Business NPV for the domestic products is negative as UK manufacturers of these products would not receive any of the direct benefits such as energy savings but direct costs would still apply. However, this does not consider the nature of the business involved in the white goods market. This is explained further in Section 10.

*Table 4: Summary of costs and those directly impacting on UK businesses (2021 prices).*

| **Costs/benefits** | **Total (£m)** | **Of which direct business costs (£m) if…** | | |
|---|---|---|---|---|
| | | **90% imported** | **95% imported** | **100% imported** |
| Costs to manufacturers/business purchasers | 269 | 59 | 47 | 35 |
| Costs of increase in non-traded $CO_2e$ emissions (extra heating)[27] | 3 | 0 | 0 | 0 |
| **Total Costs (A)** | **273** | **59** | **47** | **35** |
| Value energy savings (net) | 565 | 133 | 133 | 133 |
| Value of reduction in $CO_2e$ emissions | 49 | 0 | 0 | 0 |
| Net benefits of air quality improvements | 26 | 0 | 0 | 0 |
| **Total Benefits (B)** | **639** | **133** | **133** | **133** |
| **Net Present Value (B–A)** | **367** | **74** | **86** | **98** |

Note that totals may not appear to add up due to rounding. Benefits to UK businesses are 0 for household appliances because they are domestic products.

*Table 5: EANDCB and Business Net Present Value for Option 2 (under the 95% import scenario).*

| | Total 2021 Prices, 2021 present value (£m) | Commercial refrigeration | Household refrigeration | Household Dishwashers | Household Washing Machine and Dryers |
|---|---|---|---|---|---|
| Business Net Present Value | 86 | 98 | -4.2 | -4.4 | -3.1 |
| Equivalent Annualised Net Direct Cost to Business (EANDCB)[44] | -5 | -5 | 0.2 | 0.2 | 0.2 |
| Score for Business Impact Target (BIT) | -23 | -26 | 1.1 | 1.2 | 0.8 |

Note that totals may not appear to add up due to rounding. Under a 95% import scenario, costs are not applicable for all domestic household dishwashers or washing machines/washer-dryers, so we estimate costs to be near to zero.

[44] The Equivalent Annual Cost is calculated by dividing the net present value through an annuity rate. This rate can be calculated using the formula: a = (1+r)/r * [1- 1/(1+r)^ t], where r is the interest rate (3.5%) and t is the number of years over which the NPV has been calculated (31).

# 6 Commercial refrigerating appliances

137. Section 5 provided an overview of the costs and benefits of Option 2. This section examines those specifically for commercial refrigerating appliances. It begins with a detailed description of the product itself and the proposed requirements.

## 6.1 Commercial refrigerating appliances: Overview

138. Commercial refrigerating appliances are insulated cabinets that are controlled at specific temperatures, cooled by natural or forced convection through one or more energy consuming means. They are used in supermarkets and small shops for displaying and selling food, drink, and other items at specified temperatures. The appliances covered include supermarket refrigerating cabinets, beverage coolers, ice-cream freezers, gelato-scooping cabinets and refrigerated vending machines.

139. Commercial refrigerating appliances in scope include electric mains-operated refrigerating appliances with a direct sales function, including appliances sold for refrigeration of items other than foodstuffs. The scope of ecodesign requirements does not apply to several commercial refrigeration products which are listed in Annex 1.

140. Around 190,000[45] commercial refrigerating appliances are sold in the UK annually. Annual sales outputs were extracted based on data from a 2003 BSRIA study (see Table 28, Annex 2 for more detail), under the assumption that stock remains constant over time.

[45] Estimate based on installed stock values for the EU scaled to UK using UK proportion of EU population. The EU figures are from the JRC 2014 preparatory study available at: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC91168/comm_refrig_published_bkg_doc%20-%202014%20august%2026.pdf – see Assumptions log in Annex 2 for further detail.

141. The European Commission's most recent Preparatory Study on commercial refrigerating appliances[46] concluded that an ecodesign regulation was needed to secure energy savings. Some countries already apply minimum energy performance standards (MEPS) and/or information requirements for commercial refrigeration equipment. MEPS currently apply in Australia, New-Zealand, China, Mexico, and the US. China and Mexico are the only economies that apply mandatory energy labelling for refrigerated display cabinets. In addition to the MEPS, Australia applies a high efficiency designation scheme and the US operates voluntary labelling through Energy Star.

142. Introducing requirements as set out in Option 2 will require manufacturers to:

- ensure that the energy efficiency index (EEI) of refrigerating appliances should not be above the values set out in the draft regulations;
- meet certain resource efficiency requirements regarding the availability of and access to spare parts and maintenance information to facilitate repairs;
- ensure that commercial refrigerating appliances are designed in such a way that certain materials and components can be removed with the use of commonly available tools, as set out in the draft regulations;
- provide instruction manuals for users and make them available on free to access websites including the information set out in the draft regulations;
- ensure that each refrigerator is supplied with a printed label in the format set out in the draft regulations.

## 6.2 Commercial refrigerating appliances: Costs and benefits of Option 2

143. The EUP CBA model was split into four separate sub-models based

[46] Ecodesign preparatory report on commercial refrigeration 2014

on each specific refrigerating appliance, with each sub-model examining the impact of the regulatory changes on commercial refrigeration appliances. The sub-models are split based on the following technologies: supermarket refrigerated (freezer or refrigerator) display cabinets: beverage coolers: small ice-cream freezers: and refrigerated vending machines.

144. For each sub-technology, a single representative model was developed, which represents a 'notional' market average product. In reality, this product does not exist, but its energy consumption and cost represent averages (see Annex 1) that are multiplied by estimates of UK commercial refrigeration appliance sales in order to estimate UK energy consumption.

145. Gelato-scooping cabinets have been excluded from the model as these represent a small proportion of the UK commercial refrigeration installed stock.

146. Each model uses the following inputs which are generated from raw data:

- forecasted sales/stocks figures
- forecasted levels of usage (in hours/year);
- average power demand (in kW);
- technology ("Tech") demand values;
- expected technology lifespan (before a replacement is required). A more detailed description is provided in Annex 1.

147. The numbers below in Table 6 and Table 7 show the effects of the proposed ecodesign requirements for commercial refrigerating appliances compared with Option 1 (Do Nothing). Low and high scenarios of ±10% have been presented as indicative variances from the central estimate due to unknown uncertainty. Based on more in-depth sensitivity analysis provided in Section 0 which considers the sensitivity of each variable used in the modelling, ±10% is the expected maximum range for which costs and benefits could vary. Figure 6 and Figure 7 show the cumulative costs/benefits and energy savings respectively for the central estimate.

*Table 6: Discounted costs summary for commercial refrigerating appliances (2021 prices)*

| £m | Low (-10%) | Central | High (+10%) |
|---|---|---|---|
| Costs to manufacturers (assumed to be passed onto consumers) | 32 | 35 | 39 |
| Total costs of increase in non-traded $CO_2e$ emissions | 0 | 0 | 0 |
| TOTAL | **32** | **35** | **39** |

*Table 7: Discounted benefits summary for commercial refrigerating appliances (2021 prices)*

| £m | Low (-10%) | Central | High (+10%) |
|---|---|---|---|
| Value of energy savings | 120 | 133 | 146 |
| Value of reduction in $CO_2e$ emissions | 12 | 13 | 14 |
| Net benefits of air quality improvements | 8 | 9 | 10 |
| TOTAL | **140** | **155** | **171** |

Figures have been rounded so may not appear to sum correctly.

*Figure 6: Estimated energy use under Options 1 (Do Nothing) and 2 (updating ecodesign requirements) for commercial refrigerating appliances and the cumulative energy savings of implementing Option 2.*

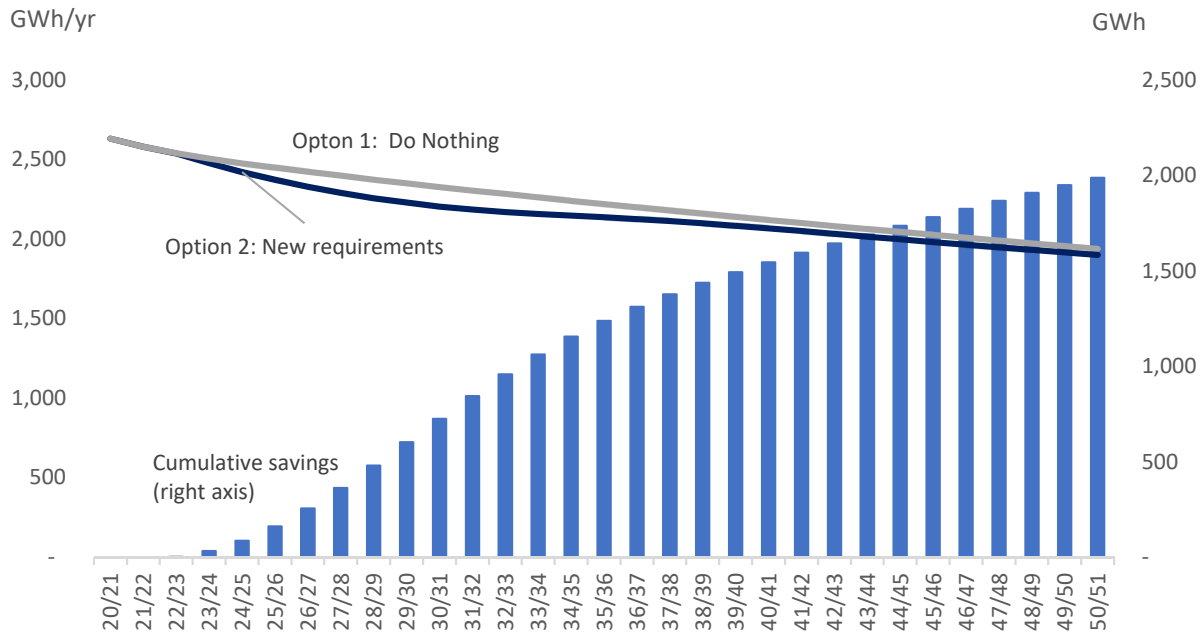
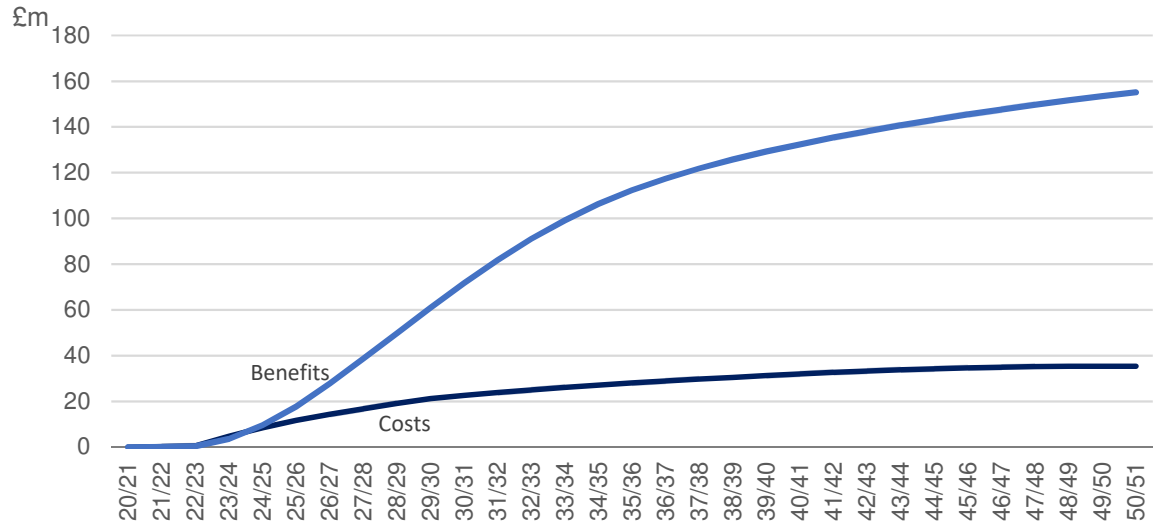



*Figure 7: Cumulative costs and benefits of Option 2 for commercial refrigerating appliances (2021 prices).*




Note that the modelling includes cost-scaling whereby, towards the end of the appraisal period, costs reduce year-on-year. This considers products whose costs would be incurred but benefits only partially realised during the appraisal period.

148. The proposed regulation for commercial refrigerating appliances delivers an estimated NPV of £120m and is expected to save around 1,988 GWh of electrical energy and 0.2 million tonnes of $CO_2e$ over the appraisal period (2021/22 to 2050/51). Annual energy savings amount to around 50 GWh by the end of the appraisal period.

149. Annual energy savings (the difference between the estimated energy use of the two options) increase year-on-year at the start of the appraisal period (Figure 6) as the non-compliant stock gradually gets replaced by commercial refrigerating appliances which meet the requirements under Option 2. Once the stock has largely been replaced (by around 2034/35), annual energy savings remain broadly static. Additional costs under Option 2 occur at the point of purchase only, whereas the energy saving benefits are accrued over the lifetime of the product. This results in cumulative costs exceeding benefits (Figure 7) during the early part of the appraisal period, providing a positive NPV (where benefits exceed costs) from 2025 onwards. It is also the reason why the modelling scales down costs towards the end of the appraisal period (as shown in Figure 7). Not scaling would result in all the costs, yet only part of the benefits, being considered for products purchased towards the end of the appraisal period, negatively affecting the net present value.

150. The per unit compliance costs reduce over time based on a scaling factor. This is because reference scenario efficiencies are improving over time and the factor reduces costs in line with this. The reason why the cumulative costs nearly flatten out in 2035 is because the compliance costs for refrigerated display cabinets (which consume 10x the energy annually compared to the other modelled products) are assumed to drop to zero. However, other products modelled continue to incur costs and benefits through to 2050, so the cost curve does not flatten completely.

### 6.2.1 Commercial refrigerating appliances: Non-monetised costs and benefits

151. This section examines the additional costs and benefits that, for proportionality reasons, have not been monetised. To indirectly take these into account in the CBA, sensitivity analysis has been undertaken in Section 0.

152. Specifically, for commercial refrigerating appliances, there would be costs associated with the requirements to provide, on websites and instruction manuals, the following:

- the recommended setting of temperatures in each compartment for optimum food preservation;
- an estimation of the impact of temperature settings on food waste;
- instructions for the correct installation and end-user maintenance, including;
    - cleaning of the appliance with a direct sales function;
    - access to professional repair such as internet webpages, addresses, contact details;
    - relevant information for ordering spare parts, directly
    - the minimum period during which spare parts are available;
    - the minimum duration of the guarantee

153. However, these costs will be small in relation to overall costs and benefits of the policy option. Monetising such costs is therefore considered disproportionate. However, any such costs may fall disproportionately on to smaller businesses and are therefore considered in the SAMBA (Section 10).

154. Further, compliance and distributional costs were considered

negligible as outlined in Section 1.1 Similarly, additional benefits of innovation due to UK manufacturers being required to improve efficiency and in having the same requirements as for EU manufacturers (particularly for ease of trade with the EU) were not considered.

## 6.3 Commercial refrigerating appliances: Sensitivity analysis

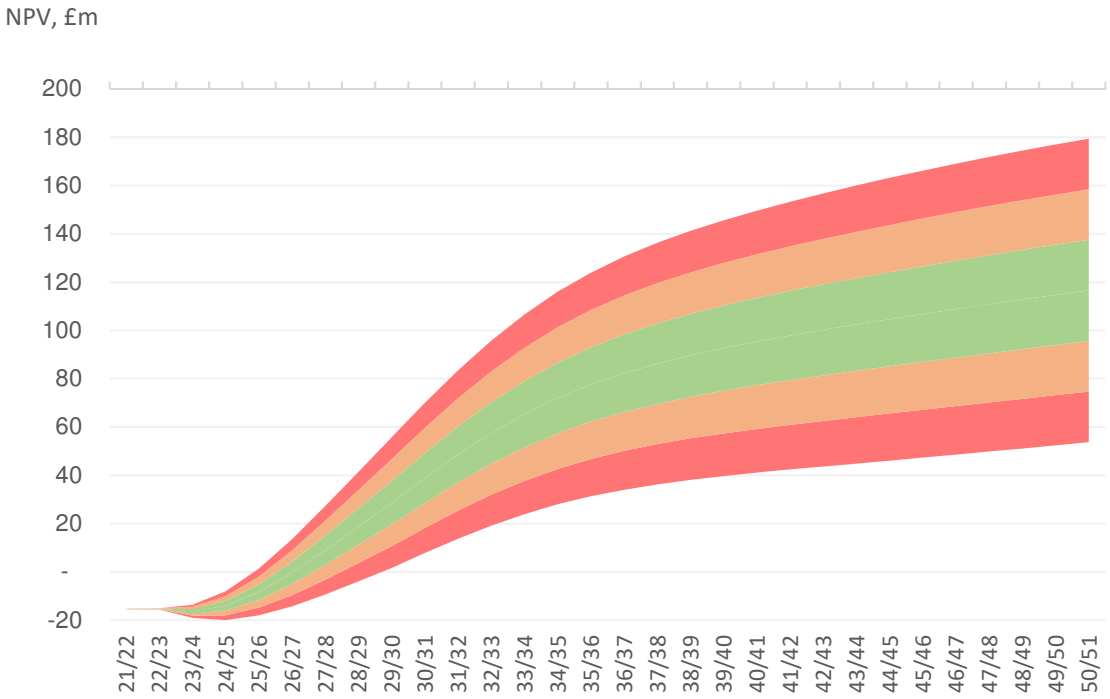
155.

156.

157. Figure 8 below indicates the impact on the net present value over the appraisal years with up to 30% adjustments from the central costs and benefit estimates. Note that the extremities of the bands constitute a 10/20/30% increase (decrease) in costs along with a 10/20/30% decrease (increase) in benefits.

158. The 20% scenario is the highest expected variation in the costs and benefits, and therefore NPV. Higher variation than this is considered unrealistic based on the assumptions used in modelling but is represented by the 30% increase/decrease scenario. See Section 0 for further detail.

*Figure 8: Chart showing the range of the net present value (NPV) over the appraisal period with up to 30% adjustments from the central cost and benefit estimates (2021 prices).*




The green area shows the range of NPV where costs/benefits vary up to 10% from the central estimates, orange within 20% and red, 30%.

