Options assessment

Title:	Raising minimum energy performance standards for Heat Pumps
Type of measure:	Secondary Legislation
Department or agency:	DESNZ
IA number:	…
RPC reference number:	…
Contact for enquiries:	spaceheatingstandards@energysecurity.gov.uk
Date:	27/11/2024

1. Summary of proposal

Electric heat pumps are an established low carbon heating technology and have been identified (along with heat networks) as the primary means of decarbonising heating over the next decade and with a key role in all 2050 scenarios. They are highly efficient producing several units of heat for every unit of energy consumed, by extracting and using heat from a source such as the ground or air, making them more than three times as efficient as a gas boiler. Widespread deployment of heat pumps will increase future electricity demand (particularly during cold weather) with impacts on generation capacity and electricity network reinforcement requirements.

Due to developments in heat pump technology, the existing minimum energy performance standards (MEPS) are no longer pushing the market towards more efficient products. Evidence suggests that heat pump efficiency levels are clustering around the existing MEPS, but technological advancements mean products are now able to be produced at much higher efficiencies. Government intervention is required to push the market towards manufacturing more efficient heat pumps, which will reduce energy demand and reduce consumer bills.

Following research, analysis and modelling, we have set out MEPS proposals in this options assessment and associated consultation which will ensure that only the most energy efficient products are available on the market, while also ensuring that consumer choice is maintained.

As an established technology, heat pumps are subject to a MEPS and energy labelling requirements under Ecodesign for Energy-Related Products and Energy Information Regulations 2021. The metric used to set MEPS is the Seasonal Space Heating Energy Efficiency (SSHEE) which expresses energy efficiency in primary energy terms, i.e. the efficiency of the energy source is factored into the efficiency calculation. SSHEE is the ratio, expressed as a percentage, between the space heating demand for a designated heating season supplied by a space heater, and the annual primary energy consumption required to meet this demand. A primary energy factor (PEF) CC "conversion coefficient" is applied to convert primary energy values to final energy values. This allows for a comparison between different technologies using different energy sources.

In the current ecodesign regulations (legislation no. 813/2013) the MEPS, set out below, are based on a PEF of 2.5:

- Heat pump space heaters and heat pump combination heaters, with the exception of low-temperature heat pumps: The seasonal space heating energy efficiency shall not fall below 110 %
- Low temperature heat pumps (designed to deliver water with a flow temperature of 35C) are subject to minimum energy performance standards of 125%
- Medium temperature heat pumps (designed to deliver water with a flow temperature of 55C) are subject to minimum energy performance standards of 110%

The aim of this Options Assessment is to support the ecodesign and energy labelling consultation document, providing additional details regarding the analysis produced to support the development of heat pump policies, and specifically its contribution to the decision-making process as the policy options were refined. The consultation proposes a range of measures across space heater products more broadly. This options assessment will focus on the heat pump proposals only, which are:

- An updated primary energy factor of 1.9;
- SSHEE MEPS requirements of 168% in 2027 and 175% in 2029 for low temperature heat pumps;[1]
- SSHEE MEPS requirements of 168% in 2027 and 175% in 2029 for medium temperature heat pumps;[2]
- SSHEE MEPS requirements of 143% in 2027 and 153% in 2029 for high temperature heat pumps.[3]

The EU have proposed updates to their ecodesign and energy labelling requirements for space heaters, however we do not have sight of their final policies. The MEPS proposals we are consulting on for heat pumps are at least as ambitious, in places more ambitious,

---

1 A low-temperature (LT) heat pump is specifically designed for low-temperature application, and that cannot deliver heating water with an outlet temperature of 52 °C at an inlet dry (wet) bulb temperature of – 7 °C (– 8 °C) in the reference design conditions for average climate.

2 A medium-temperature (MT) heat pump is declared to be capable of being used in a medium temperature application, delivering its declared capacity for heating at an indoor heat exchanger outlet temperature of 55 °C.

3 A high-temperature (HT) heat pump is declared to be capable of being used in a high temperature application, delivering its declared capacity for heating at an indoor heat exchanger outlet temperature of 65 °C.

than the EU's proposals that have been proposed up until publication of this Options Assessment.

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 legally binding 'carbon budgets', covering interim periods, which are among the most stringent climate targets in the world. The most ambitious is 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[4] [5]. 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, significantly heat pumps in the near term. A range of policies are expected to combine to grow the heat pump market to 600,000 installations a year by 2028 (compared to sales of around 60,000 in 2023[6]) and there could be over 11mn heat pumps deployed by 2035[7]. As an established technology, heat pumps are subject to a minimum energy performance standard (MEPS) and energy labelling requirements under Ecodesign regulations.

Due to developments in heat pump technology, DESNZ have identified that the existing MEPS are no longer pushing the market towards more efficient heat pumps. Without updating Ecodesign requirements in line with technological progress, manufacturers will be able to place products on the market with energy efficiencies below what is reasonably achievable in the current landscape.

