Options assessment

Title: Raising Product Standards for Space Heating (Gas boiler policies)

Type of measure: …

Department or agency: ...Department for Energy Security and Net Zero

IA number: …

RPC reference number: …

Contact for enquiries: …

Date: …

If your measure is to be submitted for RPC scrutiny you should complete the whole form as much as you are able, given the state of policy development and available evidence. This should include the regulatory scorecard with quantified business impacts, even if this is just the best estimate at this stage. Other impacts may be left unquantified at this stage, including household impacts where quantification may not always be proportionate at this stage. When complete, the whole form should be submitted to the RPC secretariat. **Please include annexes for supporting material where relevant. This form is not expected to be published.**

1. Summary of proposal

The aim of this Options Assessment (OA) is to support the boiler policies included in the Ecodesign and Energy Labelling consultation. It provides analysis to support the development of policy regarding boiler efficiency standards, and specifically its contribution to the decision-making process as the policy options were refined. The proposed changes form a suite of measures, described below, designed in combination to increase the efficiency of a typical boiler by up to 6 percentage points when the full set of measures are introduced:

- From 2026:
    - preventing the worst performing heating controls, Classes I – III, from being placed on the market.
    - requiring all domestic-scale (up to 45kW) combination boilers and controls to be able to use open communication protocols.
    - requiring the factory-default flow temperature for domestic-scale combination boilers to be set at 60 degrees to encourage low temperature usage
- From 2028:
    - requiring that all domestic-scale combination boilers (≤45kW) are capable of modulating their heat output down to 15% of their maximum output without on/off cycling.

These proposals were set out in the government response to the Boiler Standards and Efficiency consultation, which was published in March 2024. The policy options were refined based on feedback from stakeholders.

2. Strategic case for proposed regulation

The UK was the first major economy in the world to set a legally binding target to achieve Net Zero greenhouse gas emissions by 2050. To ensure continued progress, we have set a series of 'carbon budgets', covering interim periods, which are among the most stringent climate targets in the world, including the target to cut emissions by 78% by 2035, compared to 1990 levels.

There are around 30 million buildings in the UK with heating in residential buildings responsible for approximately 16% of all carbon emissions[1,2]. The decarbonisation of heat is recognised as one of the biggest challenges we face in meeting our climate targets.

There are several strategic pathways to full decarbonisation of heat by 2050 with a range of low-carbon technologies and systems that may have an important role to play. It is expected that heat pumps will play the most significant role in the near term.

However, despite a range of policies that are expected to combine to grow the heat pump market, we still expect there to be at least 10 million boiler installations between 2025 and 2035. This represents a significant target population for further improvements to in-situ boiler performance which will reduce carbon emissions from the point of installation over the lifetime of the boiler into the 2040s.

Historically, innovation and technological development in the gas boiler market has mostly been driven by government regulation. Previous changes to boilers have largely focused on

[1] DESNZ, (2024), Final UK greenhouse gas emissions national statistics: 1990 to 2022, (https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2022)
[2] DESNZ, (2023), Energy consumption in the UK 2023, (https://www.gov.uk/government/statistics/energy-consumption-in-the-uk-2023)

raising minimum tested efficiency. In 2003, the Government announced a new minimum efficiency standard for gas boilers of 86% from 2005, with exemption permitted under specific circumstances.

Subsequent changes sought to ensure that gas boilers could operate as efficiently as possible in the home after research published in 2009 showed there to be a gap between tested and advertised efficiency levels.[3] In 2018, new installation standards applying in England, known as Boiler Plus, were set with the intention of incorporating additional energy saving technology to enhance boiler performance. Similar standards to Boiler Plus have now been adopted under the devolved administrations' building regulations.

Despite these previous interventions, there are several key factors in the UK heating market which have prevented boilers and general heating systems from operating more efficiently and perpetuated the performance gap between boilers under test conditions and in-situ efficiency. We have included below the main barriers and market failures which justify Government intervention through a new series of product standards.

Carbon Externality: A key element of the rationale for this intervention is the market failure with respect to the uncaptured negative externalities associated with the use of conventional heating technologies. The full societal costs of heating based on fossil fuel combustion should consider the emission of greenhouse gases and the impacts on health. The Boiler Plus Review[4] suggested that the upfront cost of the boiler, the ability to site the boiler in a particular location and ensuring the boilers output could cover the properties heating and hot water demand took priority over whether a new boiler would be more energy efficient. The need to deliver advancements in the decarbonisation of heating requires more urgent Government action to correct the effects of this market failure within the UK heating system.

Imperfect information: Consumers may be unaware of the potential benefits of higher-performing boilers and the disparity between lab and in-situ efficiency, making it difficult for consumers to accurately value the benefits of higher efficiency. This information asymmetry reduces the consumer's ability to choose the heating appliance based on merit, and thus constrains the most efficient technology's ability to compete in the market. Government intervention would allow consumers to choose among only higher-performing boilers addressing this market failure.

Misaligned Incentives: In rented properties, where the costs of upgrading a property falls to landlords, the benefits of lower energy costs and/or a warmer home accrue to tenants. These misaligned incentives make it less likely for landlords to include the appliance efficiency in their decision process when purchasing a boiler. Therefore, without Government intervention landlords might continue to purchase less efficient boilers, which carry a higher societal cost.

Economies of scale: New product standards will create a large market for the best types of products, which can lead to economies of scale through supply chain optimisation. Without Government intervention the most efficient boiler models are likely to be a premium product, which cost consumers more and

[3] DECC, (2009), Final Report: In-situ monitoring of efficiencies of condensing boilers and use of secondary heating: (https://assets.publishing.service.gov.uk/media/5a75149be5274a3cb28697f7/In-situ_monitoring_of_condensing_boilers_final_report.pdf)
[4] BEIS, (2021), 'Boiler Plus (2018)', (https://www.gov.uk/government/publications/boiler-plus-initial-policy-review)

hinder widespread deployment. Research conducted into the switch from non-condensing to condensing boilers concluded that without Government intervention, the significant market changes and extensive deployment of condensing boilers across the UK housing stock would not have occurred nor the added benefit of economies of scale[5].

These barriers mean that, without Government regulation, the domestic gas boiler market will fail to deliver its carbon saving potential and will not make the fullest contribution to legally binding carbon budgets.

3. SMART objectives for intervention

The policy objectives of this intervention are to increase the in-situ efficiency of domestic-scale gas boilers by introducing a new set of product standards beginning in 2026 with a full range of measures to be realised in 2028. The intended effects are to decrease gas consumption in the short term, thereby increasing UK energy security, reducing carbon emissions, and lowering energy bills for consumers.