159. Table 8 below provides more detailed costs for the +/- 20% scenario (the orange areas in Figure 3) compared with the central estimates.

*Table 8: Costs, benefits and NPV for commercial refrigerating appliances under high (+20%) and low (-20%) scenarios over the entire appraisal period (2021/22 to 2050/51).*

| All values are in 2021 prices, £m | Commercial refrigerating appliances |
|---|---|
| Low (-20%) costs | 28 |
| Central Costs | **35** |
| High (+20%) costs | 42 |
| Low (-20%) benefits | 124 |
| Central Benefits | **155** |
| High (+20%) benefits | 186 |
| Low NPV (high costs, low benefits) | 82 |
| Central NPV | **120** |
| High NPV (low costs, high benefits) | 158 |

160. Under the high costs (+20%) and low benefits (-20%) scenario (Low NPV), there would be an estimated NPV of £82M over the appraisal period (2021/22 to 2050/51) compared with £120M under the expected scenario. This would arise from, say, a 20% increase in costs of the products under Option 2 compared with the Do Nothing, along with a combined 20% decrease in the expected energy savings from the legislation (due to, for example, a 20% reduction in the expected annual energy use). A reduction in costs by 20% and a similar proportional increase in energy savings would, however, deliver an NPV of around £158M.

161. An increase in costs of around 440% (benefits remain the same) or a decrease in benefits of around 77% (costs remain the same) represents the tipping point at which the NPV becomes negative. The next section examines the likelihood of such a divergence.

## 6.4 Commercial refrigerating appliances: Risks

162. This section outlines the potential risks associated with the costs and benefits of the policy along with possible mitigations. The main risks identified with the analysis in this Impact Assessment relate to the cost and

benefit estimates, particularly whether the costs identified could be higher and/or benefits lower than expected, resulting in the NPV becoming negative.

163. The risks around each variable have been considered in Table 28 of Annex 2 through the assumptions log along with mitigations where relevant. The following high-level results can be drawn from the log:

- **3 low risk assumptions** have been identified: lifespan, sales, and average use
- **2 low-medium risk assumptions** have been identified: stock, and lifespan
- **2 medium risk assumptions** have been identified: prices/costs, and energy consumption

## 6.5 Commercial refrigerating appliances: Impact on UK businesses

164. According to the Commission's Impact Assessment, this regulation is expected to strengthen the global effort to introduce high-efficiency commercial refrigerating appliances to the market. In the short term this will constitute a negative impact for manufacturers of low-energy cabinets around the globe. To protect SMEs, the timing between the different tiers are aligned with the duration of the normal design cycles of the appliances so that manufacturers have sufficient time to adapt their products to the energy efficiency requirements. In the long run, the production of high-quality cabinets both in and outside of the EU will increase.

165. Table 9 below splits out the total costs and benefits into those which fall directly to businesses. Import scenarios are not included here, as all costs and benefits are direct for commercial appliances. This is because all costs and benefits to business are the same, whether the goods are imported or not, as the end-user will be expected to pay the higher price. A 95% import scenario has been assumed in the modelling.

*Table 9 Summary of costs and benefits to businesses – commercial refrigerating appliances (2021 prices).*

| Costs/benefits, £m | Option 2 | Of which direct business costs |
|---|---|---|
| Costs to manufacturers/business purchasers | 35 | 35 |
| Costs of increase in non-traded CO2e emissions (extra heating) [27] | 0 | 0 |
| Total Costs (A) | **35** | **35** |
| Value energy savings (net) | 133 | 133 |
| Value of reduction in CO2e emissions | 13 | 0 |
| Net benefits of air quality improvements | 9 | 0 |
| Total Benefits (B) | **155** | **133** |
| Net Present Value (B–A) | **120** | **98** |

Note that totals may not appear to add up due to rounding.

166. Using the BEIS Impact Assessment Calculator, the provisional Equivalent Annualised Net Direct Cost to Business (EANDCB) of the preferred policy option (Option 2) is set out in Table 10 below, alongside the Business NPV and Business Impact Target Score.

*Table 10: EANDCB and Business Net Present Value for Option 2 (under the 95% imported scenario) – commercial refrigerating appliances*

| | 2021 Prices, 2021 present value (£m) |
|---|---|
| Business Net Present Value | 98 |
| Equivalent Annualised Net Direct Cost to Business (EANDCB)[47] | -5 |
| Score for Business Impact Target (BIT) | -26 |

[47] The Equivalent Annual Cost is calculated by dividing the net present value through an annuity rate. This rate can be calculated using the formula: a = (1+r)/r * [1- 1/(1+r)^ t], where r is the interest rate (3.5%) and t is the number of years over which the NPV has been calculated (31).

# 7 Household refrigerating appliances

167. Section 5 provided an overview of the costs and benefits of Option 2. This section examines those specifically for household refrigerating appliances. It begins with a detailed description of the product itself and the proposed requirements.

## 7.1 Household refrigerating appliances: Overview

168. A refrigeration system for household use is an insulated metal cabinet, which contains a cold chamber. It is used for storing and keeping perishable foodstuff and beverages. It is operated by electricity, has a storage chamber and is designed for continuous automatic operation.

169. The scope of the ecodesign requirements does not apply to some household refrigerating products which are listed in Annex 3.

170. The European Commission's most recent Preparatory Study on household refrigerating appliances[48] concluded that by 2030, there is potential for significant energy savings from updating the ecodesign regulations for household refrigerating appliances. There is scope for improvements in the energy efficiency of household refrigerating appliances which would be in line with technological developments. There is also the potential to use fewer resources and contribute to the circular economy through improved repairability and recyclability by introducing resource efficiency requirements.

171. In addition to this, a new International Electrotechnical Commission (IEC) standard for household refrigerating appliances, IEC 62552:2015, was published in 2015. This standard aimed to be universally applicable, more efficient, accurate and reliable than the one used in the regulation at the time, and the requirements applicable to products sold in the UK should be updated to take this new standard into account.

172. Introducing proposed requirements as set out in Option 2 would

[48] Final preparatory study report on household refrigeration 2016

require manufacturers to:

- ensure that the energy efficiency index (EEI) of refrigerating appliances should not be above the values set out in the draft regulations;
- ensure that the maximum idle state power consumption of household refrigerating appliances should not exceed the values set out in the draft regulations;
- meet certain resource efficiency obligations such as regards the availability of and access to spare parts and maintenance information to facilitate repairs;
- ensure that household refrigerating appliances are designed in such a way that certain materials and components can be removed with the use of commonly available tools, as set out in the draft regulations; and
- provide in their instruction manuals for users and on free to access websites the information set out in the draft regulations.

## 7.2 Household refrigerating appliances: Costs and benefits of Option 2

173. The EUP CBA model was split into four separate sub-models based on each specific refrigerating appliance, with each sub-model examining the impact of the regulatory changes on household refrigerating appliances. The sub-models are split based on the following technologies: chest freezers; fridge freezers; refrigerators; upright freezers.

174. For each sub-technology, a single representative model was developed, which represents a 'notional' market average product. In reality, this product does not exist, but its energy consumption and cost represent averages that are multiplied by estimates of UK household refrigerating appliance sales in order to estimate UK energy consumption.

175. Table 11 and Table 12 show the effects of the proposed revision to the existing ecodesign requirements for household refrigerating appliances compared with Option 1 (Do Nothing). Low and high scenarios of ±10% have been presented as indicative variances from the central estimate due to unknown uncertainty. Based on more in-depth sensitivity analysis

provided in Section 0 which considers the sensitivity of each variable used in the modelling, ±10% is the maximum expected range for which costs and benefits could vary.

*Table 11: Discounted costs summary for household refrigerating appliances (2021 prices)*

| **£m** | **Low (-10%)** | **Central** | **High (+10%)** |
|---|---|---|---|
| Costs to manufacturers (assumed to be passed onto consumers) | 76 | 84 | 93 |
| Total costs of increase in non-traded CO2e emissions | 2 | 2 | 2 |
| TOTAL | **78** | **87** | **95** |

*Table 12: Discounted benefits summary for household refrigerating appliances (2021 prices)*

| **£m** | **Low (-10%)** | **Central** | **High (+10%)** |
|---|---|---|---|
| Value of energy savings | 105 | 116 | 128 |
| Value of reduction in $CO_2e$ emissions | 9 | 10 | 11 |
| Net benefits of air quality improvements | 0.2 | 0.2 | 0.3 |
| TOTAL | **114** | **127** | **140** |

Figures have been rounded so may not appear to sum correctly.

*Figure 9: Estimated energy use under Options 1 (Do Nothing) and 2 (updating ecodesign requirements) for household refrigerating appliances and the cumulative energy savings of implementing Option 2.*

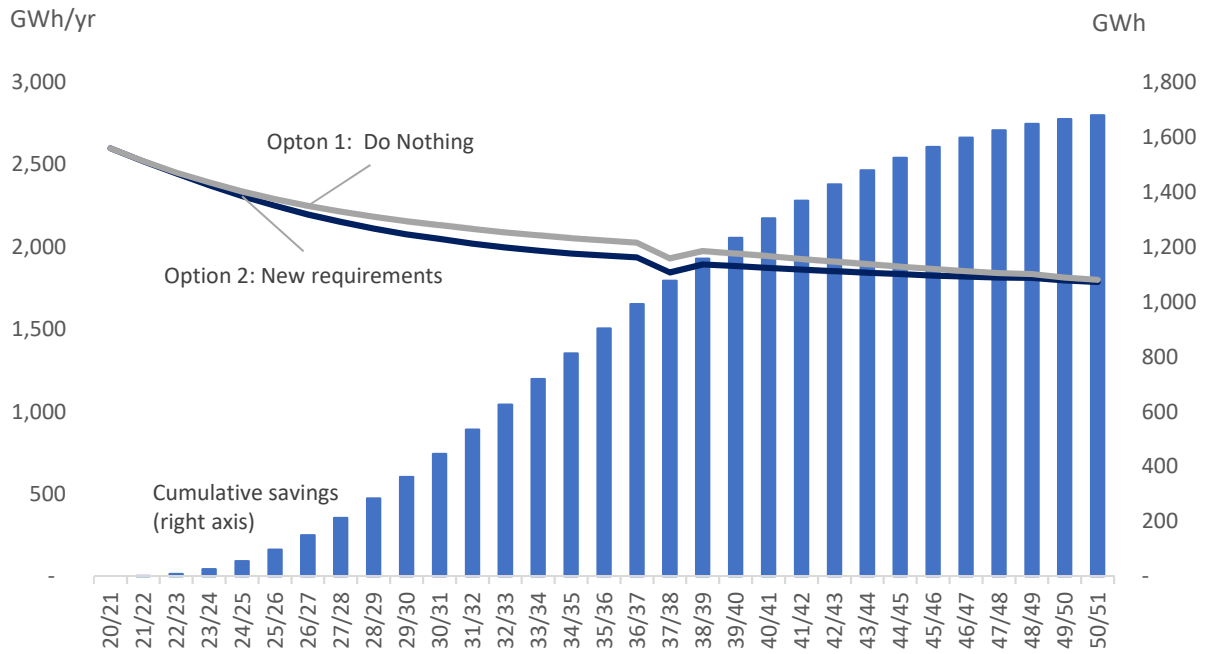
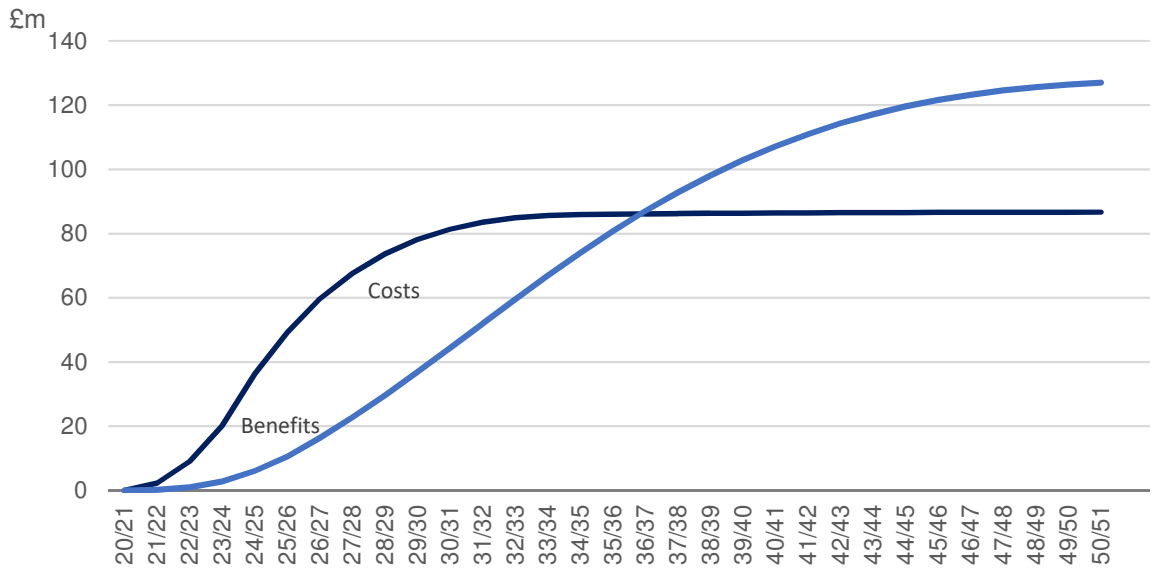



*Figure 10: Cumulative costs and benefits of Option 2 for household refrigerating appliances (2021 prices).*




Note that the modelling includes cost-scaling whereby, towards the end of the appraisal period, costs reduce year-on-year. This considers products whose costs would be incurred but benefits only partially realised during the appraisal period.

176. The draft regulations for household refrigerating appliances deliver an estimated net present value of £40M and is expected to save around 1,199

GWh of electrical energy and 0.1 million tonnes of $CO_2e$ over the appraisal period (2021/22 to 2050/51). Annual energy savings amount to around 15 GWh a year by the end of the appraisal period.

*Annual energy savings (the difference between the estimated energy use of the two options) increase year-on-year at the start of the appraisal period (*

177. Figure 9) as the non-compliant stock gradually gets replaced by household refrigerating appliances which meet the requirements under Option 2. Once the stock has largely been replaced (by around 2035/36), annual energy savings remain broadly static. Additional costs under Option 2 occur at the point of purchase only, whereas the energy saving benefits are accrued over the lifetime of the product. This results in cumulative costs exceeding benefits (Figure 10) during the early part of the appraisal period, only providing a positive net present value (where benefits exceed costs) from 2036/37 onwards. It is also the reason why the modelling scales down costs towards the end of the appraisal period (as shown in Figure 10). Not scaling would result in all the costs, yet only part of the benefits, being considered for products purchased towards the end of the appraisal period, negatively affecting the net present value.

178. The per unit compliance costs reduce over time based on a scaling factor. This is because reference scenario efficiencies are improving over time and the factor reduces costs in line with this. The reason why the cumulative costs flatten out in 2035 is because the compliance costs are assumed to drop to zero. Energy savings are no longer attributed to products sold after 2035. However, benefits are still accruing beyond 2035 because the products sold in previous years remain in the stock (and are accumulating energy savings) until they are replaced. This is why the benefits start to flatten out as we approach 2050 (as more and more products sold pre-2035 reach the end of their lifetimes).

### 7.2.1 Household refrigerating appliances: Non-monetised costs and benefits

179. This section examines the additional costs and benefits that, for

proportionality reasons, have not been monetised. To indirectly take these into account in the CBA, sensitivity analysis has been undertaken in Section 0.

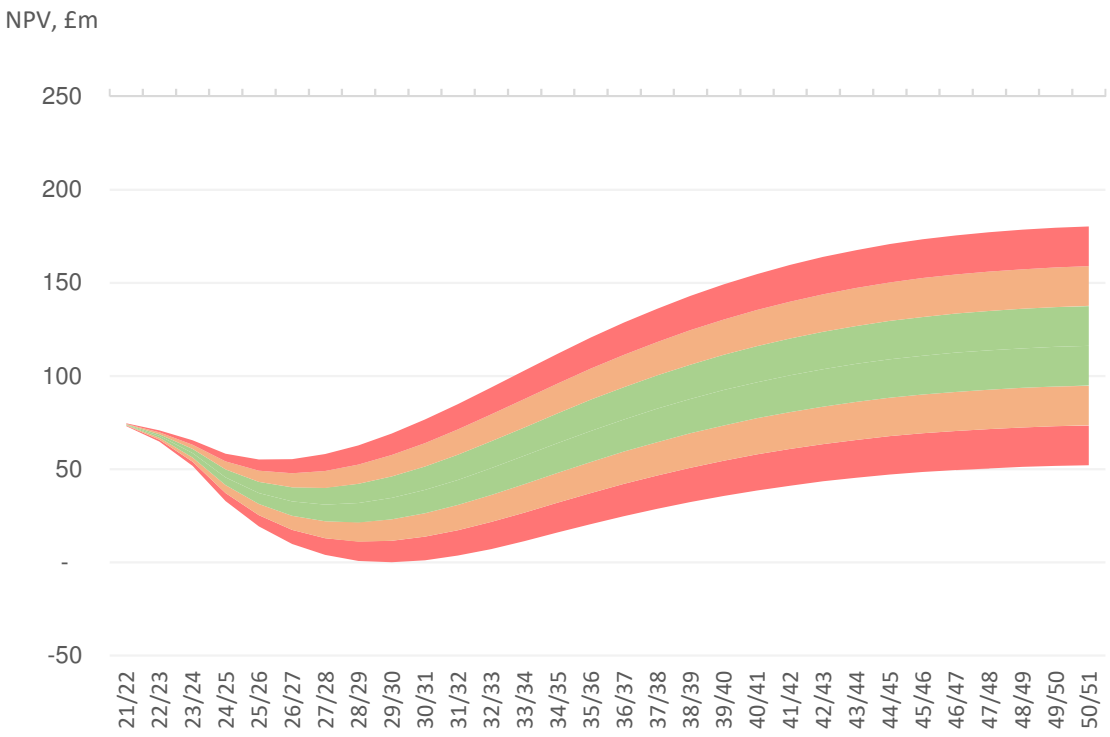
180. Specifically, for household refrigerating appliances, there would be costs associated with the requirements to provide, on websites and instruction manuals, the following:

- The combination of drawers, baskets and shelves that results in the most efficient use of energy of the refrigerating appliance;
- Clear guidance about where and how to store foodstuffs;
- The recommended setting of temperatures in each compartment for optimum food preservation;
- An estimation of the impact of temperature settings on food waste;
- A description of the effects of special modes and features;
- Instructions for the correct installation and end-user maintenance, including cleaning of the refrigerating appliance;
- Information on access to professional repair, such as internet webpages, addresses, contact details;
- The minimum period during which spare parts are available;
- Relevant information for ordering spare parts; and
- The minimum duration of the guarantee of the refrigerating appliance offered by the manufacturer, importer or authorised representative.