The recent increase in electricity prices combined with consideration of pressure on the grid illustrate the need to ensure only the most energy efficient products are available on the market. However, whilst more energy efficient products tend to be more expensive up front there is technical scope within heat pumps to increase the energy efficiency of these products and also have the following benefits.

- Carbon savings – a phase out of the least energy efficient heat pumps from mid 2020s could see significant contributions to reducing the cost of achieving CB5 & CB6 through electricity demand reduction from heat pumps.
- Energy demand – By improving the energy efficiency of heat pumps we expect to see a reduction in electricity demand compared to leaving the market unregulated,

[4] 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)

[5] DESNZ, (2023), Energy consumption in the UK 2023, (https://www.gov.uk/government/statistics/energy-consumption-in-the-uk-2023)

[6] https://www.heatpumps.org.uk/resources/statistics/

[7] https://www.gov.uk/government/publications/carbon-budget-delivery-plan

as expected electricity demand for heating is expected to create an increasingly large demand on the power sector as heat pump sales expand through the decade.

- Reduced bills – By improving the energy efficiency of heat pumps, we expect consumers will see a small reduction in their annual energy bills as a result of increased MEPS.

Whilst heat pumps are already much more efficient than equivalent fossil fuel heating systems, as they become more widely used there is a need to ensure that poor performing products are not being sold on the UK market.

Government intervention is required as the market is not moving quickly enough towards high levels of efficiency to enable the potential benefits to be realised for heat pumps. There is little evidence of improvement in performance of reported installations year-on-year[8], while there is significant potential for further improvements to be made. This is on account of several market failures:

a) **Carbon externality**: the price of less energy efficient heat pumps does not reflect the negative externalities associated with energy use. The excess energy used creates an avoidable cost to society in the form of excess power consumption and greenhouse emissions. Government intervention can help overcome this by ensuring that only more energy-efficient products are available.

b) **Economies of scale:** regulating the market by forcing it to develop more high efficiency products will lead to expanded volumes of production due to the large market to supply, which will bring down the costs to consumers and lead to greater deployment. New heat pump standards are also likely to push the market to increase innovation in order to drive down the cost of production. In the absence of government intervention, higher efficiency heat pumps will continue to cost more than their lower efficiency alternatives.

c) **Behavioural changes:** in the absence of higher MEPS, consumers may be more likely to purchase heat pumps with lower efficiency as they do not realise, or ignore, the opportunity cost of buying a less efficient product at lower upfront cost (i.e. forgone bill and energy savings which they would have benefitted from by buying a higher efficiency product at a slightly higher upfront cost). Therefore, the implementation of updated MEPS would compel consumers to purchase more efficient heat pumps, allowing for energy and bill savings to be made.

d) **Misaligned incentives:** In rented properties where, commonly, heating solutions are already installed by the landlord before tenants move in, the costs of higher energy bills and/or less efficient heating solutions accrue to tenants. The issue of misaligned incentives here can crop up, as it is less likely for landlords to include heat pumps which have higher efficiency when making a decision to buy at the point of replacement. Therefore, without government intervention, landlords are likely to keep purchasing less efficient heat pumps, which carry a higher cost to their tenants and society.

The draft Regulations will apply in Great Britain only. The Windsor Framework provides that limited areas of EU law will continue to apply to and in the UK in respect of Northern Ireland. In accordance with the Windsor Framework, EU Ecodesign and Energy Labelling Regulations will continue to have direct effect in Northern Ireland and so businesses selling heat pumps

[8] MCS Installations Database – analysis of all Air-Source Heat Pumps installed in the UK between 2016-2023.

in Northern Ireland may choose to either only meet the less stringent EU rules or meet the higher GB standard. The costs and benefits in this Impact Assessment are therefore calculated on a GB basis.

We have assessed the GB heat pump market to understand how the existing MEPS requirements have impacted the efficiency of heat pumps. Through this review, we have established that heat pumps are capable of far exceeding the existing MEPS.

3. SMART objectives for intervention

The update to existing ecodesign requirements for heat pumps is intended to set optimal, new minimum standards for energy efficiency which reflect what is broadly achievable for heat pump products on the market. The intended effects are to:

- Increase innovation, investment, and uptake of more energy efficient products by phasing out the least efficient products on the market
- Reduce traded carbon emissions and energy bills for consumers and businesses
- Ensure effective regulation for consumers and businesses
- Reduce demand on the power sector and electricity networks

This policy intervention will help reduce consumer bills and reduce electricity demand, contributing to two key government priorities to increase energy security and reduce the cost of living. By reducing the running costs of heat pumps it will also align with wider government aims to increase the take up of heat pumps.

We believe this regulation follows the Smart objectives for the following reasons:

Specific: The regulations have been designed using the latest market analysis to ensure we achieve the desired effect of removing the least efficient heat pumps from each market while preserving consumer choice. These have been informed through extensive conversation with industry stakeholders, trade organisations and research bodies, backed up by detailed market data on the range of products available.