These objectives are SMART:

Specific: removing Class I – III controls, requiring the use of open protocols for combination boilers, requiring combination boilers are capable of modulating down to 15% of maximum output, and requiring factory-default flow temperature settings of 60 degrees are all specific actions.
Measurable: a post-implementation review will be carried out to examine the impacts of the policies in terms of carbon and bill savings. However, in terms of meeting the requirements above, the nature of the policies is that manufacturers either do or do not implement by the given date and are therefore measurable.
Achievable: having considered feedback to the Improving Boiler Standards and Efficiency consultation[6], and through further stakeholder engagement, in particular with regard to manufacturer lead-in times, we are confident that these measures are achievable under the timetable proposed. In addition, we are setting new standards at levels that are already met by many of the best performing products on the market.
Relevant: policies that improve the performance of natural gas boilers are expected to reduce consumer bills and carbon emissions, helping to ease the costs of living while contributing to the UK's carbon budgets.
Time-limited: these policies all have prescribed timescales for implementation.

These policy objectives align with the government priorities of driving innovation in the manufacturing sector by supporting investment into internal manufacturing of higher spec boiler for the GB market by giving certainty to industry. While the upgrade to boilers is likely to lead to a small cost to the consumer, this is offset over the lifetime of the boiler by lowering energy bills. Therefore, this policy also aligns with the government's priority of taking action to reduce the cost of living.

[5] CREDS, (2020), The story of condensing boiler market transformation – a briefing note for BEIS, (https://www.creds.ac.uk/publications/the-story-of-condensing-boiler-market-transformation-a-briefing-note-for-beis/)
[6] DESNZ (2024), 'Improving boiler standards and efficiency', (https://www.gov.uk/government/consultations/improving-boiler-standards-and-efficiency)

4. Description of proposed intervention options and explanation of the logical change process whereby this achieves SMART objectives

Preferred option (Option 2) – From 2026 prevent Class controls I-III from being placed on GB market and require all temperature controls and combination boilers to use open protocols. Additionally, require all combination boilers to be supplied with a 60 degrees Celsius (°C) flow temperature factory default setting by 2026. Then from 2028, require all combination boilers (≤45kW) to be able to modulate their maximum output down to 15% without on/off cycling by 2028.

We believe that this set of regulations will improve in-situ efficiency of gas boilers, and thereby reduce gas consumption and emissions, as they are designed to complement the following changes that have been made previously to ensure maximum effectiveness of the boiler policy:

1) The changes apply at the point products are placed on the market
2) Boiler communication control changes will ensure they can deliver the previously expected benefits.

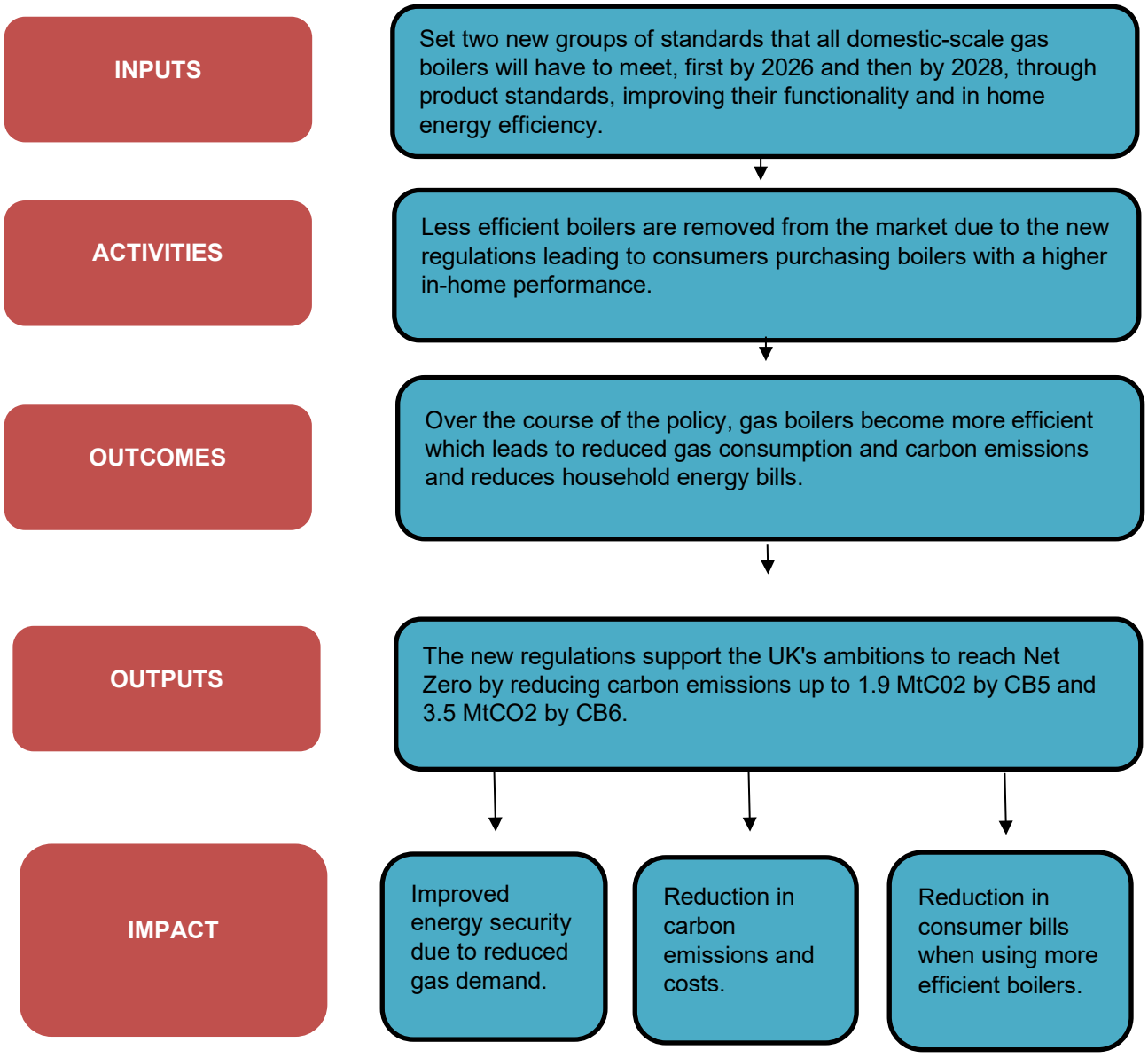
Products standards, such as ecodesign, affect what can be purchased on the market, in contrast to building regulations, which apply at the point of installation and affect installers and consumers. Product standards and building regulations were previously set by different bodies (the EU and the UK Government respectively) and did not align, which meant that non-compliant controls could still be purchased despite changes to the building regulations. Consumers are often unaware, or ignore, the opportunity cost of buying a less efficient product at lower upfront cost. The changes affecting what can be placed on the market avoids this issue as responsibility sits with manufacturers.

In addition, many potentially compliant heating controls were prevented from delivering their appropriate benefit due to a significant portion of the boiler market using closed protocols. This meant they could not improve a condensing boilers efficiency by lowering the flow temperature. We are seeking to amend this through the proposed policies by requiring the use of an open protocol.