181. Figure 11 below indicates the impact on the net present value over the appraisal years with up to 30% adjustments from the central costs and benefit estimates. Note that the extremities of the bands constitute a 10/20/30% increase (decrease) in costs along with a 10/20/30% decrease (increase) in benefits.

182. The 20% scenario is the highest expected variation in the costs and benefits, and therefore NPV. Higher variation than this is considered unrealistic based on the assumptions used in modelling but is represented by the 30% increase/decrease scenario. See Section 0 for further detail.

*Figure 11: Chart showing the range of the net present value (NPV) over the appraisal period with up to 30% adjustments from the central cost and benefit estimates (2021 prices).*




The green area shows the range of NPV where costs/benefits vary up to 10% from the central estimates, orange within 20% and red, 30%.

183. Table 13 below provides more detailed costs for the +/- 20% scenario (the orange areas in Figure 6) compared with the central estimates.

*Table 13: Costs, benefits and NPV for household refrigerating appliances under high (+20%) and low (-20%) scenarios over the entire appraisal period (2021/22 to 2050/51).*

| All values are in 2021 prices, £m | Household refrigerating appliances |
|---|---|
| Low (-20%) costs | 69 |
| Central Costs | **87** |
| High (+20%) costs | 104 |

| | |
|---|---|
| Low (-20%) benefits | 102 |
| Central Benefits | **127** |
| High (+20%) benefits | 152 |
| Low NPV (high costs, low benefits) | -2 |
| Central NPV | **40** |
| High NPV (low costs, high benefits) | 83 |

184. Under the high costs (+20%) and low benefits (-20%) scenario (Low NPV), there would be an estimated NPV of -£2m over the appraisal period (2021/22 to 2050/51) compared with £40m under the expected scenario. This would arise from, say, a 20% increase in costs of the products under Option 2 compared with the Do Nothing, along with a combined 20% decrease in the expected energy savings from the legislation (due to, for example, a 20% reduction in the expected annual energy use). A reduction in costs by 20% and a similar proportional increase in energy savings would, however, deliver an NPV of around £83M.

185. An increase in costs of around 147% (benefits remain the same) or a decrease in benefits of around 32% (costs remain the same) represents the tipping point at which the NPV becomes negative. The next section examines the likelihood of such a divergence

### 7.3 Household refrigerating appliances: Risks

186. This section outlines the potential risks associated with the costs and benefits of the policy along with possible mitigations. The main risks identified with the analysis in this Impact Assessment relate to the cost and benefit estimates, particularly whether the costs identified could be higher and/or benefits lower than expected, resulting in the NPV becoming negative.

187. The risks around each variable have been considered in Table 29 of Annex 3 through the assumptions log along with mitigations where relevant. The following high-level results can be drawn from the log:

- **3 low risk assumptions** have been identified: stock, use, and

lifespan.

- **2 medium risk assumptions** have been identified: cost, and energy usage.

## 7.4 Household refrigerating appliances: Impact on UK businesses

188. There are no manufacturers of these products in the UK. Retailers' revenues are likely to increase due to higher prices for the products. The regulation will also be positive for SMB companies which is explained in Section 10.

189. Table 14 below splits out the total costs and benefits into those which fall directly to businesses under potential import scenarios. A 95% import scenario has been assumed in the modelling.

*Table 14: Summary of costs and those directly impacting on UK businesses – household refrigerating appliances (2021 prices).*

| Costs/benefits | Total (£m) | Of which direct business costs (£m) if… | | |
|---|---|---|---|---|
| | | 90% imported | 95% imported | 100% imported |
| Costs to manufacturers/business purchasers | 84 | 8 | 4 | - |
| Costs of increase in non-traded $CO_2e$ emissions (extra heating) [27] | 2 | 0 | 0 | - |
| **Total Costs (A)** | **87** | **8** | **4** | **-** |
| Value energy savings (net) | 116 | 0 | 0 | - |
| Value of reduction in $CO_2e$ emissions | 10 | 0 | 0 | - |
| Net benefits of air quality improvements | 0.2 | 0 | 0 | - |
| **Total Benefits (B)** | **127** | **0** | **0** | **-** |
| **Net Present Value (B–A)** | **40** | **-8** | **-4** | **-** |

Note that totals may not appear to add up due to rounding. Benefits to UK businesses are 0 because household refrigerating appliances are domestic products. Under a 100% import scenario, no manufacturers would be impacted because all household refrigerating appliances would be being imported into the UK.

190. Using the BEIS Impact Assessment Calculator, the provisional Equivalent Annualised Net Direct Cost to Business (EANDCB) of the

preferred policy option (Option 2) is set out in Table 15 below, alongside the Business NPV and Business Impact Target Score.

*Table 15: EANDCB and Business Net Present Value for Option 2 (under the 95% imported scenario) – household refrigerating appliances*

| | 2021 Prices, 2021 present value (£m) |
|---|---|
| Business Net Present Value | -4.2 |
| Equivalent Annualised Net Direct Cost to Business (EANDCB)[49] | 0.2 |
| Score for Business Impact Target (BIT) | 1.1 |

191. We will actively look to address the uncertainty around the scale of UK imports during the consultation process since this significantly affects the EANDCB and BIT score above.

[49] The Equivalent Annual Cost is calculated by dividing the net present value through an annuity rate. This rate can be calculated using the formula: a = (1+r)/r * [1- 1/(1+r)^ t], where r is the interest rate (3.5%) and t is the number of years over which the NPV has been calculated (31).

# 8 Household dishwashers

192. Section 5 provided an overview of the costs and benefits of Option 2. This section examines those specifically for household dishwashers. It begins with a detailed description of the product itself and the proposed requirements.

## 8.1 Household dishwashers: Overview

193. Household dishwashers are machines that clean, rinse and dry tableware. These household dishwashers exist in stand-alone and built-in versions and would both be required to meet the same proposed energy efficiency requirements. The draft regulations also cover electric mains-operated household dishwashers that can also be powered by batteries.

194. The scope of the ecodesign requirements does not apply to some household dishwasher products which are listed in Annex 5.

195. Around 1 million household dishwashers are sold in the UK annually. Annual sales outputs were extracted based on data from a 2003 BSRIA study (Table 31, Annex 5), under the assumption that stock remains constant over time.

196. The European Commission's most recent Preparatory Study on household dishwashers concluded that large energy savings could be made with the introduction of an 'eco' programme and the availability, reduction in cost and delivery of spare parts can provide resource

efficiency savings[50].

197. The EU Ecodesign Regulation setting minimum performance standards for dishwashers had been in force since 2010. Since then, dishwasher minimum performance standards have entered into force in Canada (2013)[51], South Africa (2016), and Australia (2012), according to the IEA Policies database[52].

198. Introducing requirements as set out in Option 2 will require manufacturers to:

- Ensure that the cleaning performance index (IC) and the drying performance index (ID) of household dishwashers should not be lower than the values set out in the draft regulation;
- ensure that the off mode or standby mode power consumption of Household Dishwashers should not exceed the values set out in the draft regulation;
- meet certain resource efficiency obligations such as the availability of and access to spare parts and maintenance information to facilitate repairs;
- ensure that all household dishwashers provide an 'eco' programme which meets the requirements set out in the draft regulation;
- ensure that all household dishwashers meet the Energy Efficiency Index (EEI) requirements set out in the draft regulation; and
- provide in their instruction manuals for users and on free to access websites the information set out in the draft regulation.

## 8.2 Household dishwashers: Costs and benefits of Option 2

199. The EUP CBA model was used for the analysis.

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[50] Ecodesign and Energy Label for Household Dishwashers Preparatory study. Available at: https://ec.europa.eu/jrc/en/publication/ecodesign-and-energy-label-household-dishwashers

[51] https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-regulations/guide-canadas-energy-efficiency-regulations/dishwashers/6955

[52] https://www.iea.org/policies?sector=Residential&q=dish&type=Minimum%20energy%20performance%20standard

200. The model uses the following inputs which are generated from raw data:

- forecasted sales/stocks figures;
- forecasted levels of usage (in hours/year);
- average energy consumption per cycle (in kWh);
- technology ("Tech") demand values;
- expected lifespan (before a replacement is required);
- cost of new products.

201. Table 16 and Table 17 below show the effects of the proposed revision to the existing ecodesign requirements for household dishwasher compared with Option 1 (Do Nothing). Low and high scenarios of ±10% have been presented as indicative variances from the central estimate due to unknown uncertainty. Based on more in-depth sensitivity analysis provided in Section 0 which considers the sensitivity of each variable used in the modelling, ±10% is the maximum expected range for which costs and benefits could vary.

202. Figure 12 and

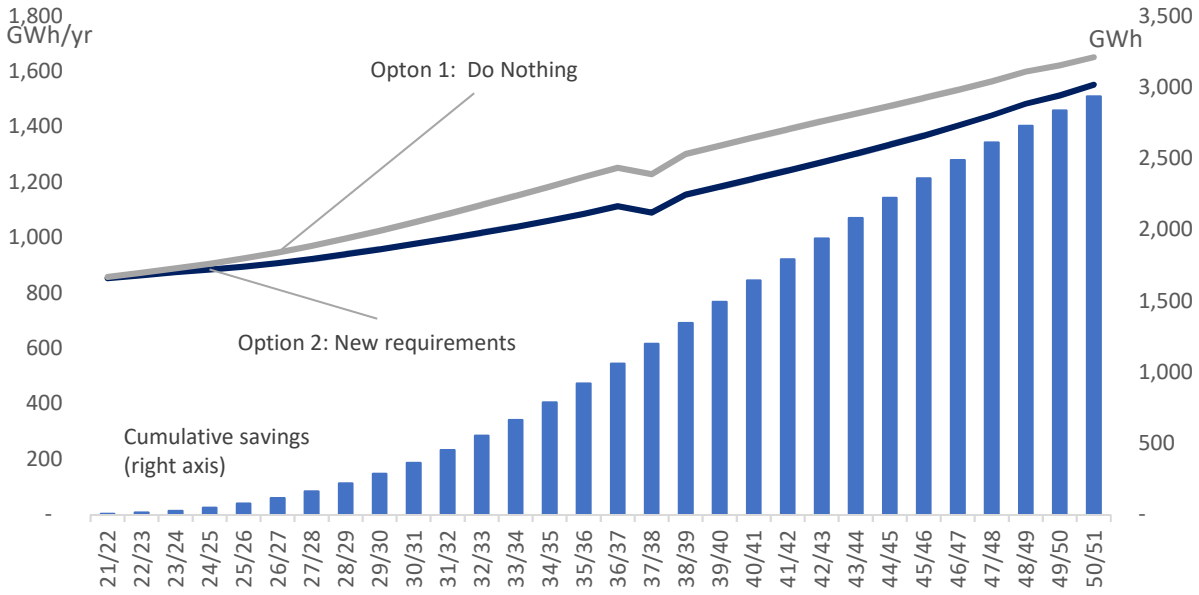



Figure 13 show the cumulative costs/benefits and energy savings respectively for the central estimate.

*Table 16: Discounted costs summary for household dishwashers (2021 prices).*

| £m | Low (-10%) | Central | High (+10%) |
|---|---|---|---|
| Costs to manufacturers (assumed to be passed onto consumers) | 79 | 88 | 97 |
| Total costs of increase in non-traded $CO_2e$ emissions | 0.4 | 0.4 | 0.4 |
| TOTAL | **79** | **88** | **97** |

Figures have been rounded so may not appear to sum correctly.

*Table 17: Discounted benefits summary for household dishwashers (2021 prices).*

| £m | Low (-10%) | Central | High (+10%) |
|---|---|---|---|
| Value of energy savings | 117 | 130 | 143 |
| Value of reduction in $CO_2e$ emissions | 9 | 10 | 11 |
| Net benefits of air quality improvements | 6 | 7 | 8 |
| TOTAL | **132** | **147** | **161** |

Figures have been rounded so may not appear to sum correctly.

*Figure 12: Estimated energy use under Options 1 (Do Nothing) and 2 (updating ecodesign requirements) for household dishwashers and the cumulative energy savings of implementing Option 2[53].*

[53] The 'kink' in Figure 12 is due to a dip in UK Gov household projections data from 2036 to 2037, Table 401 available here: https://www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections. As it is seen consistently in both scenarios, the energy savings are not affected.

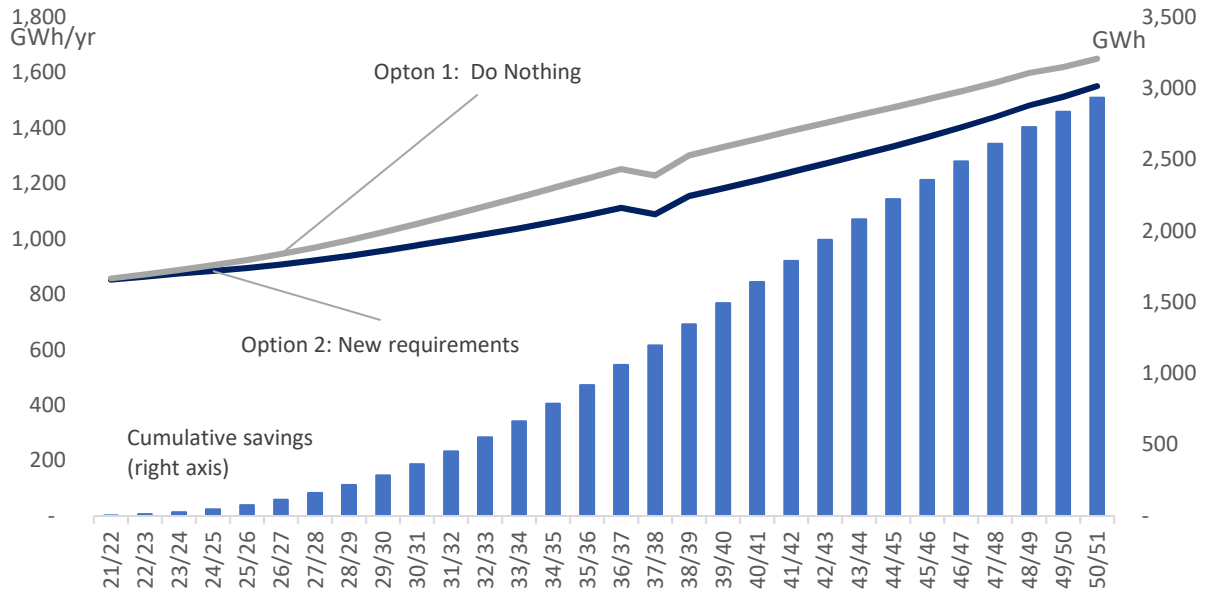
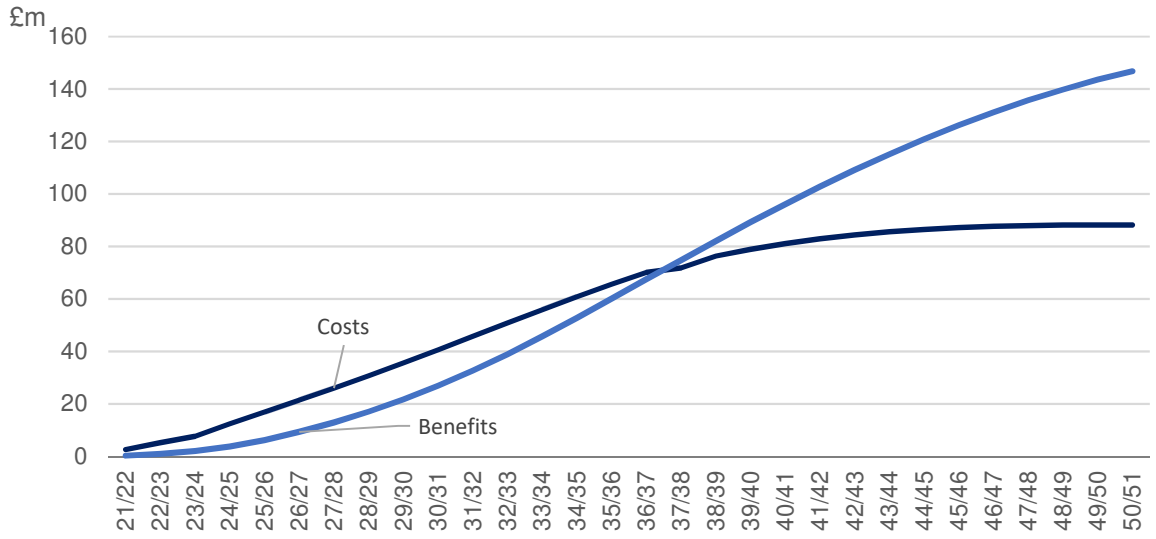



*Figure 13: Cumulative costs and benefits of Option 2 for household dishwashers*




Note that the modelling includes cost-scaling whereby, towards the end of the appraisal period, costs reduce year-on-year. This considers products whose costs would be incurred but benefits only partially realised during the appraisal period.

203. The draft regulations for household dishwashers deliver an estimated NPV of £117m and is expected to save around 2,778 GWh of electrical energy and 0.2 million tonnes of $CO_2e$ over the appraisal period (2021/22 to 2050/51). Annual energy savings amount to around 100 GWh a year by the end of the appraisal period.