Measurable: The MEPS levels set a specific efficiency level, which is understood by industry and widely used to measure efficiency. The testing methodology has long been in place and the efficiency achieved is required to be present on the label and technical information of products sold.

Achievable: We have used the market data and expert advice to look at past market improvements and forecast future efficiency to ensure MEPS are set at a level where no more than 50% of available product types on the market are affected for each category, the level desired for ecodesign in general.

Realistic: These MEPS have been set using comprehensive data of the product types available on the UK market, to ensure an accurate level is set.

Time limited: While ecodesign legislation in general does not have an expiry date, the PIR is an opportunity to amend any unintended consequences of the legislation. Typically over a ten year cycle all product regulations under ecodesign have their legislation updated to reflect the current market position and how technology may have changed over the period.

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

Preferred option – Raise existing minimum energy performance standards for heat pumps in GB to 168% in 2027 and 175% in 2029 for MT heat pumps and set MEPS levels of 143% in 2027 and 153% in 2029 for HT heat pumps.

In general products cluster near the current minimum standards as it is cheaper to produce less efficient products. Market forces will drive products to the cheaper end, at a long-term cost to the consumer society from energy consumption. This is therefore the reason for needing the intervention via Ecodesign measures.

We know that manufacturers can in general produce more efficient products, in the most cases a manufacturer will be producing multiple products with different efficiencies in the same factory. Our MEPS proposals intervene at the point of cutting out 40-50% of product reported efficiencies on the market as over time this has been shown to maximise energy savings while also not leaving gaps in either the product types available on the market or leaving manufacturers unable to switch to a viable product. In most cases they are already producing these, it is a matter of reprioritising production. The long lead time for implementation of updates to the Ecodesign regulations in combination with the transparency obligation via a WTO notification allows manufacturers ample time to adjust their production.

In terms of costs to the consumer, the electricity savings from using more efficient products will outweigh the cost of the new efficiency standards over time. Small upfront costs increase per product will result in direct energy bill savings for consumers. Without raising MEPs, consumers are likely to buy products with lower efficiencies as they do not realise, or ignore, the opportunity cost of buying a less efficient product at lower upfront cost.

An analysis of the current heat pump product market led to the preferred option being decided as:

- An updated primary energy factor of 1.9;
- SSHEE MEPS requirements of 168% in 2027 and 175% in 2029 for low temperature heat pumps;[9]
- SSHEE MEPS requirements of 168% in 2027 and 175% in 2029 for medium temperature heat pumps;[10]
- SSHEE MEPS requirements of 143% in 2027 and 153% in 2029 for high temperature heat pumps.[11]

9

A low-temperature (LT) heat pump is specifically designed for low-temperature application, and that cannot deliver heating water with an outlet temperature of 52 °C at an inlet dry (wet) bulb temperature of – 7 °C (– 8 °C) in the reference design conditions for average climate.

10 A medium-temperature (MT) heat pump is declared to be capable of being used in a medium temperature application, delivering its declared capacity for heating at an indoor heat exchanger outlet temperature of 55 °C.

11 A high-temperature (HT) heat pump is declared to be capable of being used in a high temperature application, delivering its declared capacity for heating at an indoor heat exchanger outlet temperature of 65 °C.