Through these new regulations we estimate a boiler bought from 2028 will have a 6-percentage point increase in in-situ energy efficiency compared to boilers without the proposed measures. Ensuring that consumers purchase products with a higher in-situ energy efficiency subsequently leads to reduced household gas demand. This delivers benefits in terms of bill savings at the household level, and as more consumers buy products that are compliant with the regulations we expect a reduction in national gas consumption with positive implications for energy security and reductions in carbon emissions. The simple logic model below summarises how the policy is expected to meet its objectives.

Reviews of ecodesign and energy-related products (ErP) policies have shown these types of policies have been one of the most cost-effective ways to reduce carbon emissions,

energy costs and energy demand[7]. In addition, using regulation in this policy area is in keeping with how previous standards have been implemented, such as the mandating of condensing boilers in 2005. Despite offering running cost savings of around 10% compared to regular boilers, prior to this policy intervention uptake of condensing boilers was low. Following the announcement in 2003 that condensing boilers were to become mandatory, annual installations in the UK rose from around 170,000 to over 400,000[8] prior to the regulations being implemented. Since implementation in 2005, condensing boilers have made up all gas boiler installations. Therefore, regulatory actions that set new minimum requirements for appliances support consumers making better choices. In using regulation to implement these policy proposals, we can support consumers when buying boilers to maximise the potential impact of these energy efficiencies. The approach we are taking aligns with these previous policies and ensures a small impact on consumer costs and little to no impact on public expenditure.



[7] IEA, (2021, Achievements of appliance energy efficiency standards and labelling programs. Available at: (https://www.iea.org/reports/achievements-of-energy-efficiency-appliance-and-equipment-standards-and-labelling-programmes/executive-summary)

[8] CREDS (2020), 'The story of condensing boiler market transformation – a briefing note for BEIS' (https://www.creds.ac.uk/publications/the-story-of-condensing-boiler-market-transformation-a-briefing-note-for-beis/)

5. Summary of long-list and alternatives

The process for moving from a longlist to a shortlist is described below:

Do nothing (Option 1)

We assume that by doing nothing there is less incentive for the market to develop efficiency measures. Despite market maturity, due to a combination of factors, boilers are still not able to operate as efficiently in the home compared to tested minimum performance standards. Since the introduction of new boiler standards in 2005, the market has been allowed nearly 20 years to make these improvements to in-situ performance on its own and has so far not been able to. Doing nothing would be a missed opportunity for bringing benefits in terms of additional carbon savings, energy security and reducing household bills.

Raise public awareness through campaigns.

The Government's Help for Households campaign included tips such as reducing the flow temperature of combination boilers and bleeding radiators. This campaign, other social media and a campaign led by the heating industry and consumer advice bodies had significant traffic especially during the energy bills crisis. However, this type of online/social media content is unlikely to reach a significant proportion of the 25m homes using gas. For example, the British Charity Nesta estimates that their "Money Saving Boiler Challenge", which campaigns to lower flow temperatures and has received wide media coverage, has led to 238,793 boiler turn downs[9]. This is a major success which will have saved bills and reduced emissions for those who acted. However, it only amounts to less 1% of all gas households, which strongly implies regulation to achieve these aims will have a greater impact.

Campaigns to raise public awareness are therefore not sufficient to change the market substantially and deliver the consumer bills/carbon benefits.

Require boilers to operate at a maximum heating flow temperature of 55°C by 2026.

This proposal was not shortlisted as not all properties are currently suitable to run at a 55°C flow temperature all year round. This is because some properties have high heat losses and unsuitable heat emitters for low temperature heating. Therefore, as the occupants would not be able to manually adjust the flow temperature upwards, in this scenario boilers might not heat some houses to a suitable temperature. In addition, while 55°C delivers a superior efficiency improvement, our consumer advice and policy proposals are to have 60°C for combination boilers. A flow temperature of 60°C strikes the right balance for most homes between comfort and reduced emissions and bills because of the variance of building efficiency within the housing stock, meaning lower temperatures than 60°C may not be suitable year-round. Flow temperatures of 55°C could also disadvantage certain population groups. For example, those who are elderly or have pre-existing health conditions are recommended to have a flow temperature of 65°C.

[9] Nesta (2024), 'Money Saving Boiler Challenge', (https://moneysavingboilerchallenge.com/) [Accessed 1st August 2024]

6. Description of shortlisted policy options carried forward

In the process of narrowing down from our shortlist to a single preferred option, we considered estimates of both the likely savings to households and carbon savings of each policy. We looked at the feasibility of implementing each policy alongside the mechanisms by which compliance would be monitored and efficacy assessed. We also considered evidence from previous policies in terms of reach, implementation and efficacy when reaching a position on our preferred option to take forward. The proposals timing was defined by assessing the benefits of implementing them as soon as possible against the need of giving industry a reasonable lead-in time.

Alternative Option (Option 3) – Delay all policy proposals until 2028

Under this option we would set a 2028 starting date for all the proposals within the preferred option (Option 2). This implies delaying the requirement for open protocols and a default flow temperature factory setting of 60 degrees Celsius (°C) for all combination boilers in 2026. Delaying the proposals may be preferential to some manufacturers and sellers, as it allows a longer period of time for adaptation. However, in revising the timelines in response to feedback from the consultation, we are ensuring that manufacturers have adequate time to prepare for the changes and ensuring the policies are deliverable in the preferred option. Some preferred policy options do not require significant changes for manufacturers to comply. For example, open protocols, such as OpenTherm, already exist and commonly used by many boiler manufacturers and are near universal in countries such as the Netherlands. In contrast, delaying the policies until 2028 reduces the benefits in terms of carbon emissions savings, long-running variable costs and air-quality costs. We therefore believe the preferred option balances all the above to deliver the maximum benefits whilst being affordable to consumers and deliverable to manufacturers.

SaMBA and medium-sized business impact of the preferred option (Option 2)

We also do not believe the preferred option will cause disproportionate impact to small businesses. The new regulations, if enacted, will principally impact manufacturers and retailers, both actors who are involved with placing the products on the market. The UK boiler market is dominated by 4 large manufacturers and at least 98% of sales come from companies which are UK based constituents of larger multinationals (and are not themselves SMEs, according to the Companies Act 2016) [10]. Therefore, it is anticipated that most of the impact will be on these larger organisations.

The boiler installation sector, however, is dominated by small businesses; there are over 78,000 registered Gas Safe businesses, comprising of over 151,000 registered Gas Safe installers in the UK.[11] These businesses will be indirectly affected by the proposed regulation through potential one-off familiarisation and training costs and will in some instances be required to update the information they provide to consumers when advertising products. However, as these effects are indirect this cost has not been quantified in this Options Assessment.