204. Annual energy savings (the difference between the estimated energy

use of the two options) increase year-on-year at the start of the appraisal period (Figure 12) as the non-compliant stock gradually gets replaced by household dishwashers which meet the requirements under Option 2. Once the stock has largely been replaced (by around 2034/2035, annual energy savings remain broadly static. Additional costs under Option 2 occur at the point of purchase only, whereas the energy saving benefits are accrued over the lifetime of the product. This results in cumulative costs exceeding benefits (

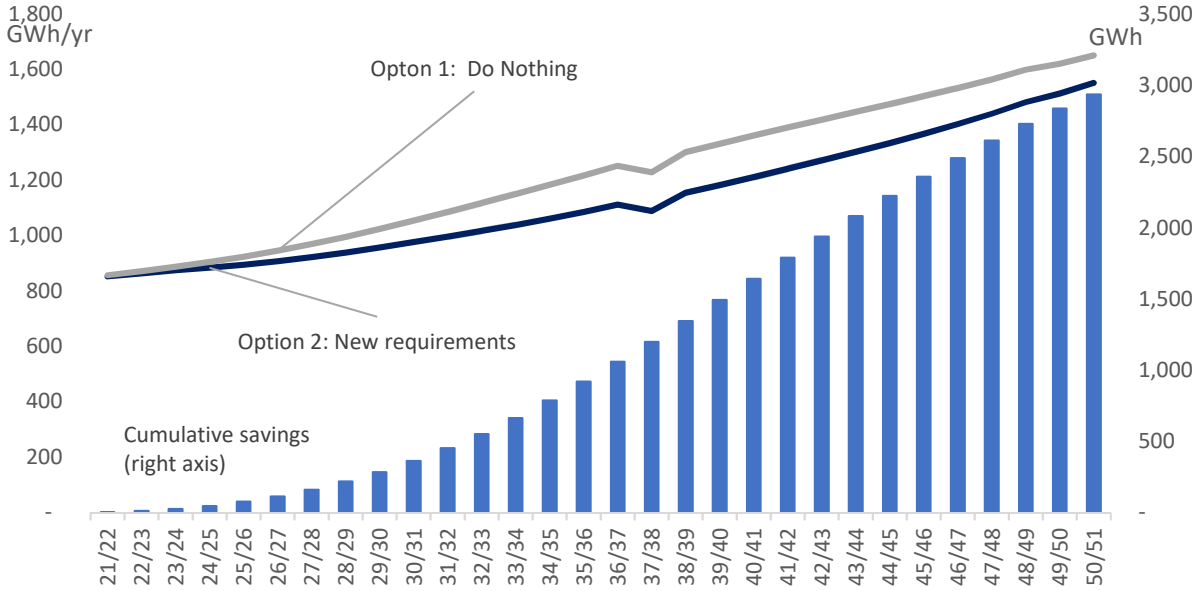



Figure 13) during the early part of the appraisal period, only providing a positive NPV (where benefits exceed costs) from 2038 onwards. It is also the reason why the modelling scales down costs towards the end of the appraisal period (as shown in

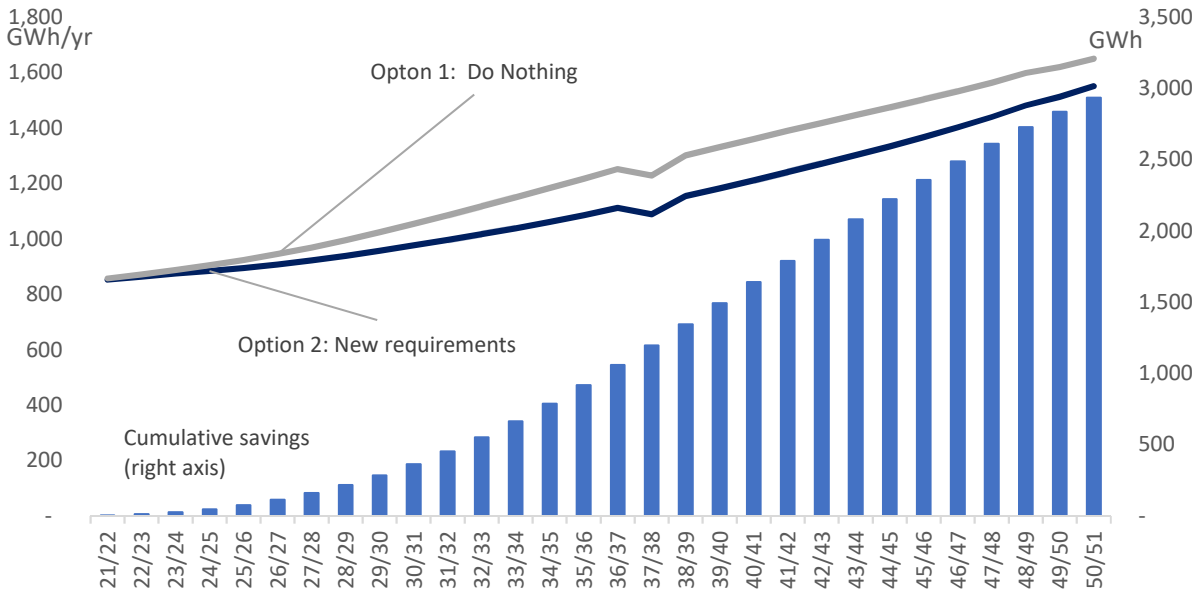



Figure 13). Not scaling would result in all the costs, yet only part of the benefits, being considered for products purchased towards the end of the appraisal period, negatively affecting the net present value.

205. Energy consumption is predicted to steadily increase over the appraisal period (Figure 12) due to increasing popularity of household dishwashers. Therefore, whilst the energy efficiency of dishwashers will increase, increased sales over the appraisal period means that net energy consumption will increase as well.

### 8.2.1 Household dishwashers: Non-monetised costs and benefits

206. This section examines the additional costs and benefits that, for proportionality reasons, have not been monetised. To indirectly take these into account in the CBA, sensitivity analysis has been undertaken in Section 0.

207. Specifically, for household dishwashers, there would be costs associated with the requirements to declare in the technical documentation:

- the name and address of the supplier
- a general description of the dishwasher model, sufficient for it to be unequivocally and easily identified;

- where appropriate, the references of the harmonised standards applied;
- where appropriate, the other technical standards and specifications used;
- identification and signature of the person empowered to bind the supplier; and
- technical parameters set out in the draft regulations.

208. The overall savings of resource efficiency measures are considered modest in comparison to the energy savings. Moreover, it is not possible to quantify all resource efficiency measures, even if considered important according to stakeholders[54].

209. Although the draft regulations would be a revision of existing regulation, transitional costs are not expected to be minimal despite the general processes being already established.

210. However, these costs will be small in relation to overall costs and benefits of the policy option. Monetising such costs is therefore considered disproportionate. However, any such costs may fall disproportionately on to smaller businesses and are therefore considered in the Small and Micro Business Assessment (SAMBA) in Section 10.

211. Further, compliance and distributional costs were considered negligible as outlined in Section 51.1. Similarly, additional benefits of innovation due to UK manufacturers being required to improve efficiency and in having the same requirements as for EU manufacturers (particularly for ease of trade with the EU) were not considered.

### 8.3 Household dishwashers: Sensitivity analysis

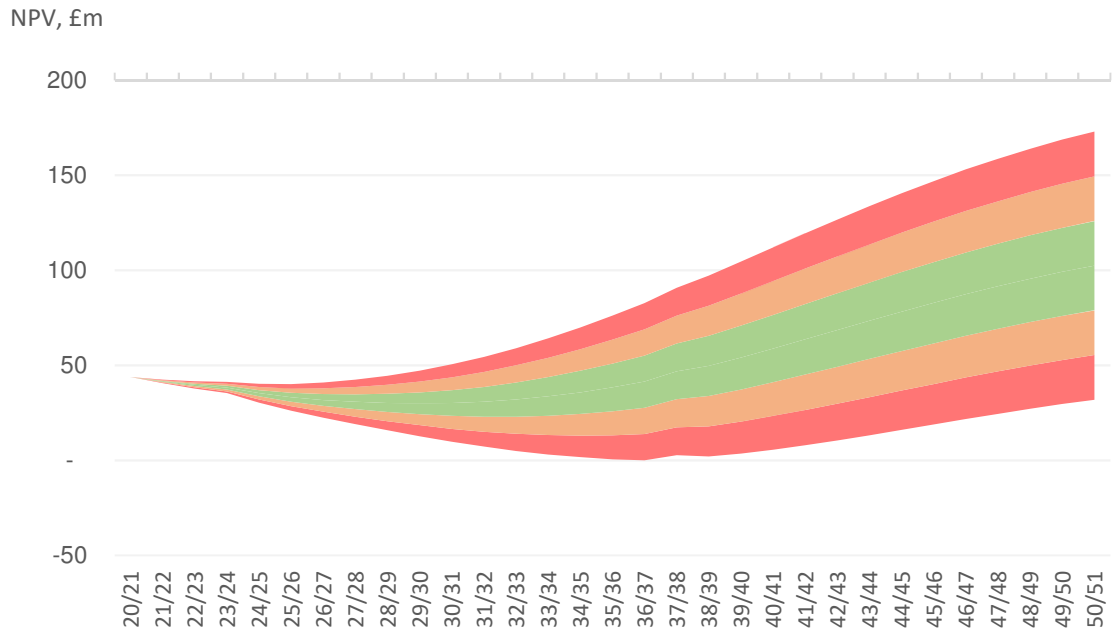
212. Figure 14 below indicates the impact on the net present value over the appraisal years with up to 30% adjustments from the central costs and

[54]European Commission Impact Assessment on ecodesign requirements for household dishwashers (2019). Available at: https://ec.europa.eu/info/law/better-regulation/initiative/1555/publication/5780347/attachment/090166e5c7e3519e_en

benefit estimates. Note that the extremities of the bands constitute a 10/20/30% increase (decrease) in costs along with a 10/20/30% decrease (increase) in benefits.

213. The 20% scenario is the highest expected variation in the costs and benefits, and therefore NPV. Higher variation than this is considered unrealistic based on the assumptions used in modelling but is represented by the 30% increase/decrease scenario. See Section 0 for further detail.

*Figure 14: Chart showing the range of the net present value (NPV) over the appraisal period with up to 30% adjustments from the central cost and benefit estimates (2021 prices).*




The green area shows the range of NPV where costs/benefits vary up to 10% from the central estimates, orange within 20% and red, 30%.

214. Table 18 below provides more detailed costs for the +/- 20% scenario (the orange areas in Figure 9) compared with the central estimates.

*Table 18: Costs, benefits and NPV for household dishwashers under high (+20%) and low (-20%) scenarios over the entire appraisal period (2021/22 to 2050/51).*

| All values are in 2021 prices, £m | Household dishwashers |
|---|---|
| Low (-20%) costs | 71 |
| Central Costs | 88 |
| High (+20%) costs | 106 |

| | |
|---|---|
| Low (-20%) benefits | 117 |
| Central Benefits | 147 |
| High (+20%) benefits | 176 |
| Low NPV (high costs, low benefits) | 12 |
| Central NPV | 59 |
| High NPV (low costs, high benefits) | 106 |

215. Under the high costs (+20%) and low benefits (-20%) scenario (Low NPV), there would be an estimated NPV of £12m over the appraisal period (2021/22 to 2050/51) compared with £59M under the expected scenario. This would arise from, say, a 20% increase in costs of the products under Option 2 compared with the Do Nothing, along with a combined 20% decrease in the expected energy savings from the legislation (due to, for example, a 20% reduction in the expected annual energy use). A reduction in costs by 20% and a similar proportional increase in energy savings would, however, deliver an NPV of around £106M.

216. An increase in costs of around 166% (benefits remain the same) or a decrease in benefits of around 40% (costs remain the same) represents the tipping point at which the NPV becomes negative. The next section examines the likelihood of such a divergence.

## 8.4 Household dishwashers: Risks

217. This section outlines the potential risks associated with the costs and benefits of the policy along with possible mitigations. The main risks identified with the analysis in this Impact Assessment relate to the cost and benefit estimates, particularly whether the costs identified could be higher and/or benefits lower than expected, resulting in the NPV becoming negative.

218. The risks around each variable have been considered in Table 31 of Annex 5 through the assumptions log along with mitigations where relevant. The following high-level results can be drawn from the log:

- **2 medium risk assumptions** have been identified: cost and

usage values.

## 8.5 Household dishwashers: Impact on UK businesses

219. Figure 14 splits out the total costs and benefits into those which fall directly to businesses. A 95% import scenario has been assumed in the modelling.

*Table 19: Summary of costs and benefits directly impacting UK businesses for likely import scenarios – household dishwashers (2021 prices).*

| Costs/benefits | Total (£m) | Of which direct business costs (£m) if… | | |
|---|---|---|---|---|
| | | 90% imported | 95% imported | 100% imported |
| Costs to manufacturers/business purchasers | 88 | 9 | 4.4 | - |
| Costs of increase in non-traded $CO_2e$ emissions (extra heating)[27] | 0.4 | 0 | 0 | - |
| **Total Costs (A)** | **88** | **9** | **4.4** | **-** |
| Value energy savings (net) | 130 | 0 | 0 | - |
| Value of reduction in $CO_2e$ emissions | 10 | 0 | 0 | - |
| Net benefits of air quality improvements | 7 | 0 | 0 | - |
| **Total Benefits (B)** | **147** | **0** | **0** | **-** |
| **Net Present Value (B–A)** | **59** | **-9** | **-4** | - |

Note that totals may not appear to add up due to rounding. Benefits to UK businesses are 0 because household dishwashers are domestic products. Under a 100% import scenario, no manufacturers would be impacted because all household dishwashers would be being imported into the UK.

220. Using the BEIS Impact Assessment Calculator, the provisional Equivalent Annualised Net Direct Cost to Business (EANDCB) of the preferred policy option (Option 2) is set out in Table 20 below, alongside the Business NPV and Business Impact Target Score.

*Table 20: EANDCB and Business Net Present Value for Option 2 – household dishwashers*

| | 2021 Prices, 2021 present value (£m) |
|---|---|
| Business Net Present Value | -4.4 |
| Equivalent Annualised Net Direct Cost to Business (EANDCB)[55] | 0.2 |
| Score for Business Impact Target (BIT) | 1.2 |

# 9 Household washing machines/washer-dryers

221. Section 5 provided an overview of the costs and benefits of Option 2. This section examines those specifically for household washing machines/washer-dryers. It begins with a detailed description of the product itself and the proposed requirements.

## 9.1 Household washing machines/washer-dryers Overview

222. Washing machines are automatic machines which clean and rinse laundry by using water, chemical, mechanical and thermal means. A spin extraction function is also used in this cleaning process. Washer-dryers in addition to having the function of a household washing machine also has

[55] The Equivalent Annual Cost is calculated by dividing the net present value through an annuity rate. This rate can be calculated using the formula: a = (1+r)/r * [1- 1/(1+r)^ t], where r is the interest rate (3.5%) and t is the number of years over which the NPV has been calculated (31).

the function of drying laundry by heating and tumbling.

223. Washing machines in scope are electric mains-operated washing machines and washer-dryers, including built-in washing machines and washer-dryers. In addition, electric mains-operated washing machines and washer-dryers that can also be powered by batteries are included in this scope.

224. The scope of the ecodesign requirements does not apply to some washing machine/washer-dryer products which are listed in Annex 4.

225. Around 1.6 million washing machines/washer-dryers units are sold in the UK annually, most of which are imported. Annual sales outputs were extracted based on data from a 2003 BSRIA study (Table 30, Annex 4), under the assumption that stock remains constant over time.

226. Since the EU Ecodesign Regulation was passed in 2010, many other countries around the world have passed minimum energy performance standards for washing machines/washer-dryers. These include Vietnam, Malaysia, Mexico, Singapore, Peru, Canada, South Africa, Mexico, and Australia according to the IEA Policies database[56].

227. The European Commission's most recent Preparatory Study[2] on washing machines/washer-dryers concluded that there is scope for improvements in the energy efficiency of washing machines/washer-dryers which would be in line with technological developments. In the Commission Regulation (EU) No 1015/2010 [57] the best available technology (BAT) benchmark for energy consumption of washing machine/washer-dryers between 5kg and 8kg capacity was 0.85 kWh/cycle to 1.2 kWh/cycle. In 2018 the energy usage for a BAT model that has 8KG capacity was 0.44 kWh/cycle according to EU top ten[58]. There is also the potential to use

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56 https://www.iea.org/policies?sector=Residential&type=Minimum%20energy%20performance%20standard&q=wash

57 European Commission, implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for household washing machines (2010). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32010R1015

58 EU top ten (2018). Available at http://www.topten.eu/english/household/washing-machines/8kg-3.html

fewer resources and contribute to the circular economy through improved repairability and recyclability by introducing resource efficiency requirements.

228. Introducing requirements as set out in Option 2 will require manufacturers to:

- ensure that the minimum power source efficiency of washing machines /washer-dryers should not be lower than the values set out in the draft regulations;
- ensure that the maximum idle state power consumption of washing machines/washer-dryers should not exceed the values set out in the draft regulations;
- ensure that washing machines/washer-dryers are designed in such a way that certain materials and components, as set out in the draft regulations, can be removed with the use of commonly available tools;
- meet certain resource efficiency obligations such as the availability of and access to spare parts and maintenance information to facilitate repairs;
- provide in their instruction manuals for users and on free to access websites the information set out in the draft regulations; and
- ensure that the weighted water consumption requirements of washing machines/washer-dryers meet the values set out in the draft regulations.

## 9.2 Household washing machines: Costs and benefits of Option 2

229. The EUP CBA was used for this analysis.

230. The numbers below in Table 21 and Table 22 show the effects of the proposed revision to the existing ecodesign requirements for washing machines/washer-dryers compared with Option 1 (Do Nothing). Low and high scenarios of ±10% have been presented as indicative variances from the central estimate due to unknown uncertainty. Based on more in-depth sensitivity analysis provided in Section 0 which considers the sensitivity of

each variable used in the modelling, ±10% is the maximum expected range for which costs and benefits could vary.

*Table 21: Discounted costs summary for washing machines/washer-dryers (2021 prices)*

| £m | Low (-10%) | Central | High (+10%) |
|---|---|---|---|
| Costs to manufacturers (assumed to be passed onto consumers) | 56 | 62 | 68 |
| Total costs of increase in non-traded CO2e emissions (£m) | 1 | 1 | 1 |
| TOTAL | **57** | **63** | **69** |

.