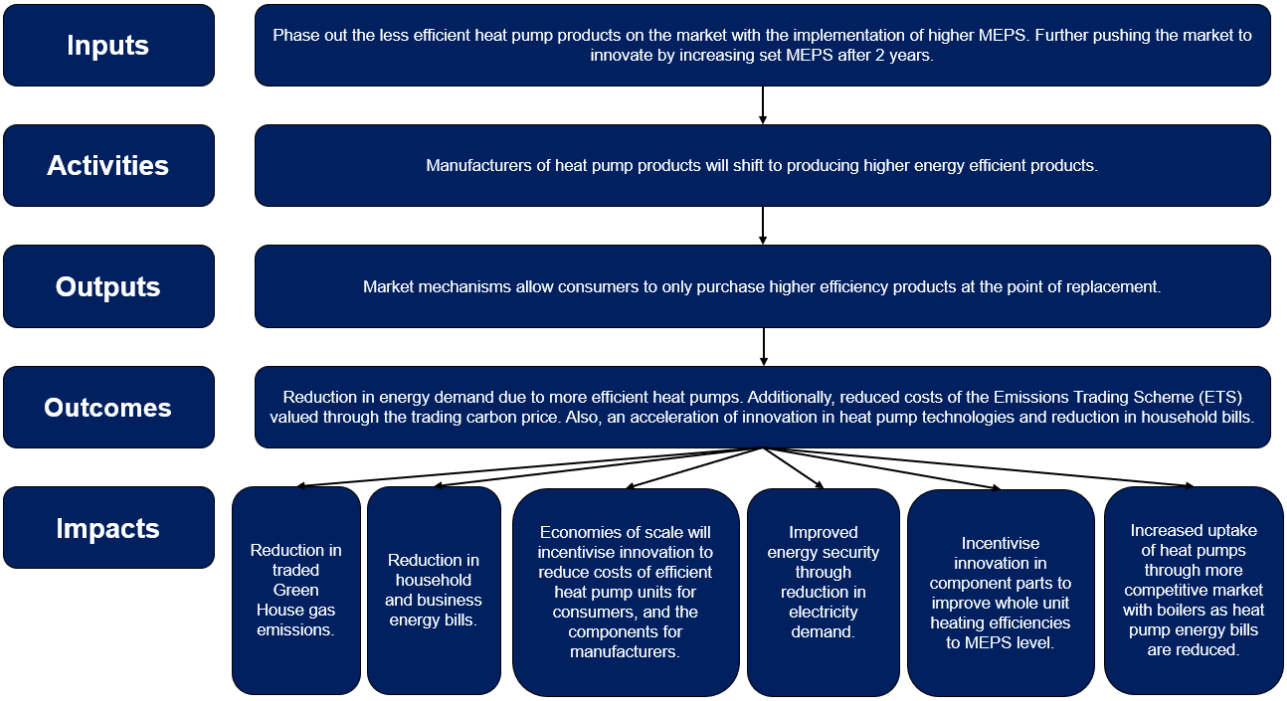
The MCS Product Database contains information of all heat pump models registered in the UK and their performance level (SCOP – Seasonal Coefficient of Performance)[12] measured at different delivery temperatures. Analysing this data allowed us to produce distributions of product efficiencies, split into different technology types (Air Source Heat Pumps (ASHPs), Ground Source Heat Pumps (GSHPs)) and delivery temperatures Low Temperature (LT), Medium Temperature(MT),and High Temperature (HT). The market distributions provide us with the weighted average efficiency of products, and the MEPS in this preferred option have been set in order to cut out the lowest 40% performing products on the market in 2027, and the lowest 50% in 2029, after applying a 1% annual technological efficiency improvement. A summary of the headline costs and benefits associated with this option are tabulated below:

Total NPV					
	Discounted monetized benefit (£m)	**Discounted policy cost (£m)**	**Discounted NPV (£m)**	**Carbon savings (MtCO2e)**	**Energy savings (GWh)**
CB5	£139	£225	-£86	0.13	1,159
CB6	£389	£387	£2.6	0.26	4,289
Total to 2050	£2,198	£1,366	£831	0.95	31,899

The small negative NPV in CB5 is a result of the costs of the new minimum standards (through the small increase in average costs for heat pumps) arising at the point of purchase, whereas the benefits (through energy bill savings) are realised over the entire product lifetime. When viewed over the lifetime of the individual product the benefits far outweigh the costs, hence the overall positive NPV.

[12] SCOP is the designed approximation of the true energy efficiency of a technology over an entire year (based on lab tested efficiency results), and is the metric used MCS listings in the Installation and Product databases.

Below is a logic model showing how this intervention will achieve the objectives stated in the previous section.



5. Summary of long-list and alternatives

Do Nothing - Under this option the current Ecodesign Regulations for space heating products would remain unchanged.

The main reason why this option has not been pursued further is that, without updated regulation, the market will not achieve the full potential efficiency savings possible given the market and associated negative impacts described above.

In a Do Nothing scenario, it is reasonable to assume that GB and global manufacturers of heat pump products have less incentive to innovate and produce products increase energy efficiency, as their focus is likely to be price competition. They will have the opportunity to undercut higher priced, more efficient products with cheaper, less efficient products. Without updating ecodesign requirements, the market failures listed above would be unmitigated.

Self Regulation - Under this option the manufacturers would agree a common set of standards to adhere to.

We have considered self-regulation as an option, whereby suppliers of heat pumps would voluntarily ensure that their products met a higher minimum energy performance standard. This could either replace the existing ecodesign regulations entirely or be a means by which manufacturers go beyond the existing mandatory requirements to meet the higher MEPS proposed by this policy. Under the ecodesign legislative framework, the Secretary of State must not regulate an energy-related product that is already the subject of self-regulation; the legislative framework also sets out principles which voluntary initiatives should follow.

Where self-regulatory initiatives have been considered at an EU level for products other than heat pumps, concerns were raised about the lack of guidance around the criteria used to evaluate self-regulatory initiatives, particularly with respect to monitoring and evaluation.

A self-regulation scenario could create a coordination failure. In the absence of government intervention, there is a real risk of free riders introducing inefficient products into the market if a voluntary agreement were to be used. Particularly in a scenario in which a voluntary agreement replaced the existing mandatory requirements, there would be a risk that free-riders could re-introduce highly inefficient products, which were previously banned, back into the market. Free riders would be those who do not sign up to the voluntary agreement but benefit from higher costs voluntarily incurred by their competitors which allows them to undercut the market cost. Therefore, government intervention is necessary to avoid a coordination failure and allow for an equilibrium to be reached in the market where firms can supply higher efficiency heat pumps avoiding free riders.