[10] BSRIA (2022), 'Domestic Boilers Market Analysis' , (https://www.bsria.com/uk/product/BV2bkB/domestic_boilers_world_market_for_heating_boilers_2022r2021_8a707622/).
[11] Gas Safe Register (2023), 'Gas Safe Register: At A Glance 2022-23': (https://www.gassaferegister.co.uk/media/52sdjzer/2022-23-gas-safe-register-at-a-glance.pdf).

Dealers/Retailers must display the new labels so that they are clearly visible, attaching them to the product where appropriate, and making other product information available to consumers[12] in the form a product fiche. The product fiche contains the heating appliances technical details such as efficiency at different flow temperatures. However, this is unlikely to pose any additional cost to dealers/retailers as this is already common practice.

7. Regulatory scorecard for preferred option

Please provide quantitative estimates and qualitative descriptions of impacts under each heading in the following sections. The right hand column for directional ratings should be based on the description of impact and the sign of the suggested indicator (NPV, NPSV, all impacts): **Green** – positive impact, **red** – negative impact, **amber** – neutral or negligible impact, **blue** – uncertain impact. Please use the colours in the examples shown below, as these are suitable accessible colours. Please see BRF guidance technical annex for definitions.

Part A: Overall and stakeholder impacts

(1) Overall impacts on total welfare		**Directional rating** **Note: Below are examples only**
Description of overall expected impact	Overall, our chosen option is expected to lead to a reduction in gas demand because of the improved efficiency of boilers. In turn, this is expected to bring benefits in terms of carbon emissions savings, reduced long variable running costs and air quality improvements compared to the alternative and do-nothing scenario. The main cost of the proposed policy is a technology capital cost associated with producing a boiler which complies with the proposed new requirements. The expected impact on businesses and households is discussed in the sections below.	**Positive** **Based on all impacts (incl. non-monetised)**
Monetised impacts	**Total NPSV (2024 prices; PV base = 2026) = £3,709m** Carbon costs = £2,772m LRVC = £1,232m Air quality = £75m Technology cost = -£370m	**Positive** **Based on likely £NPSV**
Non-monetised impacts	There is an additional benefit to UK energy security as the proposed policies would save 63 TWh of gas by 2050, therefore reducing reliance on imports.	**Positive**
Any significant or adverse distributional impacts?	The policy proposals are not expected to lead to any significant distributional impacts. Since the original proposals for changing boiler standards, included in the Improving Boiler Standards and Efficiency consultation, amendments have been made to reduce any potential for uneven impacts across businesses and households. These changes were made based on consideration of feedback from industry and other groups. The revised proposals preserve the consumer benefits and carbon savings while still offering a degree of flexibility taking account of consumer needs and building variance.	**Neutral**

[12] DESNZ, (2023), 'Regulations: energy information', (https://www.gov.uk/guidance/the-energy-labelling-of-products#:~:text=From%201%20March%202021%2C%20certain,the%20whole%20of%20the%20UK%20.)

(2) Expected impacts on businesses		
Description of overall business impact	The policy proposals will apply to manufacturers of boilers in the UK. Under our preferred option, these manufacturers will face a technology capital cost of £50 per boiler (in our central scenario) associated with converting supply chains to stop making non-compliant boilers and controls. It is expected that this cost will wholly be passed on to the consumer. In addition to the technology cost, boiler manufacturers will also face a one-off familiarisation cost associated with the time taken to understand the new regulations.	**Neutral**
Monetised impacts	We expect that both NPV and EANDCB would be minimal for these policies, as based on responses to previous consultations, it is expected that the costs associated with upgrading boiler technology would wholly be passed onto the consumer. After accounting for passthrough costs, businesses are likely to face a one-off familiarisation cost estimated at £61,000, which would be realised in the first year of the policy. This is discussed in more detail in Section 9.	**Neutral** **Based on likely business £NPV**
Non-monetised impacts	Small businesses that use domestic scale boilers will also benefit from the bill savings outlined below in the Expected impacts on households section. However, as domestic scale boilers used by small businesses cannot be separated from our overall deployment statistics, we have not directly estimated this value.	**Positive**
Any significant or adverse distributional impacts?	These proposals will affect all manufacturers of gas boilers and temperature controls placed on the GB market in the same way. All businesses will have to adhere to the new rules. Although there are different market actors with varying market preferences, there is no distinction with the standards. This reflects how new product standard changes through ecodesign have been introduced previously. There are no regional differences within the internal British market. Northern Ireland will have to adhere to European Rules as per the Windsor Framework.	**Neutral**

(3) Expected impacts on households		
Description of overall household impact	Overall, these policies are anticipated to have a positive impact on households. This is driven by bill savings due to the increased efficiency of a boiler. These savings are estimated at over £30 per year from 2028 for a typical household. The magnitude of these savings increases in larger properties that use more gas (see below: Monetised impacts). It is highly likely that boiler manufacturers would pass on the cost associated with converting supply chains to stop making non-compliant boilers and controls. In our central scenario this cost is £50. Across all house types and scenarios tested, the bill savings compensate for this potential increased cost of a boiler under the proposed policies: it is expected that a typical household would pay off this cost within 2 years.	**Positive**
Monetised impacts	**Household NPV (price base = 2024; PV base = 2026) = £2,235m** **EANDCH = -£131m**	**Positive**

	Both the household NPV and EANDCH include passthrough costs from businesses. **Average yearly bills saving from 2028 when all policies come into effect (2024 prices)** One bed flat = £14 Three-bedroom semi-detached house = £33 Five-bedroom detached house = £61 **Total (discounted) bill savings over the lifetime of the boiler from 2028 (2024 prices)** One bed flat = £169 Three-bedroom semi-detached house= £400 Five-bedroom detached house = £725	**Based on likely household £NPV**
Non-monetised impacts	**Behaviour:** The policy will help householders to become more familiar with heating systems operating as efficiently as possible through low flow temperatures. This supports the transition to low-carbon heating as most heat pumps will also operate using low flow temperatures. Additionally, the proposed policy requires controls to be used with boilers that are of consistent standard with the ones that will be needed to optimise heat pumps, so the policy provides consistency of controls across the different heating technologies. While this will benefit gas using households it may increase the running cost gap between heat pumps and boilers, due to the difference between gas and electricity costs. However, this should be counteracted by the policies we are introducing to improve heat pump performance also via an update to ecodesign and energy labelling and plans to act on price rebalancing. **Comfort taking:** Improving boiler efficiency reduces the amount of fuel required to deliver a given level of energy service, meaning that some households will heat their homes to a higher temperature, for a longer period, or heat more rooms in their homes, at the same cost. **Health benefits:** Heating homes to a higher temperature can lead to improved health. If monetised, this would have a positive impact on the SNPV.	**Positive**
Any significant or adverse distributional impacts?	We estimate that most boiler installations from 2026 will occur in households currently using gas boilers for heating. Approximately 88% of households in England currently use a gas boiler. The regional distribution of households with boilers predominantly follows the overall distribution of households across regions in the UK. As the characteristics of the households affected by the policy proposals are not dissimilar to the characteristics of the overall population, there is no evidence to suggest our recommended option will have any negative impact on people with protected characteristics. We also don't expect our recommended option to impact equality of opportunity between people with protected characteristics and those without. Under the current definition of fuel poverty, in 2023 13% of all households in England were fuel poor, compared to 12% for households using gas boilers as their main heating systems[13]. Therefore, the proposed policies will not disproportionately impact low-income households. We anticipate that enhancing boiler	**Neutral**