*Table 22: Discounted benefits summary for washing machines/washer-dryers (2021 prices)*

| £m | Low (-10%) | Central | High (+10%) |
|---|---|---|---|
| Value of energy savings | 167 | 186 | 204 |
| Value of reduction in $CO_2e$ emissions | 14 | 15 | 17 |
| Net benefits of air quality improvements | 8 | 9 | 10 |
| TOTAL | **189** | **210** | **231** |

*Figures have been rounded so may not appear to sum correctly.*

*Figure 15: Estimated energy use under Options 1 (Do Nothing) and 2 (updating ecodesign requirements) for washing machines/washer-dryers and the cumulative energy savings of implementing Option 2[59].*

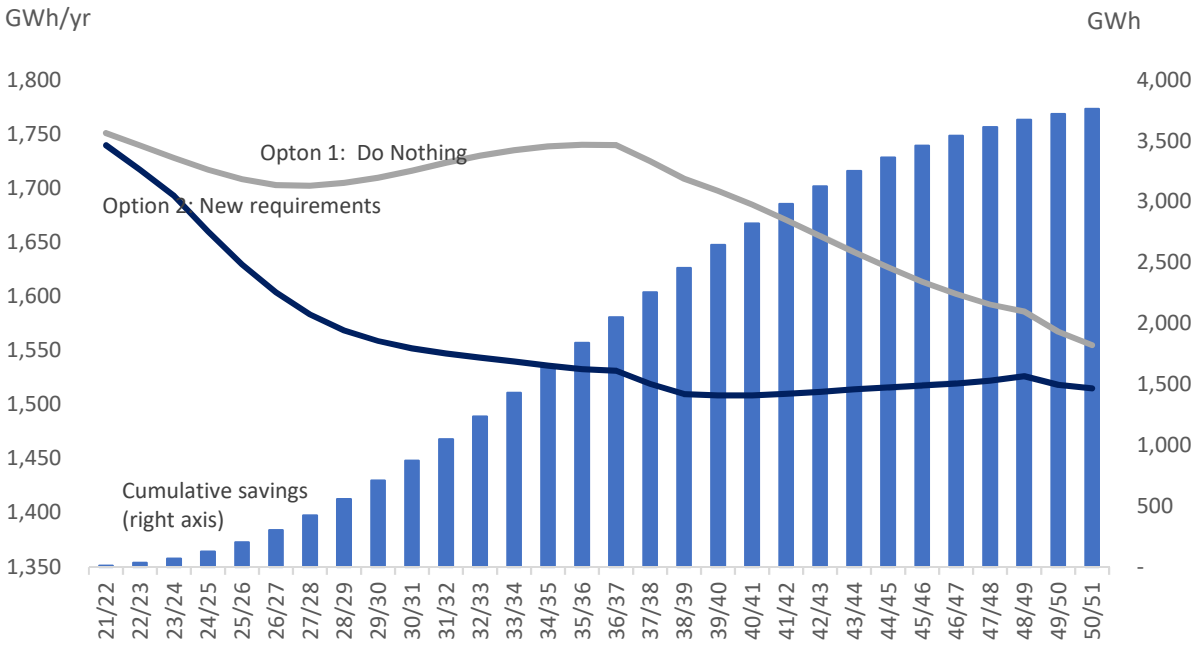
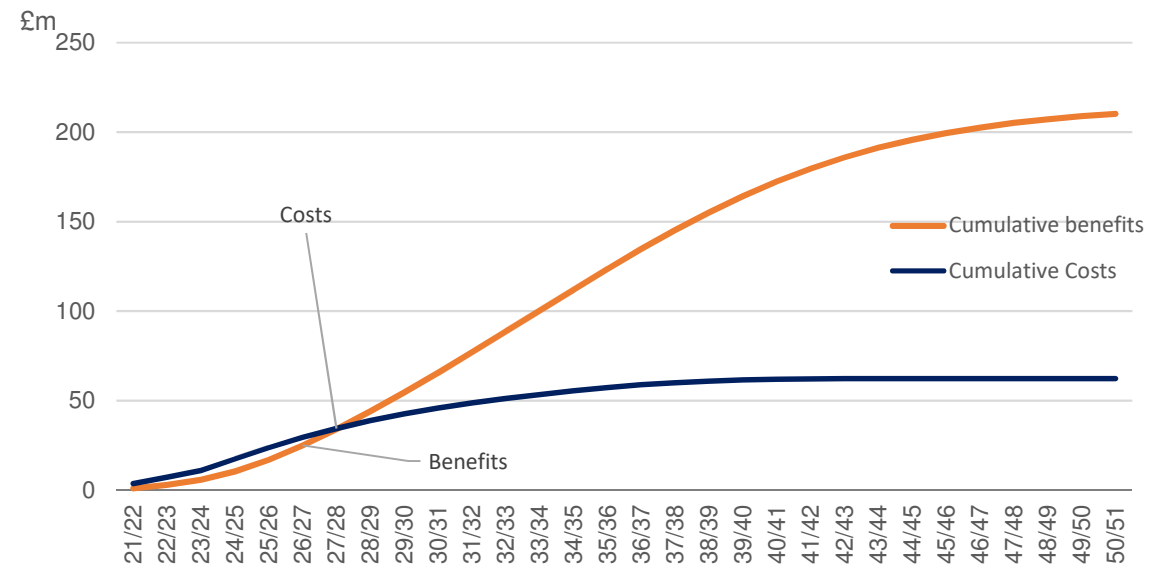



*Figure 16: Cumulative costs and benefits of Option 2 for washing machines/washer-dryers (2021 prices).*




Note that the modelling includes cost-scaling whereby, towards the end of the appraisal period, costs reduce year-on-year. This considers products whose costs would be incurred but benefits only partially realised during the appraisal period.

[59] The distinct shape of this graph is explained in paragraph 232. The trend lines would be much smoother if the Y-axis were to start from 0, however the scale of the data does not allow this.

231. The draft regulations for washing machines/washer-dryers deliver an estimated net present value of £148m and is expected to save around 3,762 GWh of electrical energy and 0.3 million tonnes of $CO_2e$ over the appraisal period (2021/22 to 2050/51). Annual energy savings amount to around 40 GWh a year by the end of the appraisal period.

232. Annual energy savings (the difference between the estimated energy use of the two options) increase year-on-year at the start of the appraisal period (Figure 15) as the non-compliant stock gradually gets replaced by washing machines/washer-dryers which meet the requirements under Option 2. Additional costs under Option 2 occur at the point of purchase only, whereas the energy saving benefits are accrued over the lifetime of the product. This results in cumulative costs exceeding benefits (Figure 16) during the early part of the appraisal period, only providing a positive net present value (where benefits exceed costs) from 2027 onwards. It is also the reason why the modelling scales down costs towards the end of the appraisal period (as shown in Figure 16). Not scaling would result in all the costs, yet only part of the benefits, being considered for products purchased towards the end of the appraisal period, negatively affecting the net present value.

233. Figure 16 has a distinctly different shape compared to the equivalent graph for the other white goods products. The reasons for this are as follows:

1. The existence of ecodesign regulation causes the initial downward trend in both scenarios. The new requirements come into effect in 21/22 hence the Option 2 line becomes steeper.
2. Under Option 1, the energy demand increase flattens out and then starts to gradually increase. This is due to the installed stock (and therefore energy demand) increasing over time due to the increased number of projected UK households over time. The energy consumption then decreases as the impact of the baseline energy efficiency improvements exceeds the effect of the increased stock.

3. Meanwhile, under Option 2, the steepness of the energy demand curve reduces over time due to the installed stock becoming larger (again due to growing number of UK households). However, the ecodesign regulation keeps the curve on a downward trend until the energy demand flattens out. As the impact of the increased stock grows, the energy demand increases until the end of the appraisal period.

### 9.1.1 Household washing machines/washer-dryer: Non-monetised costs and benefits

234. This section examines the additional costs and benefits that, for proportionality reasons, have not been monetised. To indirectly take these into account in the CBA, sensitivity analysis has been undertaken in Section 0.

235. Specifically, for washing machines/washer-dryers, there would be costs associated with the requirements to provide, on websites and instruction manuals, the following:

- information on the different programme cycles as set out in the draft regulation;
- information on the most efficient programmes in terms of energy consumption;
- information on the loading capacity of the washing machine;
- recommendations on the type of detergents suitable for the various washing temperatures and washing programmes;
- information on noise and remaining moisture content for each programme;
- information on how to activate and deactivate the network connection (if applicable) and impact on energy consumption; and
- Installation instructions, maintenance instructions and repair information for the user.

236. The overall savings of resource efficiency measures are considered modest in comparison to the energy savings. Moreover, it is not possible to quantify all resource efficiency measures, even if considered important

according to stakeholder feedback[60].

237. Although the draft regulations would be a revision of existing regulation, transitional costs are not expected to be minimal despite the general processes being already established.

238. However, these costs will be small in relation to overall costs and benefits of the policy option. Monetising such costs is therefore considered disproportionate. However, any such costs may fall disproportionately on to smaller businesses and are therefore considered in the Small and Micro Business Assessment (SAMBA) in Section 10.

239. Further, compliance and distributional costs were considered negligible as outlined in Section 51.1. Similarly, additional benefits of innovation due to UK manufacturers being required to improve efficiency and in maintaining consistency for these particular products with EU manufacturers (particularly for ease of trade with the EU) were not considered

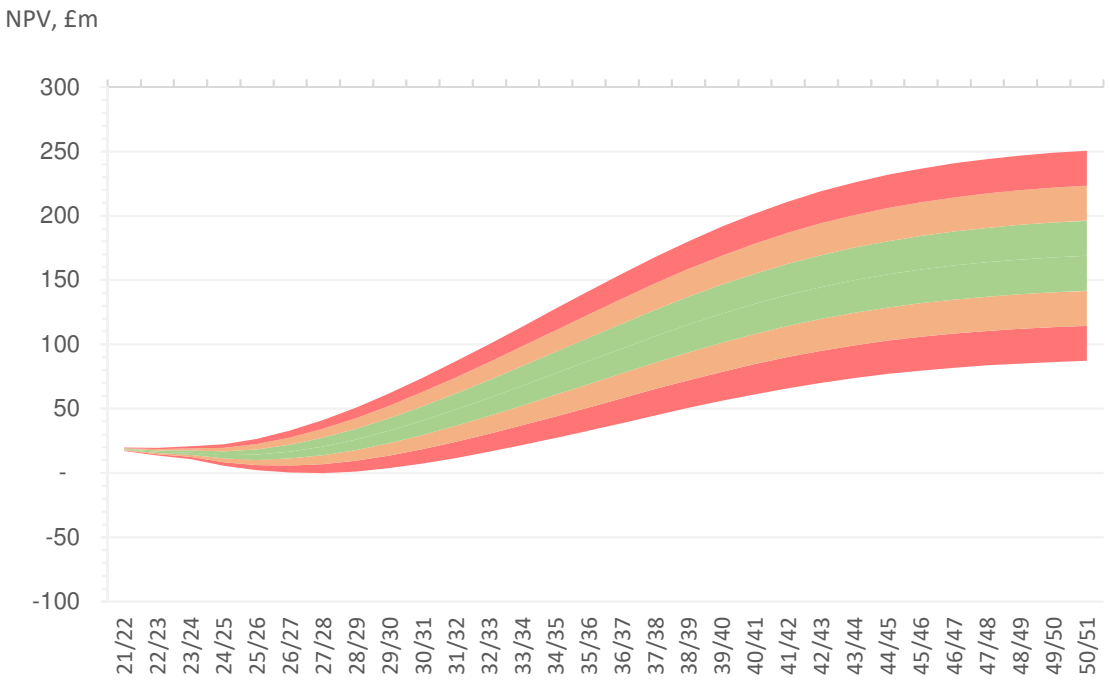
### 9.3 Household washing machines/washer-dryers: Sensitivity analysis

240. Figure 17 below indicates the impact on the net present value over the appraisal years with up to 30% adjustments from the central costs and benefit estimates. Note that the extremities of the bands constitute a 10/20/30% increase (decrease) in costs along with a 10/20/30% decrease (increase) in benefits.

241. The 20% scenario is the highest expected variation in the costs and benefits, and therefore NPV. Higher variation than this is considered unrealistic based on the assumptions used in modelling but is represented by the 30% increase/decrease scenario. See Section 0 for further detail.

[60] European Commission, Impact Assessment for ecodesign requirements for household washing machines and washer-dryers Available from: https://ec.europa.eu/info/law/better-regulation/initiative/1557/publication/5779928/attachment/090166e5c7e20d31_en

*Figure 17: Chart showing the range of the net present value (NPV) over the appraisal period with up to 30% adjustments from the central cost and benefit estimates (2021 prices).*




The green area shows the range of NPV where costs/benefits vary up to 10% from the central estimates, orange within 20% and red, 30%.

242. Table 23 below provides more detailed costs for the +/- 20% scenario (the orange areas in Figure 12) compared with the central estimates.

*Table 23: Costs, benefits and NPV for washing machines/washer-dryers under high (+20%) and low (-20%) scenarios over the entire appraisal period (2021/22 to 2050/51).*

| All values are in 2021 prices, £m | Washing machines/washer-dryers |
|---|---|
| Low (-20%) costs | 50 |
| Central Costs | **62** |
| High (+20%) costs | 75 |
| Low (-20%) benefits | 168 |
| Central Benefits | **210** |
| High (+20%) benefits | 252 |
| Low NPV (high costs, low benefits) | 93 |

| | |
|---|---|
| Central NPV | **148** |
| High NPV (low costs, high benefits) | 202 |

243. Under the high costs (+20%) and low benefits (-20%) scenario (Low NPV), there would be an estimated NPV of £93m over the appraisal period (2021/22 to 2050/51) compared with £148m under the expected scenario. This would arise from, say, a 20% increase in costs of the products under Option 2 compared with the Do Nothing, along with a combined 20% decrease in the expected energy savings from the legislation (due to, for example, a 20% reduction in the expected annual energy use). A reduction in costs by 20% and a similar proportional increase in energy savings would, however, deliver an NPV of around £202m.

244. An increase in costs of around 337% (benefits remain the same) or a decrease in benefits of around 70% (costs remain the same) represents the tipping point at which the NPV becomes negative. The next section examines the likelihood of such a divergence.

## 9.4 Household washing machines/washer dryers: Risks

245. This section outlines the potential risks associated with the costs and benefits of the policy along with possible mitigations. The main risks identified with the analysis in this Impact Assessment relate to the cost and benefit estimates, particularly whether the costs identified could be higher and/or benefits lower than expected, resulting in the NPV becoming negative.

246. The risks around each variable have been considered in Table 29 in Annex 4. The following high-level results can be drawn from the log:

247. **2 medium risk assumptions** have been identified: cost and tech demand values.

## 9.5 Household washing machines/washer-dryers: Impact on UK businesses

248. Table 24 below splits out the total costs and benefits into those which fall directly to businesses. A 95% import scenario has been assumed for the modelling.

*Table 24: Summary of costs and benefits directly impacting UK businesses for likely import scenarios – washing machines/washer-dryers (2021 prices).*

| Costs/benefits | Total (£m) | Of which direct business costs (£m) if… | | |
|---|---|---|---|---|
| | | 90% imported | 95% imported | 100% imported |
| Costs to manufacturers/business purchasers | 62 | 6 | 3 | - |
| Costs of increase in non-traded $CO_2e$ emissions (extra heating)[27] | 1 | 0 | 0 | - |
| **Total Costs (A)** | **63** | **6** | **3** | **-** |
| Value energy savings (net) | 186 | 0 | 0 | - |
| Value of reduction in $CO_2e$ emissions | 15 | 0 | 0 | - |
| Net benefits of air quality improvements | 9 | 0 | 0 | - |
| **Total Benefits (B)** | **210** | **0** | **0** | **-** |
| **Net Present Value (B–A)** | **148** | **-6** | **-3** | - |

Note that totals may not appear to add up due to rounding. Benefits to UK businesses are 0 because washing machines/washer-dryers are domestic products. Under a 100% import scenario, no manufacturers would be impacted because all washing machines/washer-dryers would be being imported into the UK.

249. Using the BEIS Impact Assessment Calculator, the provisional Equivalent Annualised Net Direct Cost to Business (EANDCB) of the preferred policy option (Option 2) is set out in Table 25 below, alongside the Business NPV and Business Impact Target Score.

*Table 25: EANDCB and Business Net Present Value for Option 2 (under the 95% imported scenario) - washing machines/washer-dryers*

| | 2021 Prices, 2021 present value (£m) |
|---|---|
| Business Net Present Value | -3.1 |
| Equivalent Annualised Net Direct Cost to Business (EANDCB)[61] | 0.2 |
| Score for Business Impact Target (BIT) | 0.8 |

250. We will actively look to address the uncertainty around the scale of UK imports during the consultation process since this significantly affects the EANDCB and BIT score above.

# 10 Small and micro business assessment

251. The UK is dominated by small and micro sized businesses (defined as having up to 49 Full Time Equivalent (FTE)[62]), making up 99% of businesses at the start of 2019[63].

252. Although research suggests there are very few, if any, UK manufacturers of white goods, there is potential for UK SMBs involved in the white goods sector to be negatively affected by the changes in production associated with Option 2. Such businesses are likely to be disproportionately affected by the transitional costs associated with Option 2, particularly around testing, and, where possible, redesigning their products to make them compliant. There are also likely to be fewer alternative products for them to market or recoup losses if a product fell outside of the acceptable efficiency range. Similarly, they may also be

[61] The Equivalent Annual Cost is calculated by dividing the net present value through an annuity rate. This rate can be calculated using the formula: a = (1+r)/r * [1- 1/(1+r)^ t], where r is the interest rate (3.5%) and t is the number of years over which the NPV has been calculated (31).
[62] BEIS Better Regulation Framework Manual, February 2018. Available at: https://www.gov.uk/government/publications/better-regulation-framework.
[63] Business Population Estimates for the UK and the Regions 2019. Available at: https://www.gov.uk/government/statistics/business-population-estimates-2019

disproportionately affected by Option 1 (Do Nothing) as smaller businesses might find it harder to capitalise on the lower regulatory standards in Great Britain compared with elsewhere, for example, through scaling-up production or bargaining with suppliers. On exploring this issue during consultation, the costs associated with transitional costs were the main concern raised. For this reason transitional costs have now been quantified in the main cost/benefit section.