Further, research suggests that voluntary agreements around energy efficiency are best considered for products which are not regulated in other economies, or where regulation is not practical . Since mandatory requirements are practical and indeed already exist in many nations for heat pumps, we have ruled out self-regulation in GB as a possible option. Continuing with a mandatory regulation approach provides clarity and a level of continuity for GB businesses.

Adopt EU proposals for Heat Pump MEPS - Under this option the current Ecodesign Regulations for space heating products would be aligned with planned MEPS at EU level.

This proposal has not been pursued as the EU proposals of 145% SSHEE for medium temperature heat pumps, and no MEPS for high temperature heat pumps do not go far enough for the UK market. Our market analysis of available products has shown that significantly less than 40% of the UK market would be below the threshold for the MEPS, which was our guide for intervention. As a result if these proposals were adopted the policy would have significantly less energy and carbon savings, and removed some of the incentive for innovation, reducing the rationale for intervention.

Alternative Heat Pump MEPS - Under this option other Heat Pump MEPS levels were explored.

Other tier levels were originally chosen for this policy. For MT heat pumps, three other policy scenarios were analysed for feasibility and market impact and are listed below:

- Raising existing MEPS to 158% in 2026 and 171% in 2028.
- Raising existing MEPS to 164% in 2026 and 171% in 2028.
- Raising existing MEPS to 171% in 2026 and 211% in 2028.

Our market analysis showed that the average product efficiency for MT heat pumps was 162% in 2023, and applying our assumed 1%/year technological improvement, will become 167% in 2026, when the first MEPS tier will be introduced, and 170% in 2028, when the second MEPS tier will be introduced. The top two options above would introduce MEPS levels that are 9% and 3% below the market average in the first tier, and so will not be ambitious enough. The bottom option is significantly over-ambitious, with the first MEPS at 4% higher than the market average in 2026, and the second MEPS being set 41% above the estimated market average for 2028. For this reason, we have proposed the more fine-tuned MEPS levels of 168% in 2026 and 175% in 2028, where the levels are closer to the

estimated averages in those years, and where we expect 40% of the lowest performing products in the market to be cut out in 2026, and 50% in 2028.

The below table outlines the percentage of the lowest performing available products in the market that are cut out with the MEPS options.

	Percentage of market cut out in first tier (2026)	Percentage of market cut out in second tier (2028)
Initial proposal 1	21%	54%
Initial proposal 2	28%	54%
Initial proposal 3	54%	100%
Current proposal	40%	50%

6. Description of shortlisted policy options carried forward

For the reasons outlined in the section above, the option to raise existing minimum energy performance standards for heat pumps in GB to 168% in 2027 and 175% in 2029 for MT heat pumps and set MEPS levels of 143% in 2027 and 153% in 2029 for HT heat pumps has been carried through to consultation.

We believe this option does not cause disproportionate impacts for small businesses as the Heat Pump manufacturers active in the GB market are large multinational suppliers of many types of heating system, including heat pumps. They hold large shares of the GB market and also supply extensively to the European market. The small and micro businesses present in the GB market consist of a small number of manufacturers making up less than 5% of total manufacturing. Similarly, heat pump component manufacture is dominated by large international companies, some of which have a UK presence, with a small number of smaller UK businesses present.[13]

Such small businesses are likely to be disproportionately affected by the transitional and compliance costs associated with the lead policy option, particularly around testing and, where possible, amending 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. Though these loses would be small compared to the overall cost of the heat pump, and recouped from consumers. Our cost analysis shows that the MEPS levels proposed would incur a cost to the manufacturer of £12 in 2027, and £56 in 2029, and the average unit capex cost is £4,200 for a MT heat pump. Therefore, we'd expect overall impacts to SMEs operating in the heat pump sector to be small.

In addition, they may also be disproportionately affected by Option 1 (Do Nothing) and the other discarded options in a scenario where further international standards are introduced as smaller businesses might find it harder to capitalise on the lower levels of regulation in the GB compared with elsewhere, for example, through scaling-up production or bargaining with suppliers.

[13] https://assets.publishing.service.gov.uk/media/5fd3c316d3bf7f3057adeb39/heat-pump-manufacturing-supply-chain-research-project-report.pdf

To mitigate the impact on small and micro businesses, possible options considered and ruled out include:

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

However, the first two options would be challenging to enforce as requirements relate to products and not manufacturers and so enforcement activities relate to checking whether products on the market comply with the requirements. An exemption, or a phasing of the regulation, would mean that products would have a 2-tier structure: those manufactured by medium (50-249 employees) and large manufacturers (250+ employees), and those by smaller businesses (10-49 employees). Such an approach would make enforcement activities harder and much more costly as businesses, as well as products, would have to be investigated. Further, if smaller businesses were exempt, such an approach could distort competition between large and SMEs, create a mechanism to bypass the regulations and reduce productivity through loss of economies of scale. Therefore, we do not consider a transition period or an exemption to be appropriate or proportionate.