[13] Department for Energy Security and Net Zero (2024). 'Fuel poverty statistics', (https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2024-2023-data)

	standards will have a small impact on fuel poverty. The efficiency improvement can save households money by reducing a proportion of their annual heating bills, and where heating bills are above average, the savings will be correspondingly higher than average. We also expect the policy to increase the thermal comfort of the households, although this benefit has not been quantified. These impacts will be beneficial for all households, but in particular, will benefit those with the lowest available funds and the lowest thermal comfort.	

Part B: Impacts on wider government priorities

Category	Description of impact	Directional rating
Business environment: Does the measure impact on the ease of doing business in the UK?	By diverging from the EU on standards, it was anticipated that there would be additional testing requirements for products which have the CE marking to gain the UK Conformity Assessment (UKCA) marking. This would have increased business friction. However, The "Product Safety and Metrology etc. (Amendment) Regulations 2024" proposed extending CE marking recognition indefinitely in GB. This allows businesses to either use a CE or UKCA marking when placing goods on the GB market while standards align. However, by introducing the new standards mentioned in this consultation, we will diverge from the EU. GB will have higher standards in some regards, therefore necessitating that all affected products placed on the market have a UKCA marking. Based on the interpretation of the regulations, for boilers to receive a UKCA marking, boiler manufacturers would have to undertake additional/repeat third-party testing by one of the UK-based Conformity Assessment Bodies (CABs). This would create increased cost and business friction. We are therefore proposing that boiler manufacturers continue to undertake third-party testing to comply with the current standards, which will continue to apply in the EU and NI. Manufacturers will then be able to self-certify their products meet clearly identified new standards in GB, where these go beyond the requirements tested in the EU.	**Neutral**
International Considerations: Does the measure support international trade and investment?	These new standards will exceed those currently set by the EU. We do not expect it to impede trade with Europe as our standards go further while we keep the testing requirements the same. While additional investment will be needed to create higher specification products for the British market, they will not be prevented from exporting to Europe. In 2022, 73%[14] of boilers were made in factories in the UK with the remainder imported largely	**Neutral**

[14] BSRIA, (2022), Domestic boilers market analysis, (https://www.bsria.com/uk/product/BV2bkB/domestic_boilers_world_market_for_heating_boilers_2022r2021_8a707622/)

	from Europe and a minority from the rest of the world. As long as GB standards remain at or higher than Europe, the proposed policies will not impede trade into Europe from boiler manufacturers in GB. As the GB boiler market remains one of the most vibrant in Europe, we expect manufacturers from outside of GB to continue to meet the higher standards in order to preserve their access. Our understanding is that these smaller imports tend to already meet higher standards in order to compete with larger manufacturers. In accordance with the Windsor Framework, EU Ecodesign Regulations will continue to apply in Northern Ireland. These Regulations introduce regulatory divergence between GB and NI. Gas boilers, which are qualifying Northern Ireland goods and comply with the lower EU standards could be imported and lawfully sold in GB without having to meet the additional GB regulatory requirements that would otherwise apply to their sale. However, given the associated costs of changing supply chains, compared to the small increase in cost per item, we expect this to have a limited effect on the policy.	
Natural capital and Decarbonisation: Does the measure support commitments to improve the environment and decarbonise?	The proposed policies are expected to lead to a reduction in gas demand. In turn, this is expected to reduce carbon emissions up to 1.9 MtC02 by CB5 and 3.5 MtCO2 by CB6, and bring benefits in terms carbon emissions savings and air quality improvements.	**Supports**

8. Monitoring and evaluation of preferred option

In the regulations, we plan to introduce a commitment to conduct an initial review (light touch Post-implementation review - PIR) 24 months after implementation of the full standards in 2028. This review will initially be focused on compliance with the regulations, working with the Office for Product Safety and Standards (OPSS). OPSS monitors products that are available for sale via all routes, including on online selling platforms and social media platforms. OPSS also purchases products for compliance assessment and testing via different routes, including on online selling platforms, and have established processes to respond to non-compliance. Using the OPSS will ensure that reviewing is consistent and proportionate, and backed up by an enforcement procedure for non-compliance. This will begin as soon as the new legislation has come into force, with OPSS spot-checking products.

It makes sense to initiate the light touch PIR process after the second tier has come into force in 2028. This review would inform any adjustments or updates needed to the policy to ensure it continues to meet its objectives. We considered setting the date for the PIR to allow enough time to adjust the MEPS, allowances or exemptions before tier two requirements come into force in 2028, where evidence suggested this would be appropriate. However, this approach has several challenges. Firstly, we expect the market to take one to two years to adjust to the new regulations, which means we may not be able to gather meaningful data to inform a PIR until 2026/2027. This would only allow a short time for consultation on proposed changes and for legislation to be taken through

Parliament before any changes were to take effect in 2028. Secondly, given the level of ambition within the preferred policy option, suppliers of boiler and temperature controls will need some investment in re-developing products and to sell through old stock, which they will be incentivised to do in order to avoid market impacts. This means that suppliers will benefit from certainty around what requirements will apply and when; whereas planning a PIR mid-way through the interval between the two sets of proposed changes would remove some of this certainty, which could impede investment in technological advancements. A PIR that takes place two years after implementation of tier two changes in 2028 will therefore allow enough time for the market to adjust to the new requirements. Whilst this PIR would commence data gathering shortly after tier two has come into force in 2028, we anticipate that the market will have prepared well in advance for this set of changes so market data should clearly show the impact by that time.

We expect the review will largely be a qualitative assessment of the impacts of the draft Regulations supported by quantitative analysis where possible. The PIR will use available evidence to assess the impacts of the Regulations - in particular, whether they have met the objective of phasing out boilers/temperature controls from the market that do not meet the new standards. The review will interrogate whether these Regulations remain the best option for achieving energy, carbon and bill savings from gas boilers. The findings of the review will be used to inform future policy development.

In order to assess the impacts of the Regulations, the PIR will aim to assess the boiler products available on the market at the time of the review and to compare this to the predictions made in this OA. To do this, sales data, stock data, product lifespan estimates, product energy consumption, and market observations will be obtained at the time of the review. Third-party testing of products will also be required.