253. SMBs that use white goods products would benefit from the proposed requirements through reduced costs over the lifetime of the products. SMB resellers/importers, as well as those that install and service white goods, will benefit from the new regulation through increased business revenue[64].

254. The EU Commission[65] suggests that GB SMB companies are primarily involved in the white goods repair business. One objective of the resource efficiency measures is to improve the competitiveness of independent repairers and facilitate a more open playing field in repair activities. The impact of the proposed measures on these mostly micro companies is expected to be very positive. Measures requiring availability of spare parts and access to repair information should help independent repairers overcome barriers currently limiting their capability to compete in a fair way, widening the range of products they can repair. This is expected to greatly outweigh the potential negative effect of lower profit margins due to more competition between repair services. Additionally, lower costs for repair are expected to drive up the overall demand for repairs, as studies show that consumers currently cite (perceived) high costs as the main reason to not repair but replace appliances[66].

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64

65 EU top ten (2018). Available at http://www.topten.eu/english/household/washing-machines/8kg-3.html

66 IMPACT ASSESSMENT Accompanying the document Commission Regulation laying down ecodesign requirements for household dishwashers and washer-dryers pursuant to Directive 2009/125/EC of the European Parliament and of the Council, amending Commission regulation (EC) No 1275/2008

255. While the exact number of such businesses affected by the draft regulations is uncertain, Table 26 below shows the employment numbers for the manufacture and repair of domestic and electrical appliances in Great Britain.

*Table 26: Great Britain level employment by 2, 3 and 5 digit SIC, using data from 2018[67].*

| | Full time employees (thousands) | Part time employees (thousands) | Total employment (thousands) |
|---|---|---|---|
| Manufacture of electric domestic appliances | 6.9 | 0.6 | 7.5 |
| Repair of electrical equipment | 4.8 | 0.7 | 5.7 |

256. Under the assumptions that, firstly, the manufacture of white goods in the UK makes up a very small proportion of employment figures, and secondly, the repair of electrical equipment includes white goods products which play a significant role, introducing new ecodesign requirements would likely have a positive impact on SMBs in Britain. This is because of the expected increase in the repair market detailed earlier.

257. To mitigate the impact on small and micro business manufacturers, possible options could be considered including:

- phasing the transition period; or
- providing an exemption.

258. However, existing regulation relates to products and not manufacturers. An exemption, or a phasing of the requirements, would mean that products would have a 2-tier structure: those manufactured by medium and large manufacturers (250+ employees), and those by smaller businesses. Such an approach would make enforcement activities harder

[67] Annual employee and employment estimates for Great Britain and UK split by 2, 3 and 5 digit Standard Industrial Classification: SIC 2007. Results given by full-time/part-time and public/private splits. Available at: https://www.ons.gov.uk/file?uri=%2femploymentandlabourmarket%2fpeopleinwork%2femploymentandemployeetypes%2fdatasets%2findustry235digitsicbusinessregisterandemploymentsurveybrestable2%2f2018provisional/table22018p.xlsx

as businesses, as well as products, would have to be investigated. This may also put an additional burden on SMEs as they may be required to provide an additional label/paperwork to show exemption status. Further, if smaller businesses were exempt, such an approach could have the perverse incentive of stifling growth. These mitigations would also only apply to small and micro businesses involved in manufacturing and not to other activities such as service or repair.

259. The EU's proposed legislation applies regardless of the manufacturer's size and that will continue to be the case in the EU under their regulations. If an exemption or phase-in period were in place for GB-manufacturers, they would be unable to export their products to the EU market, affecting their competitiveness.

260. We do not expect there to be a difference in the balance of energy savings and purchase costs between small and large businesses. The products covered by these regulations are considered disaster products. They are only replaced when no longer working. Additionally, a large business is not expected to extract greater energy savings through use of the products. These products are expected to be used at capacity. In a business making efficient use of capital, the size of the business is irrelevant to the energy savings. The consistency through business size across both costs and benefits strengthens the argument that a small business exemption is not necessary.

261. While we cannot completely rule-out small or micro GB businesses being affected, for the reasons outlined above, we have decided not to propose any mitigation measures.

262. These assumptions were tested at consultation, it was highlighted by stakeholders that there may be an additional burden for transitional costs, which have been added into the quantified costs for this IA. However, from responses to the consultation, we understand most SME's will have prepared their products to meet EU requirements so an exemption may have little effect. These are requirements which the UK agreed at EU level in Winter 18/19 after informal consultation with industry. Most SMEs will, therefore, have been familiar with the requirements for some time. Any further transitional period for familiarisation or preparation would likely have

little effect as SMEs would likely have used this lead in time to prepare.

263. When the methodology described in paragraph 88 is scaled for the number of small and micro businesses, the total cost of transition comes in at £315,600. Once again, small and micro businesses will face this one-off cost in 2021. Though this is expected to be a high estimate of the potential costs, given the caveats explained in the transitional cost section, the small potential number of SME manufacturers and the alignment with the EU explained above.

# 11 Wider impacts

264. Table 27, below summarises the wider social and environmental costs and benefits, some of which have, while others have not, been considered in this assessment.

*Table 27: Wider impacts of the suggested policy option*

| Does your policy option/proposal have an impact on…? | Assessed? | Section |
|---|---|---|
| Statutory equality duties | | |
| Statutory Equality Duties Impact Test guidance | No | - |
| Economic impacts | | |
| Competition Assessment Impact Test guidance | Yes | Annex 6 |
| Small and Micro Business Assessment | Yes | Section 10 |
| Environmental impacts | | |
| Greenhouse Gas Assessment Impact Test guidance | No | - |
| Wider Environmental Issues Impact Test guidance | Yes | Annex 7 |
| Social impacts | | |
| Health and Well-being Impact Test guidance | No | - |
| Human Rights Impact Test guidance | No | - |
| Justice Impact Test guidance | No | - |
| Rural Proofing Impact Test guidance | No | - |

| Sustainable development | | |
|---|---|---|
| Sustainable Development Impact Test guidance | No | - |

265. Of the above assessments, only three have been identified as worth exploring further:

- Competition Assessment Impact Test guidance;
- Small and Micro Business Assessment (SAMBA); and
- Wider Environmental Issues Impact Test guidance.

266. Of the remaining seven additional assessments, no additional analysis has been conducted for the following reasons:

- Environmental impacts have already been costed and included in our CBA. Sustainable development has also been considered qualitatively. This policy is directly related to energy efficiency and warrants more in-depth consideration.
- Regulating energy related products has no direct or indirect effect on statutory equality duties.
- Of the social impact tests available, none are directly related to the regulation of energy-related products and do not appear relevant to this assessment.

# 12 Summary and Implementation Plan

## 12.1 Summary

267. In a Do Nothing scenario, commercial refrigeration will not be regulated and household refrigeration, dishwashers, and washing machines/washer-dryers would have outdated requirements. In the case

of commercial refrigeration professional buyers are likely to disregard energy and resource efficiency when making purchasing decisions. Instead, these decisions are based on reliability, performance and the specific needs of the buyer.

268. Policy Option 2 addresses these market failures by revising ecodesign requirements for household refrigeration, dishwashers, washing machines/washer-dryers and introducing ecodesign and energy labelling requirements for commercial refrigeration, which reflect those agreed by the UK as a Member State at EU level in December 2018 & January 2019 before EU exit. Option 2 also introduces resource efficiency requirements for these products, making them more repairable and recyclable, contributing to a circular economy.

269. The main analysis used is taken from the EUPP model (see Annex 2 and 3)

270. The benefits identified are:

- reduced energy costs[68] due to improved energy efficiency;
- consistency between GB and EU requirements;
- likely increase in innovation due to manufacturers having to produce more efficient products;
- carbon savings / reduction in greenhouse gas emissions[68];
- improved air quality[68]; and
- increased repairability and recyclability.

271. The costs identified are:

- increased manufacturing costs[68] to produce more efficient products. This includes transitional costs and is assumed to be passed onto consumers through the supply chain resulting in increased prices[68];
- transitional (one-off) costs of implementing the policy, including familiarisation costs of understanding the requirements;
- possible reduction in consumer choice if some product types are

[68] This cost/benefit was quantified.

removed from the market. However, these are likely to be replaced by new, more efficient products;

- distributional impacts; and
- enforcement costs of imposing requirements. These have a net zero cost.

272. Quantified costs and benefits give an NPV of £733M over the appraisal period (2021/22 to 2050/51).

### 12.2 Implementation and Delivery Plan for Option 2

273. The Office for Product Safety and Standards (OPSS) within BEIS is the appointed UK Market Surveillance Authority responsible for the enforcement of ecodesign and enforcement of energy labelling requirements for suppliers (enforcement of energy labelling requirements for dealers is the responsibility of Trading Standards/Northern Ireland Department of Economy) and so would be responsible for ensuring manufacturers, authorised representatives, or importers comply with the new ecodesign and energy labelling requirements for household refrigeration, household dishwashers, household washing machines/washer-dryers and commercial refrigeration. They will do so through applying their enforcement policy[11].The aim of which is to undertake risk-based enforcement activities, including supporting stakeholders through the provision of advice and guidance as well as employing proportionate sanctions. This regime will ensure the estimated energy bill and carbon emissions savings are realised.

274. Once the regulations are in force, the costs associated with enforcement may increase due to checks connected with additional product functionality and product information requirements. However, these costs are unlikely to be significant; the opportunity cost of staff familiarisation with the new guidance would form part of OPSS's routine activities after the new measures are implemented. Further, for household refrigeration, household dishwashers, household washing machines/washer-dryers, the regulations replace the existing regulations; it is only the regulations for commercial refrigeration which expand the scope of the regulations that OPSS need to enforce.

275. The Local Weights and Measures Authorities (Trading Standards) and, in relation to Northern Ireland, the Department of Economy are responsible for ensuring that dealers comply with the requirements of the energy labelling regulations.

276. The revised ecodesign requirements for household refrigeration, dishwashers and washing machines/washer-dryers and the new commercial refrigeration ecodesign and energy labelling requirements will apply from March 2021, at the same time as the EU's implementation dates. The Government has carried out a consultation whereby manufacturers and other stakeholders have commented on the Government's proposals. We are also working with trade bodies to ensure that our intention to regulate is communicated to their members.

277. Once the draft regulations are made, OPSS will issue a notice informing manufacturers and importers of the new regulations. As the proposed ecodesign and energy labelling requirements reflect what the UK agreed as a Member State at EU level in December 2018 & January 2019 following extensive consultation we anticipate a good level of awareness among manufacturers. We have used communications to inform consumers and stakeholders about the changes to energy labelling.

278. Considering technological progress for household refrigeration and commercial refrigeration, dishwashers and washing machines/washer-dryers, the Government will review household refrigeration, dishwashers, and washing machines/washer-dryers draft regulations 7 years from their entry into force. For commercial refrigeration draft regulations, it will be 5 years from their entry into force. This is to allow enough time for all provisions to be implemented and to understand market penetration.

279. The proposed requirements will be brought forward using secondary legislation.

### 12.3 Post Implementation Review

280. We plan to undertake light-touch Post Implementation Reviews (PIRs) for the individual product Regulations within than the individual review periods indicated in the draft Regulations (for household refrigeration,

household dishwashers and household washing machines/washer-dryers, after 7 years; for commercial refrigeration, after 5 years).

281. Considering the expected impacts of the Regulations, we think a light touch PIR will be proportionate. We expect the review will largely be a qualitative assessment of the impacts of the draft Regulations supported by quantitative analysis where possible.

282. The PIR will use available evidence to assess the impacts of the Regulations - in particular, whether they have met the objective of phasing out lower energy efficiency white goods from the market and improving their resource efficiency. The PIR will also aim to assess the extent to which the Regulations have led to increased uptake of more energy efficient white goods. The review will interrogate whether these Regulations remain the best option for achieving energy, carbon and bill savings from white goods. The findings of the review will be used to inform future policy development.

283. In order to assess the impacts of the Regulations, the PIR will compare the energy consumption of household refrigeration, household dishwashers, household washing machines/washer-dryers and commercial refrigeration products on the market at the end of the review period and compare this to the predictions made in this Impact Assessment. To do this, sales data, product energy consumption, and market observations will be obtained at the time of the review.

284. However, this quantitative analysis will have limitations due to the difficulty in isolating the direct impacts resulting from the Regulations. The sales data will be impacted by external factors including, but not limited to, advancements in technology and changes in consumer preferences (for example as consumers become more climate aware). To address this, the PIR will also use qualitative analysis to assess the extent to which the Regulations were a significant factor in any changes in the market.

285. We anticipate that the PIR will also use market observations (for example, breaches such as putting products on the market that do not fully comply with the requirements of the Ecodesign regulation) as well as consultation with industry. We expect the review will focus on whether the regulations have resulted in only white goods that comply with the

requirements being placed on the market, rather than attempting to quantify the energy savings of their use.

286. As net energy savings are relatively low in the context of the UK's total energy use, we predict that measuring direct energy savings from improved ecodesign requirements for white goods would be difficult in the context of the UK energy market. We also believe it would be disproportionate to launch a GB-wide study evaluating the quantitative impact of the Regulations in a more fair and representative way. Hence why the PIR would largely be a qualitative assessment, supported by quantitative analysis where possible.

287. In addition, we expect the review to consider whether, as a result of technological advances, further savings could be made by setting better Ecodesign and Energy Labelling requirements, or whether these regulations remain the most effective option for achieving greater carbon savings from white goods. To achieve this, data on the contemporary stock of white goods at the time of the review would need to be collected, making sure that the information includes energy efficiency of the products. The PIR would seek to understand the scope for future energy and resource efficiency improvements in these products through a combination of market research and consultation with relevant stakeholders.

288. Further, an assessment of the development of global regulatory standards, particularly in the EU, may help to inform GB policy and whether GB legislation requires updating, for example by increasing the stringency of the requirements, broadening the scope of the requirements or introducing circular economy principles. This will help to establish if the objectives of the regulation remain appropriate.

# Annex 1 General modelling approach and key assumptions

289. This annex sets out the modelling approach used in this Impact Assessment, the detail of the costs and benefits analysed in the CBA as well as the key assumptions made.

## A1.1 The model

290. For 20 years, the UK has been developing end-use energy models to examine the likely impact from policy measures addressing energy consumption of Energy-Using Products (EUP) such as lighting and household appliances. The model used in this Impact Assessment has gone through various iterations including via the Government's Market Transformation Programme (MTP) and, currently, the Energy Using Products Programme (EUPP).

291. In 2012, the model was extensively peer-reviewed which has led to further improvements and was awarded a rating of over 90% by BEIS's independent Modelling Integrity Team in June 2018 – the level required for all business-critical models.

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

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

- **Stocks and/or sales** of EUP being modelled (including breakdown by technology type);
- The **lifespan** of the EUP;
- **The energy consumption** of EUP (including by mode type and mode such as "on" or "standby");

- The **level of usage** of EUP (hours/year); and
- **The price** and value estimates, to calculate costs and benefits.

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

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

## A1.2 Input variables

### A1.1.1 Stocks and/or sales

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

296. The composition of the stock in terms of its energy efficiency and the level of usage of the products is also required to determine energy use from a class of EUPs. The average energy efficiency of the stock evolves according to the rate at which EUPs at one level of energy efficiency are replaced by EUPs of another level of energy efficiency.

297. In the context of EUPs, the rate of increase in energy efficiency over time depends on the rate at which older, less energy-efficient products are replaced by newer, more energy-efficient products which, in turn, may be

affected by the policy being assessed.

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

### A1.1.2 Lifespan (years)

299. The lifespan of a cohort of EUPs is modelled according to a normal distribution. Each cohort has a mean lifespan (the age at which half of the cohort is disposed of) and a corresponding standard deviation indicating the level of variance in that lifespan. The model considers the technical/economic lifespan, accounting for products being replaced before they are irreparable (for example, a mobile phone being replaced at the end of a fixed-term contract).

### A1.1.3 Costs (£)

300. The following prices are considered in the model:

- the **purchase costs of new products** represent the per-unit cost of inflows to the EUP stock;
- **energy prices** which are applied to the energy savings relative to the counter-factual case;
- **carbon prices** to monetise the benefits of lower emissions as a result of the energy savings;
- the **value of improved air quality** from the energy savings; and
- real prices are used as at the baseline year for the model and are discounted, as per Green Book guidance, at the social time

preference rate of 3.5%[69].

### A1.1.4 Level of usage (hours/year)

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

### A1.1.5 Energy consumption (kW)

302. In each year, energy demand is given by annual usage (hours/year) multiplied by the average efficiency of the stock. The annual usage figures can be differentiated by technology and operating mode (e.g. “on” versus “standby”) and may also differ over time. Estimates of greenhouse gas emissions are calculated from the energy demand figures by applying emissions factors to the series from the *Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal*[70].

## A1.3 Modelling assumptions

303. The model does not link Costs and Stocks/Sales, i.e. if the cost of a product increases in the model, stocks/sales figures are unaffected and vice-versa. Similarly, the model assumes that a change in the price of energy will only lead to a change in the value of energy savings (and not the effective lifespan of products).

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

305. All manufacturing costs are assumed to be passed on to consumers through the price of the product.

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[69] The Green Book: Central Government Guidance on Appraisal and Evaluation, March 2019. Available at: https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent.

[70] Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal, January 2018. Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal.

## A1.4 Modelling example

### A1.4.1 Costs

306. This section includes an example of how the model calculates the costs and benefits. 2023 has been used as the example year. (All figures have been rounded).

307. As an example, let us assume that 20 million products were purchased in 2023. Due to the regulatory changes, the additional costs of buying a product (over those under Option 1 where there are no regulatory changes) are estimated, on average, to be £0.25 (2017 prices). This gives,

Total cost (2017 prices) = 20.0m units * £0.25 = £5.0m.

308. Converting to 2021 prices, however, gives,

Total cost (2021 prices) = £5.0m * 1.07[71] = £5.3m.