7. Regulatory scorecard for preferred option

Part A: Overall and stakeholder impacts

(1) Overall impacts on total welfare		**Directional rating** **Note: Below are examples only**
Description of overall welfare impact	Increase in costs associated with the increased MEPS are very small compared to the overall costs and installation of a heat pump, and of any government grants and schemes supporting heat pump installation. Increasing MEPS to 168% in 2027 would result in a £12 higher cost per product, and to 175% in 2029 would result in £56 higher cost. The current average cost for a MT heat pump unit is around £4,200. As such these are not expected to make a material difference in heat pump affordability or the consumer decision to purchase a heat pump. Bill savings as a result of increased efficiency are directly proportional to the amount of energy used by a household or business for their heating as such impact proportionally across purchasers of heat pumps. The overall impact of these regulations is expected to be positive due to these bill savings.	**Positive** **Based on all impacts (incl. non-monetised)**
Monetised impacts	For the reasons outlined above monetised impacts for particular protected groups have not been calculated. But overall bill savings mean the impacts of this measure are net positive. This is outlined in more detail in the business and household sections below.	**Positive** **Based on likely £NPSV**

Non-monetised impacts	There is an additional benefit to the electricity system through deployment of more efficient heat pumps which has not been monetised for this analysis. As heat pump deployment increases in future, increasing their efficiency will reduce total and likely peak (in cold weather) electricity demand, which will reduce the need for generation capacity and distribution network reinforcement, reducing system costs and increasing security of supply.	**Positive**
Any significant or adverse distributional impacts?	We do not expect any significant distributional impacts as a result of this policy. Impacts are proportional to energy use of households and businesses and so are distributed proportionally to population and business concentrations.	**Neutral**

(2) Expected impacts on businesses		
Description of overall business impact	The impacts on businesses purchasing and installing heat pumps on their premises is expected to overall be positive for these proposals. Whilst there will be a small increase in upfront costs relative to the cost of the heat pump, this is made back through bill savings and these savings will continue into future years. We expect the impacts on manufacturers and installers of heat pumps to be small and time limited as outlined in the business environment impacts below.	**Positive**
Monetised impacts	Business NPV = £34 million These do not include pass through costs to households.	**Positive**
Non-monetised impacts	We do not expect any further non-monetised impacts to those outlined above.	**Neutral**
Any significant or adverse distributional impacts?	We do not expect any significant distributional impacts as a result of this policy. Impacts are proportional to energy use of households and businesses and so are distributed proportionally to population and business concentrations.	**Neutral**

(3) Expected impacts on households		
Description of overall business impact	The impacts on households is expected to overall be positive for these proposals. Whilst there will be a small increase in upfront costs relative to the cost of the heat pump, this is made back through bill savings and these savings will continue into future years. For example, an ASHP bought after the introduction of the tier 2 regulations would expect to pay back the increased cost of the unit within six years with an average saving of £22 per year for a duel fuel household, with continued energy bill savings past this point.	**Positive**

Monetised impacts	Household NPV = £798m These include the costs of manufacturers passing through the increased cost of MEPS compliant heat pumps to households.	**Positive**
Non-monetised impacts	We do not expect any further non-monetised impacts to those outlined above.	**Neutral**
Any significant or adverse distributional impacts?	We do not expect any significant distributional impacts as a result of this policy. Impacts are proportional to energy use of households and businesses and so are distributed proportionally to population and business concentrations. While it is true that lower income households spend a higher level of income on energy than high income ones, the exact distribution of heat pump sales will be dependant on other government policy and market factors, not as a result of this policy. We consider there be no impact on groups with the following protected characteristics as a result of the policy proposal, as no evidence has been found to demonstrate any impact: age; disability; gender reassignment; marriage or civil partnership; pregnancy and maternity; race; religion or belief; sex; or sexual orientation.	**Neutral**