Following this, as per current requirements, a full post implementation review will be planned for 2033 to assess the effectiveness of the regulations in delivering the carbon and bill savings anticipated. This will be assessed against any cost rises that may have been faced by consumers.

In addition to this, the Homes for Net Zero (HfNZ) research project will monitor in-situ efficiency in 1,000 homes in the first phase, potentially rising to 2,000 in a second phase. Rather than duplicating this work, we will access the project data and monitor changes in efficiency resulting from the 2026 and 2028 regulations being introduced.

We predict that measuring direct energy savings from improved ecodesign requirements for boilers would be difficult in the context of the GB energy market due to the relative size of savings to total energy use as a whole. We also believe it would be disproportionate to launch a GB-wide study evaluating the quantitative impact of the Regulations and that the HfNZ research will provide the evidence required.

9. Minimising administrative and compliance costs for preferred option

Transitional costs are estimated to be minimal under the proposed policies. Manufacturers are required to read and understand regulatory changes; however, as the current regulations are largely similar, suppliers will not need to familiarise with new definitions or procedures, for example.

We have estimated that (one-off) familiarisation costs affecting GB businesses are approximately £61,000 and are only realised in 2026. This value is based on 20 hours labour using the median hourly wage of £30 for management consultants and business analysts multiplied by the number of affected businesses[15, 16]. While we have used an illustrative value of 100 businesses, it is likely that the actual value is much smaller given that 13 businesses account for ~98% of the gas boiler market[17]. Therefore, the familiarisation cost is likely to be overestimated.

In addition to boiler manufacturers, gas boiler installers are likely to be affected by the proposed policies through one-off familiarisation costs and training. Training can be accessed at relatively low cost, and at times outside the peak boiler installation periods, so installers can be flexible as to how and when they choose to undertake training within the coming into force period. These costs have not been quantified as they are not a direct impact of the policy proposals.

Based on the current interpretation of the regulations, for boilers to receive a UKCA marking, boiler manufacturers would have to undertake additional/repeat third-party testing by one of the UK-based Conformity Assessment Bodies (CABs). This would create increased cost and business friction. We are therefore proposing that boiler manufacturers continue to undertake third-party testing to comply with the current standards, which will continue to apply in the EU and NI. Manufacturers will then be able to self-certify their products to meet clearly identified new standards in GB, where these go beyond the requirements tested in the EU.

Declaration

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Director responsible:	David Capper

[15] Earnings and hours worked, occupation by four-digit SOC: ASHE Table 14 accessed here: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/occupation4digitsoc2010ashetable14.
[16] Uplifted with the non-wage cost uplift from RPC / Eurostat 2019 (21.78%)
[17] BSRIA (2022), 'Domestic Boilers Market Analysis' , (https://www.bsria.com/uk/product/BV2bkB/domestic_boilers_world_market_for_heating_boilers_2022r2021_8a707622/).

I have read the Options 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: David Capper

Date: 03/10/2024

Summary: Analysis and evidence

For Options Assessment, it is not a requirement to complete all the below, but please complete as much as you can where possible.

Price base year: 2024

PV base year: 2026

This table may be reformatted provided the side-by-side comparison of options is retained	**1. Business as usual (baseline) (Option 1)**	**2. Do-minimum Option (Option 3 - all policies are delayed until 2028)**	**3. Preferred way forward (if not do-minimum) (Option 2 - policies are brought in two tiers in 2026 and 2028)**
Net present social value (with brief description, including ranges, of individual costs and benefits)	This option represents no change from business as usual; consequently, there are no associated costs or benefits.	The total NPSV is £2,964m. The benefits of this policy compared to the baseline scenario are the following: • carbon emissions savings = £2,191m • reduced long variable running costs = £951m • air quality improvements = £58m Expected carbon savings: • CB5 = 1.2 MtCO2 • CB6 = 2.7 MtCO2 While this policy does bring benefits compared to the baseline, these are lower than expected under the preferred way forward. The policy cost is -£236m associated with upgrading boilers to meet new efficiency standards. This cost is lower than the preferred way forward.	The total NPSV is £3,709m. The benefits of this policy compared to the baseline scenario are the following: • carbon emissions savings = £2,772m • reduced long variable running costs = £1,232m • air quality improvements = £75m Expected carbon savings: • CB5 = 1.9 MtCO2 • CB6 = 3.5 MtCO2 The policy cost is -£370m associated with upgrading boilers to meet new efficiency standards.
Public sector financial costs (with brief description, including ranges)	N/A	N/A	N/A

<table>
<tr><td>Significant un-quantified benefits and costs (description, with scale where possible)</td><td>N/A</td><td colspan="3">N/A</td><td colspan="3">N/A</td></tr>
<tr><td>Key risks (and risk costs, and optimism bias, where relevant)</td><td>Misaligned incentives continue. Loss of potential energy/carbon savings and resulting societal costs.</td><td colspan="3">Lower potential energy/carbon savings compared to the preferred option.

We assume a 10% optimism bias associated with compliance and 15% rebound effect.</td><td colspan="3">We assume a 10% optimism bias associated with compliance and 15% rebound effect.</td></tr>
<tr><td rowspan="6">Results of sensitivity analysis</td><td rowspan="6">…</td><td colspan="3">Outlined below is the sensitivity of NPSV in relation to changes in the specified assumptions (also see Figure 2 in Annex I).</td><td colspan="3">Outlined below is the sensitivity of NPSV in relation to changes in the specified assumptions (also see Figure 1 in Annex I).</td></tr>
<tr><td>Scenario</td><td>Low (NPSV)</td><td>High (NPSV)</td><td>Scenario</td><td>Low (NPSV)</td><td>High (NPSV)</td></tr>
<tr><td>Carbon costs</td><td>£1,869m</td><td>£4,060m</td><td>Carbon costs</td><td>£2,323m</td><td>£5,096m</td></tr>
<tr><td>LRVC</td><td>£2,432m</td><td>£4,037m</td><td>LRVC</td><td>£3,031m</td><td>£5,102m</td></tr>
<tr><td>Boiler upgrade cost (low = £0 and high = £200)</td><td>£3,200m</td><td>£2,256m</td><td>Boiler upgrade cost (low = £0 and high = £200)</td><td>£4,079m</td><td>£2,600m</td></tr>
<tr><td>Boiler efficiency increase (low = 4% total increase and high 8% total increase)

Expected change in carbon savings (MtCO2) are also outlined for this scenario</td><td>£1,935m

CB5 = 0.8
CB6 = 1.8</td><td>£3,959m

CB5 = 1.5
CB6 = 3.5</td><td>Boiler efficiency increase (low = 4% total increase and high 8% total increase)

Expected change in carbon savings (MtCO2) are also outlined for this scenario</td><td>£2,392m

CB5 = 1.3
CB6 = 2.3</td><td>£4,986m

CB5 = 2.5
CB6 = 4.5</td></tr>
</table>

Annex I –modelling assumptions and sensitivity

Decarbonisation Pathways

There are several strategic pathways to full decarbonisation of heat by 2050 with a range of low-carbon technologies and systems that may have an important role to play, including heat pumps and a potential role for hydrogen boilers. The Government has committed to take a decision regarding the role of hydrogen for heating in 2026. For this Options Assessment we have assessed the policy options and the do-nothing option only in a high electrification scenario, where we assume no hydrogen is used to decarbonise homes. In scenarios assuming some level of hydrogen for heating, the policy proposal would have a larger positive impact, as it would increase the efficiency of boilers burning hydrogen. Therefore, by focussing on the high electrification scenario we are presenting a conservative estimate of the policy impact.