309. Since, in the main body of this assessment, costs have been provided with a present value year of 2021, these prices must be discounted at an annual rate of 3.5%[72] giving

Discounted cost = £5.3m * $(1/1.035)^2$ = £5.0m

310. Costs in other years are calculated in the same way, taking into consideration the estimated number of sales and discounting the costs accordingly.

### A1.4.2 Benefits

311. Average annual energy consumption is estimated to be, on average, 1.50 kWh/yr less under the draft regulations. Therefore,

**Energy savings (in 2023 for those products purchased in 2023)**
**= 1.50 kWh/yr * 20.0m units = 30m kWh/yr**

[71] Table 19 (2021 price scaling factor, compared with 2017), Green book supplementary guidance, 2018.
[72] As per Green Book guidance: Discounting is used to compare costs and benefits occurring over different periods of time – it converts costs and benefits into present values. It is based on the concept of time preference, that generally people prefer to receive goods and services now rather than later.

312. Using the Green Book supplementary guidance:

**Value of energy savings (discounted) =**

**30m kWh * 1.08 £/kWh[73] * 1.03[74] * (1/1.035)^2 = £3.2**

**Value of reduction in CO2e emissions (discounted) =**

**30m kWh * 0.255/1000 tCO2e/kWh[75] * 34.0 £/tCO2[76] * 1.03[44] * (1/1.035)^2 = £0.3m**

**Net benefits of air quality improvements (discounted) =**

**30m kWh * 0.0052[77] £/kWh * 1.03[44] * (1/1.035)^2 = £0.2m**

**Total benefits (of 2023 cohort in 2023, discounted) =**

**£3.2m + £0.3m + £0.2m = £3.7**

313. Energy savings for this cohort (products purchased in 2023) are then applied in subsequent years reduced by the number of products which were estimated to have reached the end of their lifetime. This is calculated using a normal distribution with an associated mean and standard deviation. After the mean number of years, it is assumed that the annual energy savings will apply to only half of the 20.0M units and, after the mean added to two standard deviations, only 2%.

314. Note that, although these benefits are lower than the costs, total benefits from 2023 will include those cohorts of products purchased in earlier years and, correspondingly, benefits from the 2023 cohort will be realised in subsequent years.

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[73] Table 9 (Long-run variable cost, Central Estimate, Domestic, 2023), Green book supplementary guidance[Error! Bookmark not defined.].

[74] Prices in the Green book are expressed in 2018 prices which then have to be converted to 2021 prices using Table 19 (2021 price scaling factor, compared with 2018), Green book supplementary guidance, 2018[Error! Bookmark not defined.].

[75] Table 1 (Long-run marginal, Domestic, 2023), Green book supplementary guidance, 2018[Error! Bookmark not defined.].

[76] Table 3 (Traded, Central estimate, 2023), Green book supplementary guidance, 2018[Error! Bookmark not defined.].

[77] Table 15 (electricity, National average. 2023), Green book supplementary guidance, 2018[Error! Bookmark not defined.].

# Annex 2 Specific modelling for Commercial Refrigeration

284. In this section, specific details are provided for the modelling of commercial refrigerating appliances.

285. The ecodesign requirements, and therefore the modelling, does not apply to the following products:

- refrigerating appliances with a direct sales function that are only powered by energy sources other than electricity;
- refrigerating appliances with a direct sales function that do not use a vapour compression refrigeration cycle;
- the remote components, such as the condensing unit, compressors or water condensed unit, to which a remote cabinet needs to be connected in order to function;
- food processing refrigerating appliances with a direct sales function;
- refrigerating appliances with a direct sales function specifically tested and approved for the storage of medicines or scientific samples;
- refrigerating appliances with a direct sales function for the sale and display of live foodstuffs, such as refrigerating appliances for the sale and display of living fish and shellfish, refrigerated aquaria and water tanks;
- saladettes;
- horizontal serve-over counters with integrated storage designed to work at chilled operating temperatures;
- refrigerating appliances with direct sales function that have no integrated system for producing cooling and function by ducting chilled air that is produced by an external air chiller unit; this does not include remote cabinets nor does it include category 6 refrigerated vending machines, as defined in the draft regulations;
- corner cabinets;
- vending machines that are designed to work at frozen operating temperatures;
- serve-over fish counters with flaked ice;
- professional refrigerated storage cabinets, blast cabinets, condensing

units and process chillers as defined in Regulation (EU) 2015/1095; wine storage appliances and minibars.

286. The proposed ecodesign requirements for commercial refrigerating appliances set minimum energy performance standards (MEPS).

287. Additionally, the proposal includes requirements regarding information provided by manufacturers, their authorised representatives, and importers. This information is intended for use by professional buyers.

288. The proposed ecodesign requirements for refrigerating appliances with a direct sales function sets out MEPS for new products that fall within this category. The proposed energy labelling requirements also introduce energy efficiency classes from A to G to differentiate products by energy efficiency.

289. The MEPS are proposed to be enacted in two tiers (March 2021 and January 2023) while the energy labelling requirements will enter into force on 1 November 2020. Suppliers of commercial refrigeration will be required to provide energy labels on March 2021.

290. The impact of the proposed ecodesign requirements was modelled, whilst the impact of the energy labelling requirements was not accounted for as it is difficult to predict the influence of energy labels on consumer purchasing habits.

291. For the reference scenario, an annual reduction in EEI of 1.5% or lower is assumed in the absence of any future requirements. This is consistent with historic reduction in energy consumption of refrigerating appliances with a direct sales function.

292. A requirement of the model was to develop assumptions around typical energy consumption, lifetime and cost for each sub-sector of refrigerating appliances with a direct sales function. These were based on data from the JRC Preparatory Study Final report for commercial refrigeration products[78].

[78] JRC, Ecodesign for commercial refrigeration; Preparatory study update, Final report, 2014. Available from: https://www.eup-network.de/updates/preparatory-studies-news/news-detail/jrc-study-supplementing-lot-12-commercial-refrigeration-final-report-published/?L=

*Table 28: Overview of the key inputs into the CBA for commercial refrigeration as well as risks of assumptions and any mitigation actions.*

| Variable | Source(s) | Values/assumptions |
|---|---|---|
| **Stocks/sales (Same under both options)** | [1] JRC 2014 Preparatory Study<br>[2] UNESDA UK<br>[3] Open Data Institute<br>[4] DEFRA<br>[5] Eurostat<br>[6] Market Transformation Programme 2014<br>[7] UK Automatic Vending Association 2014 | Post 2030 for all appliances except display cabinets, the respective installed stock was calculated using the forecast growth rate to 2030 (+0.76%) from [1]. The UK segment was estimated using the proportion of the UK population to the EU population [5]. Eurostat population data and projections were available for 2015, 2020, 2030, 2040 and 2050. A trend was applied to estimate the population in the other years.<br><br><u>Beverage coolers</u><br>Stock was based on estimated EU28 stock [1]. UK proportion of EU28 stock was assumed to be linked with the UK proportion of soft drink sales and consumption. Stock fluctuation over time was based on the forecast growth [1].<br><br>The UK segment of the EU beverage cooler stock was estimated using soft drink consumption data [2] as a proportion of the EU consumption.<br>• Pre-2004: Estimated using the average growth rate of 2% in UK soft drink consumption during this period, obtained from [3][4] and based on the compound annual growth rate (CAGR) of soft drink consumption.<br>• For 2004 to 2007, the average UK/EU proportion was used.<br>• For 2008 to 2017. Consumption data for concentrate soft drinks was excluded. |

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| | | • For 2018 to 2030, the 2008 to 2017 CAGR of the UK/EU proportion was used to estimate the future UK beverage cooler segment.<br><br><u>Ice Cream Freezers</u><br>• Pre-2004: Small ice-cream freezer sales were assumed to be linked to small ice cream and ice lolly sales and consumption. Stock in these years was estimated using the average growth rate in UK cornet/choc-ice/ice-lolly/frozen yoghurt consumption during this period. The assumed 3% annual growth rate is obtained from [3][4] and based on the compound annual growth rate (CAGR) of soft drink consumption.<br>• For 2004 to 2017, the average UK/EU proportion was used<br>• 2004 - 2030: [1] provided an estimate of the EU28 installed stock for ice cream freezers<br>• For 2018 to 2030, the 2008 to 2017 CAGR of the UK/EU proportion was used to estimate the future UK ice cream freezer segment.<br><br><u>Vending Machines</u><br>• Pre-2003: Data from [6] was used for this period.<br>• 2003 to 2007: UK installed stock data from [7] was used for 2003 to 2006 with the 2007 installed stock interpolated between the two data sets.<br>• 2008 - 2030: [1] provides an estimate of the EU28 installed stock for vending machines.<br><br><u>Display Cabinets</u> |

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| | | • 1980 to 2003: MTP GS 2010 UK remote display cabinet sales data from the 2014 evidence workbook was used for this period. Total sales for all refrigerated display cabinets including integral cabinets was estimated using the EU remote/integral sales split for 2004 (61% remote, 39% integral or plug-in).<br>• 2004 to 2010: Data from [1] was used for this period. Total sales for all refrigerated display cabinets including integral cabinets was estimated using the EU remote/integral sales split for this period. The sales in 2004 were calculated as the midpoint between the 2003 and 2005 value to smooth out the curve which combined two data sets.<br>• Post 2010: The UK annual sales was estimated to grow at a rate of 0.24% annually up to 2050, in line with the forecast growth rate from [1] for 2013 to 2030.<br><br>**Risk: Low/medium.** Stock data has a significant effect on the results of the model. The UK proportion of EU28 stock could not be linked with the:<br>• UK proportion of EU28 soft drink sales and consumption (beverage coolers)<br>• UK proportion of EU28 population (ice cream freezers<br>However, because stock does not differ between the Reference and Policy scenario, the impact is medium. |

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| | | Consistent methods utilising reliable data sources were also used, with forecasts being based on [1]. |
| **Lifespan (same under both options)** | [1] Open Data Institute | The General Approach is to use the economic lifespan. But for all appliances, the lifespan from [1] was used because it was assumed that these accounted for commercial refrigeration products usually being substituted before their technical life ends for commercial reasons (e.g. fashion, changes of the needs of users). Hence the lifespans and associated standard deviation (SD) are listed below for each appliance:<br>• Beverage coolers: 8 years, SD = 2.25 years<br>• Ice Cream Freezers: 8 years, SD = 2.25 years<br>• Vending Machines: 9 years, SD = 2.10 years<br>• Display Cabinets: 9 years, SD = 2.50 years<br><br>**Risk: Low.** Lifespans based on [1] which is assumed to take into account substitution factors. |
| **Tech demand values (different under each option)** | [1] Bio Intelligence Service Preparatory Study Lot 12<br>[2] JRC 2014 Preparatory Study<br>[3] CLASP<br>[4] Energy Efficiency Index (EEI)<br>[5] 2018 EU Commission Impact Assessment for refrigerated appliances with a direct sales function | All appliances were assumed to operate continuously, running 24 hours a day, all year round. This was the same for both scenarios. However, for beverage coolers it is becoming increasingly common to allow higher temperature set-points out of hours, as this does not affect beverage quality. This was accounted for in the annual energy consumption.<br><br><u>Beverage Coolers</u><br>*Reference scenario* |

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| | | 2007 - 2014: Base case energy consumption data from the [1] and [2] suggested that beverage cooler energy efficiency in the EU has not changed much in this time. The EEI during this period remained flat at the 2014 level.<br><br>Pre-2007 and post-2014: 1% annual change in EEI was assumed due to the lack of change in energy efficiency in the absence of policy.<br><br>*Policy scenario*<br>[2] suggested there was a high level of homogeneity in the installed stock. Hence, where MEPS levels were below the standard base case, MEPS were assumed to have no impact on the market average. Where MEPS levels were higher, the market average was assumed to increase to the MEPS level.<br><br>1980 - 2020: Prior to policy implementation, EEI set equal to reference scenario.<br><br>2021 - 2022: Tier 1 MEPS (EEI 100) were just below the reference scenario market average (EEI 97). As a conservative approach, the policy scenario was assumed to have no impact on the market; therefore EEI set equal to the reference scenario.<br><br>Post 2022: Tier 2 MEPS come into force in 2023 and are better than the market average. The EEI was therefore set at the Tier 2 MEPS level until the reference scenario catches up and EEI is set equal to the reference scenario.<br><u>Ice Cream Freezers</u><br>*Reference scenario* |

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| | | • 2007 - 2014: Base case energy consumption data from [1] and [2] were used for the 2007 and 2014 data points with linear interpolation in between.<br>• Pre-2007 and Post-2014: A 3% annual change in EEI was assumed for the 5 years before 2007 and the 5 years after 2014 to match the annual EEI reduction observed between 2007 and 2014.<br>• Beyond this up to 1980 and 2050, a 1% annual change in EEI is assumed due to the lack of change in energy efficiency in the absence of policy.<br><br>*Policy scenario*<br>Graph provided by [3] for [2] suggested that the proposed MEPS will have a significant impact on the market average.<br>• The policy scenario is set equal to the reference scenario until the MEPS come into force in 2021 for Tier 1 and 2023 for Tier 2.<br>• The Tier 1 and 2 MEPS (EEI 80 and 50) were significantly better than the 2014 market average EEI (100).<br>• The policy scenario therefore assumed that when the MEPS come into force, the market average EEI and energy consumption were at the MEPS level, removing several products from the market.<br>• In practice, the average would be above the MEPS level, this approach is conservative and does not overestimate the policy saving.<br>• Post 2023: Tier 2 MEPS come into force in 2023 and the EEI was set at the new Tier 2 market average level (equal to the Tier 2 MEPS level). As |

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| | | this was far better than the current market average, the reference scenario never catches up with the policy scenario.<br><br><u>Vending Machines</u><br>*Reference scenario*<br>• Pre-2007: Older refrigeration products have higher energy consumption. A 1% annual change in EEI was assumed due to the lack of change between 2007 and 2014 [2]. This increased to 1.5% pre-2000 to reflect a likely higher rate of change during this period.<br>• 2007 - 2014: Base case energy consumption data from the Bio Intelligence Service 2007 prep study and the 2014 JRC prep study update show similar energy consumption levels and so the 2014 EEI (83.9) is assumed for this period.<br>• Post-2014: A 0.25% annual change in EEI was assumed from [2] due to the lack of change in energy efficiency between 2007 and 2014 and in the absence of policy.<br><br>*Policy scenario*<br>• The policy scenario is set equal to the reference scenario until the MEPS come into force.<br>• The base case/market average EEI (83.9) was much lower than the Tier 1 MEPS (100) and so it was assumed to have no effect on the market average.<br>• When the Tier 2 MEPS (80) come into force in 2023, the market average was set at the Tier 2 MEPS level. |

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| | | • Post 2023, the market average is set at the lower of the Tier 2 MEPS level until the reference scenario catches up and EEI was set equal to the reference scenario.<br><br><u>Display Cabinets</u><br>• Ratio from [4] for each year was used to estimate the annual energy consumption for refrigerated display cabinets, using the EEI calculation methodology set out in [5].<br>• The methodology has changed since the previous working document and so annual energy consumption (AEC) values from the prep studies were used rather than EEI values.<br>• There were two base cases presented in [2]: RVC2 (vertical chiller) and RHF4 (horizontal freezer), both of which are remote refrigerated display cabinets. Vertical chillers and horizontal freezers together represent about 70% of RDC sales.<br>• A sales-weighted average of these was used to estimate the annual energy consumption for the reference and policy scenarios.<br><br>*Reference scenario*<br>• Pre-2014: Findings from [2] suggested a 2.5% annual reduction in display cabinet energy consumption between 1997 and 2013.<br>• Before 1997 the EEI is kept flat at the 1997 level.<br>• 2014: Base case EEI was set using base case AEC from [2]. The AEC is converted to an EEI using the 2018 ecodesign draft regulation EEI calculation methodology. |

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| | | • Post-2014: An annual reduction in energy consumption of 1.5% is assumed based on stakeholder feedback in [2]. Stakeholders estimated a future annual reduction of 0.5 to 1.5% for 5 to 10 years.<br>• The upper end was taken as a conservative approach to minimise the projected saving potential of the MEPS. This rate was applied up to 2050.<br><br>*Policy scenario*<br>• The policy scenario is set equal to the reference scenario until the MEPS come into force in 2021 for Tier 1 and 2023 for Tier 2.<br>• The Tier 1 MEPS (100) were worse than the market average for both RDC types and so were assumed to have no impact on the market average. Policy set equal to reference scenario for 2021 and 2022.<br>• When the Tier 2 MEPS (80) come into force in 2023, the market average was set at the tier 2 MEPS level.<br>• Post 2023, the market average was set at the lower of the tier 2 MEPS level until the reference scenario catches up and EEI is set equal to the reference scenario.<br><br>**Risk: Low/medium.** Because use in the reference and policy scenarios is the same, this assumption does not have a large impact when estimating costs, energy savings and emission savings. Each respective appliance could also eventually be turned off but the percentage of time they stay off is very likely to be minimal and this should not have a significant effect in the model. |

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| | | The difference between energy consumption in the Reference and Policy Scenarios is the key factor for estimating energy and carbon savings. However, the data is taken from reliable sources.<br><br>For beverage coolers specifically, annual EEI reduction has been 0% between 2007-2014. It could continue at this pace. So, the 1% is a conservative assumption that minimises the difference between the Reference and Policy scenarios that allows the Reference scenario to catch up and ensures that energy and emission savings are not overestimated. |
| **Cost (different under each option)** | [1] JRC 2014 Preparatory Study | For all appliances except from display cabinets, costs for the reference scenario were set at £0 and the policy scenario cost was the marginal cost of compliance, based on costs from [1].<br><br><u>Beverage Coolers</u><br>The marginal cost was estimated to be the difference between the cost of the base case refrigerating appliance and the cost of the refrigerating appliance with LED lighting [1]. This was the cheapest improvement option to make the base case product compliant with Tier 2 of the MEPS. This option offered an estimated 20% energy consumption saving.<br><br>A cost-scaling method was used to estimate the difference in cost between the Policy and Reference scenarios over time as the Reference scenario caught up.<br><br><u>Ice Cream Freezers</u> |

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| | | The energy saving from the proposed policy was of the order of 6% and 40% for Tier 1 and 2 respectively. The Tier 2 saving was closer to the BAT and as the marginal cost of the BAT was not provided, the marginal cost of the policy was extrapolated linearly from the marginal cost of Improvement options 1, 2 and 3 in [1] - the estimated energy saving for this option was 13%.<br>A cost-scaling method was used to estimate the difference in cost between the Policy and Reference scenarios over time as the Reference scenario efficiency improved.<br><br><u>Vending Machines</u><br>The marginal cost was estimated to be the difference between the cost of the base case refrigerating appliance and the cost of the refrigerating appliance with Improvement option 2 from [1], factored down based on the energy consumption saving from the proposed policy. Option 2 offers an estimated 18% energy consumption saving at a cost of 30 euros. As the saving from the proposed policy (Tier 2) was only 2% in 2023, the marginal cost was therefore factored down to 3.3 euros. This was a reasonable approach to account for the small proportion of products on the market would require the improvement option to meet the Tier 2 MEPS.<br><br><u>Display Cabinets</u><br>Costs for the reference scenario were set at the base case cost; sales weighted using the RVC2 (vertical chiller) and RHF4 (horizontal freezer) 2010 sales figures. Reference scenario costs increase as the reference scenario market average energy consumption reduces until it catches up |

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| | | with the policy scenario. At this point, the reference scenario cost equals the policy scenario cost.<br><br>The policy scenario cost was the cost of a compliant product, based on costs from [1]; sales weighted accordingly as for the reference scenario.<br><br>For Tier 1, the MEPS were assumed to have no impact on the market average and so the policy scenario costs equal the reference costs (i.e. base case cost).<br><br>For Tier 2 MEPS:<br>RVC2 - Option 3: Optimisation air curtain<br>RHF4 - Option 3: Night curtain<br><br>These were most consistent with the estimated energy saving from the proposed policy.<br><br>**Risk: Medium.** The premium of the compliant product is the key determinant factor for estimating the costs of the policy.<br><br>For beverage coolers specifically, consumers can choose other improvement options instead of the LED which would lead to higher costs. This assumption is based on consumers choosing the lowest cost option for compliance.<br><br>But for all, the cost of improvement option is based on [1]. |

# Annex 3 Specific modelling for Household Refrigeration

293. In this section, specific details are provided for the modelling of household refrigerating appliances.

294. The ecodesign requirements, and therefore the modelling, does not apply to the following products:

- professional refrigerated storage cabinets and blast cabinets, with the exception of professional chest freezers;
- mobile refrigerating appliances;
- appliances where the primary function is not the storage of foodstuffs through refrigeration;
- refrigerating appliances with a direct sales function.