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?	We do not expect that these requirements will directly limit the number nor range of manufacturers because the manufacturing of heat pumps is already concentrated amongst a very small number of firms. We do not expect that these requirements will indirectly limit the number or range of suppliers through increasing suppliers' costs. The UKCA mandate will marginally raise the costs associated with the declaration for conformity and we expect these costs to be small and affect all suppliers equally. The Regulations are not expected to limit the ability of manufacturers to compete. MEPS will remove products from the GB market, inevitably reducing consumer choice in the short run. However, the allowances we have introduced will ensure that at least 50% of heat pump product types are able to remain, thereby ensuring that a full range of heat pumps are made available on the GB market. We also expect manufacturers to innovate quickly to increase the number of models on the market which	**Neutral**

	can meet the new MEPS; failure to implement the policy could lead to a failure of the fourth Competition and Market Authority condition listed above due to a lack of incentive to continue to improve efficiency when current minimum standards will be far exceeded. It has been concluded that there are no adverse effects on competition from our preferred policy option as manufacturers will still be able to place their products internationally as these will be world leading efficiency standards.	
International Considerations: Does the measure support international trade and investment?	Of heat pumps sold in the UK, the UK manufactures around one third with two thirds imported, though the market share is predicted to grow to around one half of heat pumps manufactured in the UK by 2030. Almost all Heat Pumps manufactured in the UK are sold in the UK, though a small percentage (around 0.5%) are exported.[14] The Heat Pump Investment Accelerator Competition (HPIAC) is intended to significantly increase manufacturing over the longer term and shift the market to predominantly UK made heat pumps compared with the current situation. However because the UK and EU heat pump markets are expected to grow substantially, there will still be significant opportunities for import and export to/from the UK. This view was supported by the review of the subsidy control principles assessment for the heat pump investment accelerator competition, which was undertaken by the Subsidy Advice Unit (SAU) of the scheme [15]. Therefore, the UK imports large quantities of heat pumps from EU and the rest of the world, with a very small export market. The negative effect on imports (for both quantity and value) is caused by the fact that the higher standards in place in GB would exclude around 40-50% of products currently on the EU market and globally, therefore the pool of products which could be imported and be compliant with the new Regulations would be smaller than at present. Nevertheless, we judge there would be a low risk of non-GB businesses choosing to stop exporting heat pumps to the GB market as a way of avoiding the need to comply with the proposed new ecodesign requirements. The negative effect on exports (for both quantity and value), comes from marginally higher prices of domestic products due to the assumed passthrough of innovation costs. However, as the expected cost increase per product is small relative to the total cost of a heat pump,	**Neutral**

[14] https://assets.publishing.service.gov.uk/media/5fd3c316d3bf7f3057adeb39/heat-pump-manufacturing-supply-chain-research-project-report.pdf

[15] https://www.gov.uk/government/publications/report-on-the-heat-pump-investment-accelerator-competition-scheme

	we expect this effect on to be small. The expected negative effect on both imports and exports is anticipated to be temporary, given we expect the EU market will eventually converge towards the proposed MEPS in GB, and GB manufacturers will continue to be able to export to the EU under the new regulations. Further, as the market for higher efficiency heat pumps evolves to meet the new standards, we would expect these additional costs to fall away and for costs to return to a new equilibrium due to economies of scale. As a result, we do not believe the proposed MEPS are likely to have more than a negligible impact on trade. In addition, there may be potential benefits to GB manufacturers in being first movers on these higher minimum standards, though these again would likely be temporary for the reasons above. For this reason we also consider any quality and cost advantages in trade for UK businesses to be minimal, and so have not been factored into cost and benefit calculations. 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. Heat Pumps, 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?	Environmental impacts, including greenhouse gas emissions, have already been costed and included in our analysis above. This policy is expected to generate electricity savings, thereby reducing green house gas emissions and demand from electricity generation.	**Supports**

8. Monitoring and evaluation of preferred option

We plan to undertake a light-touch Post Implementation review (PIR) conducted no later than two years after the application date of the second tier of these Regulations. The preferred option will introduce two consecutive tiers of minimum energy performance standards in 2027 and 2029 respectively, which means that there is already a future update built into the policy at the point of implementation. It therefore makes sense to initiate a PIR process after the second tier has come into force in 2029. 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 MEPS, which means we may not be able to gather meaningful data to inform a PIR until 2027/2028. 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 2029. Secondly, given the level of ambition within the preferred policy option, suppliers of heat pump products will need to invest in re-developing products to meet the tier two requirements in 2029, which they will be incentivised to do in order to avoid severe 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 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 in 2029 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 2029, we anticipate that the market will have prepared well in advance for this tier 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 lower energy efficiency heat pumps from the market and shifting production to higher efficiency models. The review will interrogate whether these Regulations remain the best option for achieving energy, carbon and bill savings from heat pumps. 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 seasonal space heating energy efficiency of heat pump products on the market at the time of the review and to compare this to the predictions made in this Impact Assessment. 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.

However, this quantitative analysis will have limitations due to the difficultly 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, the effect of international regulations and changes in consumer preferences (for example as consumers become more climate aware). To address this, the PIR will use a qualitative analysis to assess the extent to which the Regulations were a significant factor in any changes in the market.

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 an informal consultation with a range of stakeholders including NGOs, charities, members of the public and industry (manufacturers, retailers, trade associations, etc.). We expect the review will focus on whether the Regulations have resulted in only heat pump products that comply with the requirements being placed on the market, rather than attempting to quantify the energy savings of their use.