The modelled decarbonisation pathway is an updated version of the high electrification scenario presented in the Net Zero Strategy[18]. It assumes that heat pump deployment will ramp-up quickly, reaching 600,000 installations by 2028 and that the heat pump market will continue its rapid growth after 2028, reaching around 1.7 million installations per year from 2035.

Modelling assumptions

The following assumptions have been used to model the two policy scenarios and the do-nothing option:

a. The proposals outlined in the consultation are focused on domestic-scale gas boilers up to 45kW capacity; we assume that all boiler installations from 2026 will occur in households currently using gas boilers for heating. Small businesses may also use domestic scale boilers; however, as small businesses cannot be separated from our overall deployment statistics, we have not directly estimated this value.

b. We assume the average lifetime of gas boilers to be 15 years. For simplicity, in our model we assumed that all gas boilers are replaced exactly every 15 years.

c. We assume at least 1.5 million replacement gas boilers will be installed in 2026; gas boiler installations reduce over time as some households switch to different heating technologies (e.g., heat pumps or heat networks). Heat pump deployment is assumed not to be affected by the policy proposals (i.e., the same number of heat pumps are assumed to be installed under all scenarios). Therefore, in our analysis, we have only included the costs associated with boilers as the costs associated with other technologies are the same in the counterfactuals and policy options.

d. We used the average heat demand for households on the gas grid and assumed that it will vary over time because of the impact of energy efficiency measures, consistent with current policy proposals, and long-term energy trends[19].

e. The proposals are appraised over the timeframe between the assumed start dates and 2050. The residual value of appliances in use in 2050 is included in the results – capital costs for heating systems are pro-rata-ed by their design lifetime to reflect the relevant costs and benefits within the appraisal period.

f. We assume that complying with the boiler standards will not increase the maintenance cost. Therefore, the difference in maintenance cost between the policy options and their this counterfactuals is zero and, for simplicity, is not reported in the results.

[18] BEIS (2021), 'Net Zero Strategy: Build Back Greener' (https://www.gov.uk/government/publications/net-zero-strategy).
[19] A value of 8,741 kWh was assumed in 2026 and based on DESNZ' analysis of the National Housing Model results. Includes space and hot water heating.

g. The Boiler Plus Review found that the available data and the views of industry suggest that compliant installations are common, but there may also be non-compliance. Because of this, we have assumed 10% optimism bias for Options 2 and 3.

Assumptions specific to each option are presented in the following sections.

Option 2

The main body of the options assessment describes the measures which we expect will improve the efficiency of boilers installed (Option 2 and 3).

Previous Government publications[20] have acknowledged a gap between lab and in-situ performance of gas boilers. As described in the consultation document, the proposals in this policy seek to improve in-situ efficiency rather than focussing only on tested efficiency. In the counterfactual we have assumed gas boilers to have an in-situ efficiency of 84%.[21] In Option 2, all newly installed boilers from 2026 are assumed to have on average, an in-situ efficiency of 87%, and from 2028, an in-situ efficiency of 90% (6% points higher than in the counterfactual).

We assume the efficiency improvement will apply to all boilers. We also assume a 15% rebound effect[22] and a 10% optimism bias, meaning that the estimated reduction in fuel demand is around 5%.

We assume the cost of complying with the new regulations to be £50[23] more than the counterfactual gas boiler cost. We discuss the uncertainty of the efficiency and cost assumptions below and demonstrate their impact on NPSV in the Summary: Analysis and Evidence section.

Option 3

All base assumptions are the same as option 1; however, in this scenario all policies come into effect in 2028. This means that boilers only increase in efficiency from 2028 rather than any increase from 2026 and that the additional cost of £50 per boiler only comes into effect in 2028.

Assumptions in the central scenario

	Lifetime	Additional cost	In-situ efficiency	Rebound effect	Optimism bias
Gas boiler in the counterfactual (Option 1)	15 years	-	84%		
Gas boiler under policy Option 2	15 years	£50 more than the counterfactual	2026: 87% 2028: 90%	15%[12]	10%
Gas boiler under policy Option 3	15 years	£50 more than the counterfactual	2028: 90%	15%[12]	10%

[20] BEIS (2017), 'Heat in Buildings: Boiler Plus Final Policy and Consultation Response', https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/651853/Boiler_Plus_final_policy_and_consultation_response.pdf

[21] From Energy Saving Trust (EST) field trials. GASTEC for the Energy Saving Trust (2009), 'In-situ monitoring of efficiencies of condensing boilers and use of secondary heating' (https://www.gov.uk/government/publications/in-situ-monitoring-of-efficiencies-of-condensing-boilers-and-use-of-secondary-heating-trial-final-report-2009) and VHK for the European Commission (2019), 'Boilers, Review study Task 4 - Technical analysis, Final report' (https://www.vhk.nl/downloads/Reports/2019/VHK%20569%20Boilers%20Task%204%20final%20report%20July%202019.pdf).

[22] Illustrative assumption, based on: Glasgow Caledonian University (2008), 'An Analysis of the Difference between Measured and Predicted Energy Savings when Houses are Insulated' (https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.510.6384&rep=rep1&type=pdf).

[23] Illustrative data point, based on knowledge of new modulation and controls costs.

Sensitivity assumptions

S1: Costs of gas boiler upgrades *(Option 2 and 3)*
The central scenario assumes an additional cost of £50 for gas boilers that meet the proposed standards set out in Option 2. As a sensitivity, the low and high end of the assumption range was tested. We assume a cost of £0 at the low end and £200 at the high end.