295. The proposed ecodesign requirements for household refrigerating appliances set revised MEPS.

296. Additionally, the proposal includes requirements regarding information provided by manufacturers, their authorised representatives and importers. This information is intended for use by professional buyers.

297. For the reference scenario, a 1% annual reduction in EEI was assumed in the absence of any future regulations. This was consistent with historic reduction in energy consumption of household refrigerating appliances.

298. A requirement of the model was to develop assumptions around typical energy consumption, lifetime and cost for each sub-sector of refrigerating appliances. These were based on data from the 2016 Preparatory Study for household refrigeration appliances[79].

[79] Preparatory Review/Study for household refrigeration appliances (2016). Available at: https://www.eup-network.de/fileadmin/user_upload/2015/Household_Refrigeration_Review_TASK_1_6_DRAFT_REPORT_20151114.pdf

*Table 29: Overview of the key inputs into the CBA for household refrigeration as well as risks of assumptions and any mitigation actions.*

| Variable | Source(s) | Values/assumptions |
|---|---|---|
| **Stock (same under both options)** | Mintel Group Ltd [1]<br>ONS [2] | Stock was based on data from [1] for household ownership levels obtained from [2] of these appliances for 2005-2010 and 2015-2018.<br>• 2011-2014 values based on linear interpolation.<br>• Pre-2005 and post 2030 ownership levels were assumed to remain static at 2005 and 2030 levels.<br>• 2019-2030 projections based trend from [1] between 2007 - 2018.<br>• Post 2030 stock levels held static to 2050.<br><br>**Risk: Low.** Data is reliable and stock data does not differ between the reference and policy scenario. |
| **Lifespan (same under both options)** | 2008 Preparatory Study [1] | Using the economic lifespan was the general approach, however, [1] states that consumers normally purchase an appliance and use it until it breaks before buying a new one. Hence, it was a safe assumption to use the technical lifespan provided in [1].<br><br>**Risk: Low.** Based on the technical lifespan from [1]. |
| **Tech demand values (different under each option)** | 2008 Preparatory Study [1]<br>2016 Review Study [2]<br>CECED [3] | Reference scenario annual energy demand per unit (kWh/yr) values are based on [1], [2] and [3].<br><br>[1] provided an estimate of the unitary energy consumption of the average new product purchased in the EU up to 2005. The energy consumption was adjusted to account for the new EEI.<br>• 2006-2013 values were calculated by interpolating the 2014 and 2005 values. |

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| | | • 2014 value was taken from the [2]<br>• 2015-2020 values were provided by [3]. A 1% annual reduction to the EEI was assumed in absence of future regulations.<br><br>Policy scenario annual energy demand per unit (kWh/yr) was equal to the reference scenario pre-2021. From 2021 onwards, the values reflected the proposed MEPS until the reference scenario 'catches up' to the policy scenario tech values. When this happened, the policy scenario values were set to the reference ones.<br><br>Household refrigeration appliances were assumed to operate continuously, running 24 hours a day, all year round. This is typical for refrigeration. Usage inputs were set to 1 in each input workbook because operating time was captured. This was the case for both the reference scenario and the policy scenario.<br><br>**Risk: Low/medium.** Data is reliable the assumption of 24-hour usage is used by industry. Usage does not differ between the reference scenario and policy scenario. But the difference between energy consumption between the scenarios is the key factor for estimating energy and carbon savings. |
| **Cost (different under each option)** | 2014 Preparatory Study [1] | Costs for the reference scenario were set at £0.<br><br>Policy scenario cost was the marginal cost of compliance, based on costs from [1]. The marginal cost was estimated to be the difference between the cost of the base case refrigerating appliance and the |

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| | | cost of the refrigerating appliance with the least life cycle cost (Least LCC/LLCC). This was deemed to be a suitable approach as [1] suggested that the LLCC scenario was a yardstick for minimum Ecodesign requirements.<br><br>**Risk: Medium.** The premium of the compliant product is the key determinant factor for estimating the costs of the policy. |

# Annex 4 Specific modelling for Washing Machines/Washer-Dryers

315. In this section, specific details are provided for the modelling of washing machines/washer-dryers.

316. The ecodesign requirements, and therefore the modelling, does not apply to the following products:

1. washing machines/washer-dryers belonging to the scope of The Supply of Machinery (Safety) Regulations 2008;
2. battery-operated washing machines/washer-dryers that can be connected to the mains through AC/DC converter.

317. The proposed ecodesign requirements for washing machines set revised MEPS.

318. Additionally, the proposal includes requirements regarding information provided by manufacturers, their authorised representatives and importers. This information is intended for use by professional buyers.

319. No data that allowed separate modelling of washing machines with different widths or place settings was identified. Due to this lack of data, a single washing machine technology was modelled, using a notional, averaged product representative of the UK market.

320. The model is stock-based, developed using a variety of sources outlined Table 30. This table also shows the high-level inputs into the model along with the sources behind the values.

*Table 30: Overview of the key inputs into the CBA for washing machines as well as risks of assumptions and any mitigation actions.*

| Variable | Source(s) | Values/assumptions |
|---|---|---|
| **Stocks/sales (Same under both options)** | [1] ONS UK household projections and ONS percentage of households with washing machines/washer-dryers; ONS, 2017, Table 401: Household projections, United Kingdom, 1961-2039. | Number of households and percentage of households with washing machines/washer-dryers obtained from [1].<br><br>The number of households is multiplied by the percentage of households with washing machines/washer-dryers to obtain the stock of washing machines.<br><br>**Risk:** Low. Data is reliable and, although stock data has significant impact on the results of the model, it does not differ between reference and policy scenario. |
| **Lifespan (same under both options)** | [1] 2007 Prep Study - Task 2. | Lifespans are taken from the lifetime expectancy lines from [1].<br><br>Standard deviation values were developed by considering the following: (1) the confidence in the lifespan input values (i.e. estimate of the variance in a sample of lifespans), (2) the number of products that would be within two standard deviations of the mean value (i.e. 95% confidence rule), (3) what would be a realistic typical high or typical low lifespan, (4) If confidence in the lifespan values are low, then the highest the S.D. can be is roughly 1/3 of the lifespan value. e.g. 40yr lifespan / 3 = 13.33 s.d.<br><br>It is assumed that lifespan is the same for reference and policy scenarios |

| | | |
|---|---|---|
| | | **Risk:** Low. Prep study data is reliable, and lifespan does not differ between reference and policy scenario. |
| **Tech demand values (different under each option)** | [1] 2007 Prep Study - Task 2.<br>[2] TopTen, 2010. Monitoring the washing machines market in Europe. | Until 2012, when the Ecodesign Regulation comes into force, the average energy consumption per unit sold (*sales EE*) trend is the same in the baseline and policy scenarios. From 2012 the two scenarios differ in the rate the sales EE progresses towards the average energy consumption of the highest energy label category (A+++).<br>In the *Baseline*, it is assumed that the *sales EE* reduces at the same rate as in the previous 10 years, until it reaches the average energy consumption of the highest energy label category (A+++)<br>In the *Policy Scenario* it is assumed that the *sales EE* reduces at the same rate as the two years following the implementation of the Ecodesign regulation (2012-2013), until it reaches the average energy consumption of the highest energy label category (A+++).<br><br>1980-1994: Assumed constant from 1980-1995, for conservativeness, in the absence of more accurate data.<br>1995: Calculated, based on [1]. Only stock energy consumption was available, so stock EE had to be converted to sales EE based on the % difference between the Prep Study 2005 stock EE (306 kWh/y) and sales EE (232 kWh/year) from [2].<br>1996-1999: Interpolated 1995 and 2000 values<br>2000: Calculated, based on [1]. Only stock energy consumption was available, so stock EE had to be converted to sales EE based on the % difference between the Prep Study 2005 stock EE (306 kWh/y) and sales EE (232 kWh/year) from [2].<br>2001-2004: Interpolated 2000 and 2005 values. |

| | | |
|---|---|---|
| | | 2012-2050 [*Baseline*]: Assumed that unit's energy consumption reduces at constant rate<br>2012-2050 [*Existing Policy*]: assumed step drop in energy consumption, with value kept constant until the baseline catches-up with the policy demand<br>2012-2050 [ New *Policy]*: energy demand kept and Existing Policy level, with step drops with two tiers of eco-design regulation introduction. Demand kept constant until Existing Policy catches up.<br><br>**Risk:** Medium. The difference between energy consumption in the Reference and Policy Scenarios is the key factor for estimating energy and carbon savings. Data is very reliable. |
| **Cost (different under each option)** | [1] 2007 Prep Study - Task 6.<br>[2] BEIS, 2018. Updated energy and emissions projections: 2017, Annex M: Growth assumptions and prices. | Reference / baseline scenario is assumed to have costs equal to 0. Costs of policy are assumed to be proportional to technology gap between baseline and policy energy usage. Valuation of the tech gap comes from [1], where the improvement cost has been estimated.<br><br>**Risk:** Medium. The premium of the compliant product is the key determinant factor for estimating the costs of the policy. Data source is reliable. |

# Annex 5 Specific Modelling for Dishwashers

321. In this section, specific details are provided for the modelling of dishwashers.

322. The ecodesign requirements, and therefore the modelling, does not apply to the following products:

- Non-household dishwashers in the scope of The Supply of Machinery (Safety) Regulations 2008;
- Battery-operated dishwashers that can be connected to the mains through an AC/DC converter purchased separately.

323. The proposed ecodesign requirements for dishwasher set revised MEPS.

324. Additionally, the proposal includes requirements regarding information provided by manufacturers, their authorised representatives and importers. This information is intended for use by professional buyers.

325. No data that allowed separate modelling of dishwashers with different widths or place settings was identified. Due to this lack of data, a single dishwasher technology was modelled, using a notional, averaged product representative of the UK market.

326. The model is stock-based, developed using a variety of sources outlined Table 31. This table also shows the high-level inputs into the model along with the sources behind the values

*Table 31: Overview of the key inputs into the CBA for dishwashers as well as risks of assumptions and any mitigation actions.*

| Variable | Source(s) | Values/assumptions |
|---|---|---|
| **Stocks/sales (Same under both options)** | [1] ONS UK household projections and ONS percentage of households with dishwashers; ONS, 2017, Table 401: Household projections, United Kingdom, 1961-2039. | Number of households and percentage of households with dishwashers obtained from [1].<br><br>The number of households is multiplied by the percentage of households with dishwashers to obtain the stock of dishwashers.<br><br>**Risk:** Low. Data is reliable and, although stock data has significant impact on the results of the model, it does not differ between reference and policy scenario. |
| **Lifespan (same under both options)** | [1] 2007 Prep Study - Task 2. | Lifespans are taken from the lifetime expectancy lines from [1].<br><br>Standard deviation values were developed by considering the following: (1) the confidence in the lifespan input values (i.e. estimate of the variance in a sample of lifespans), (2) the number of products that would be within two standard deviations of the mean value (i.e. 95% confidence rule), (3) what would be a realistic typical high or typical low lifespan, (4) If confidence in the lifespan values are low, then the highest the S.D. can be is roughly 1/3 of the lifespan value. e.g. 40yr lifespan / 3 = 13.33 s.d.<br><br>It is assumed that lifespan is the same for reference and policy scenarios<br><br>**Risk:** Low. Prep study data is reliable, and lifespan does not differ between reference and policy scenario. |

| | | |
|---|---|---|
| **Tech demand values (different under each option)** | [1] 2007 Prep Study - Task 2.<br>[2] AISE, 2014.<br>[3] GfK hitlist, 2013 | 1980-1997: Assumed constant from 1980-1995, for conservativeness, in the absence of more accurate data.<br>1998-2004: Calculated, based on [1] Figure 2.81, and; [2]<br>2005-2011: Calculated, based on [3]<br><br>2012-2050 [Baseline]: Assumed that unit's energy consumption reduces at constant rate<br>2012-2050 [Existing Policy]: assumed step drop in energy consumption, with value kept constant until the baseline catches-up with the policy demand<br>2012-2050 [ New Policy]: energy demand kept and Existing Policy level, with step drops with two tiers of eco-design regulation introduction. Demand kept constant until Exist Policy catches up<br><br>**Risk:** Medium. The difference between energy consumption in the Reference and Policy Scenarios is the key factor for estimating energy and carbon savings. Data is very reliable. |
| **Cost (different under each option)** | [1] 2007 Prep Study - Task 6.<br>[2] BEIS, 2018. Updated energy and emissions projections: 2017, Annex M: Growth assumptions and prices. | Reference / baseline scenario is assumed to have costs equal to 0. Costs of policy are assumed to be proportional to technology gap between baseline and policy energy usage. Valuation of the tech gap comes from [1], where the improvement cost has been estimated.<br><br>The difference in cost between the policy and reference scenarios is calculated based on the cost per tech gap of 1kWh/year (from [2]) and the tech gap between the scenarios from I-Tech-Workings.<br><br>**Risk:** Medium. The premium of the compliant product is the key determinant factor for estimating the costs of the policy. Data source is reliable. |

# Annex 6 Competition Assessment

327. Considered in this assessment are the effects on competition from our preferred policy option (Option 2). The following questions were considered as to whether the option:[80]

1. **Directly limits the number or range of manufacturers;**
2. **Indirectly limits the number or range of manufacturers;**
3. **Limits the ability of manufacturers to compete;**
4. **Reduces manufacturers' incentives to compete vigorously; and**
5. **Limits the choices and information available to consumers.**

328. Failure to implement the policy could lead to a failure of the third Competition and Market Authority condition listed above. UK exporters would be unable to sell their products in the EU market, thus limiting the ability of manufacturers to compete.

329. It has been concluded that there are no adverse effects on competition from our policy option as none of the above conditions are satisfied.

# Annex 7 Wider Environmental Impacts Assessment

330. Considered in this assessment are the effects on the wider environment from our preferred policy option. Each of the following questions were considered:

1. Will the policy option be vulnerable to the predicted effects of climate change?

[80] Conditions taken from RPC case histories – competition assessments, October 2020 Accessed here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/460784/Competition_impact_assessment_Part_1_-_overview.pdf

2. Will the policy option lead to a change in the financial costs or the environmental and health impacts of waste management?

3. Will the policy option impact significantly on air quality?

4. Will the policy option involve any material change to the appearance of the landscape or townscape?

5. Will the proposal change 1) the degree of water pollution, 2) levels of abstraction of water or 3) exposure to flood risk?

6. Will the policy option change 1) the amount or variety of living species, 2) the amount, variety or quality of ecosystems?

7. Will the policy option affect the number of people exposed to noise or the levels to which they're exposed?

331. The policy in question has direct benefits accruing from environmental savings. Relevant impacts have been explicitly included in the CBA. Others have not been included (such as the appearance of the landscape and the amount or variety of living species) as they are not in-scope for this policy. It has been concluded that the extent to which environmental impacts are considered in the main body of this assessment is proportionate.

# Annex 8 Glossary of Terms

| | |
|---|---|
| BEIS | Department for Business, Energy and Industrial Strategy |
| CBA | Cost-Benefit Analysis |
| EANDCB | Equivalent Annual Net Direct Cost to Business |
| EC | European Commission |
| EU | European Union |
| EUP(P) | Energy-using Products (Programme/Policy) |
| FTE | Full Time Equivalent |
| GHG | Greenhouse Gases |

| | |
|---|---|
| HRE | Heat Replacement Effect |
| IA | Impact Assessment |
| MSA | Market Surveillance Authority |
| NPV | Net Present Value |
| NPSV | Net Present Social Value |
| MTP | Market Transformation Programme |
| OIOO | One-In, One-Out |
| ONS | Office of National Statistics |
| OPSS | Office for Product Safety and Standards |
| SMB | Small and Micro Business |
| SME | Small and Medium Enterprise |
| WTO | World Trade Organisation |