S2: Efficiency improvements *(Option 2 and 3)*

In the central scenario, we assume that the policy discussed in Option 2 will improve boiler efficiency by 6%. The sensitivity test estimated the impact if the efficiency improvements were 4% (lower scenario) and 8% (higher scenario).[24]

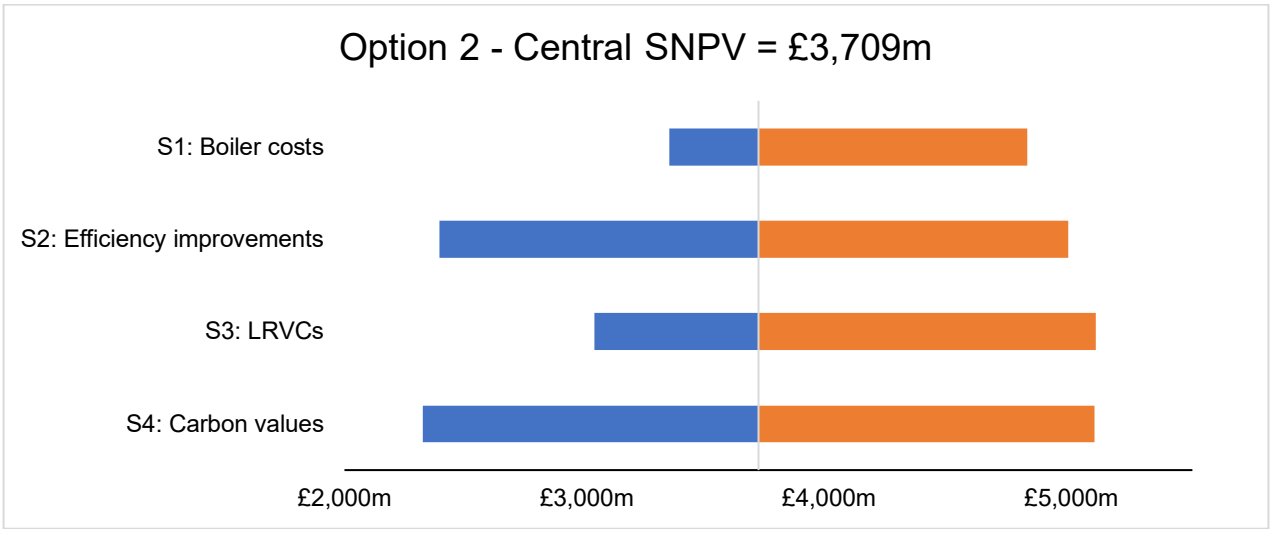
S3: LRVCs *(Option 2 and 3)*

The low and high long run variable costs projections, from the HMT Green Book supplementary guidance,[25] were used to test the sensitivity on energy prices, which are inherently hard to project with any certainty.

S4: Carbon values *(Option 2 and 3)*

HMT Green Book supplementary guidance on valuation of energy use and greenhouse gas (GHG) emissions were used to value greenhouse gas savings. To reflect the uncertainty of carbon values, low and high carbon values are tested to assess the impact on the NPV.

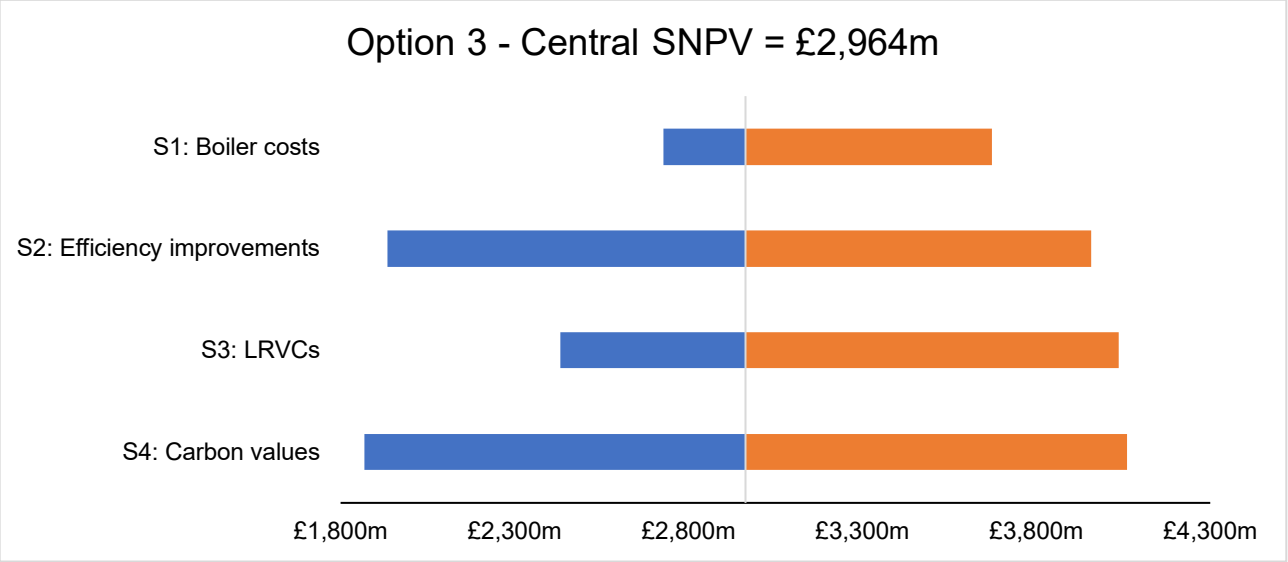
Figure 1: Sensitivities in SNPV estimates in Option 2



[24] Illustrative assumption.

[25] Based on HMT Green Book supplementary guidance, available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal.

Figure 2: Sensitivities in SNPV estimates in Option 3



Evidence base

The appraisal values used in the analysis include:

a. Carbon values – HMT Green Book supplementary guidance on valuation of energy use and greenhouse gas (GHG) emissions is used to value greenhouse gas savings.

b. Electricity and fossil fuel air quality damage costs – Values from Department for Environment, Food and Rural Affairs (DEFRA) are used to measure air quality damage costs. Air quality impact of hydrogen combustion has not been quantified.

c. Electricity and fossil fuel carbon emissions factors – HMT Green Book supplementary guidance is used to measure carbon emissions from electricity and fossil fuels.

d. Long-run variable costs of energy supply – HMT Green Book supplementary guidance is used to value the long-run variable costs of energy supply (LRVCs).

Monetised costs and benefits

We estimate the costs and benefits associated to the policy proposals.

a. Capital costs of the heating technologies installed: The total cost of purchasing and installing heating technologies under the different options. This cost implicitly include any costs borne by manufacturers to comply with the regulation, as we assume they will eventually pass them to consumers. Total cost will vary depending on the assumed capex for the different technologies (e.g., boilers complying with the standards proposed in Options 2 and 3 are assumed to be more expensive than boilers in the counterfactual Option 1).

b. Generation costs and benefits: The estimated value of the change in energy demand. Enhancing boiler standards increases boiler efficiency, reducing gas demand needed to fulfil an equivalent heat demand.

c. Carbon savings: The estimated value of the carbon emitted in all scenarios.

d. Air quality impacts: The estimated value of the public health impacts of changes to emissions of nitrogen oxides and particulate matter.

e. Maintenance: The difference between the annual costs to maintain the different heating system. These costs are assumed to be the same in all options, so the difference of zero is not shown in the result tables.

f. Familiarisation cost: This is the cost to business associated with the time spent understanding the new regulations.