We predict that measuring direct energy savings from improved ecodesign requirements for heat pump products 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 in a more fair and representative way. Hence why the PIR would largely be a qualitative assessment, supported by quantitative analysis where possible.

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 traded carbon savings from heat pump products. To achieve this, data on the contemporary stock of heat pump products 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 the product through a combination of market research and consultation with relevant stakeholders.

Further, an assessment on 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 further circular economy principles. This will help to establish if the objectives of the regulation remain appropriate.

Between 2027 and 2029, we will undertake light-touch market monitoring of the policy, as well as keeping track of regulatory changes for heat pump products in other markets. If we found market information which suggested that changes were required to the policy ahead of tier two being implemented in 2029, we could bring forward this review and undertake a fuller investigation to inform an appropriate policy response.

9. Minimising administrative and compliance costs for preferred option

Transitional costs are estimated to be minimal as a result of updating the ecodesign requirements for Heat Pumps. Manufacturers are required to read and understand regulatory changes regarding the update in MEPS. The vast majority of the current regulations will remain unchanged, so suppliers will not need to familiarise with new definitions or procedures for compliance verification, for example.

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. We have included a one-off cost to monetise the impact of reading and understanding the new GB legislation. This cost, valued at £12,000 in total for all GB businesses affected, will be realised in 2027 only. This transitional cost is calculated by multiplying the cost of one and a half days of labour by the estimated number of businesses that manufacture heat pumps. We estimate this cost to be higher than previously due to increase in MEPS, divergence from EU standards and the time needed to adjust for the new MEPS.

The number of GB businesses affected is estimated from research by Eunomia and extracts of MCS data.[16] While difficult to say exactly how many businesses are involved with heat pump manufacture, we are confident that there are less than 100 operating in GB. We have therefore taken this as an upper bound for analysis.

For hours taken, the requirements may be presented differently in the legislation than in the past and so it may take businesses a bit more time to confirm that they are compliant with the new MEPS, given the divergence from previous legislation which uniformly followed EU proposals. This has been estimated as a day and a half of labour based on feedback from a previous consultation.

To estimate the price of labour it has been assumed that 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 in advising on changes in government regulation. This is reinforced by job titles included in responses to the consultation.[17] 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 £22 per hour respectively.[18] These hourly wages are the equivalent of £40,600 and £38,700 per-annum based on working 220 eight-hour days. As a result of this a £23 per hour wage has been assumed. An additional 30% is added to this wage to account for overhead costs businesses face when employing workers. This provides a final cost for the comprehension of the regulations. An opportunity cost equal to the transitional cost has been included to account for this member of staff being diverted from other duties.

Enforcement and compliance costs are not easily quantified. Enforcement action is undertaken where the market surveillance authority (MSA) believes there is sufficient risk-based justification to do so, in line with standard enforcement policy[19]. Additional costs resulting from the preferred policy option are considered to be minimal because the aspects of the verification procedure to be followed by MSAs and the wider enforcement and sanctions regime (set out in the Ecodesign for Energy-related Products Regulations 2010) will remain unchanged under the preferred policy option.

Testing costs are not expected to increase under the lead policy option because the updated MEPS requirements only displace the existing MEPS requirements and no additional testing or reporting requirements are introduced. Also, we anticipate that product suppliers would be able to continue using the methods of measurement set out in established international standards which are used for testing under the existing ecodesign regulations and which would be used in a Do Nothing scenario. Any small extra costs associated with the declaration of conformity and the mandate for heating products sold on the GB market to display the UKCA mark that are incurred are expected to be absorbed by the supplier[20].

Any increase in frequency of testing or increase in the cost of testing, is expected to positively benefit UK Small and Medium-sized Businesses (SMEs, defined as having up to 49 Full Time

[16] https://assets.publishing.service.gov.uk/media/5fd3c316d3bf7f3057adeb39/heat-pump-manufacturing-supply-chain-research-project-report.pdf

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

[18] 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 248

[19] 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.

[20] Based on DBT research on average costs for UKCA compliance.

Equivalent (FTE) and 10 FTE employees respectively[21]) involved in these sectors, who would have the opportunity to profit from the increased demand.

As suggested in HM Government's OIOO (One-In, One-Out) Methodology[22], the cost and benefits calculated have assumed 100% compliance since we have no evidence to suggest significant non-compliance would arise. Lack of compliance would, however, impact on both costs and savings.

Declaration

Department: DESNZ

Contact details for enquiries:

spaceheatingstandards@energysecurity.gov.uk

Director responsible: David Capper

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

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

[22] HM Government's OIOU (One-In, One-Out) Methodology, July 2011. Available at: https://www.regulation.org.uk/library/2011_oioo_methodology.pdf

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: 2027

This table may be reformatted provided the side-by-side comparison of options is retained	**1. Business as usual (baseline)** **Option 1 – Do Nothing**	**2. Do-minimum Option** **Option 3 – Self Regulation**	**3. Preferred way forward** **MEPS levels of 168% in 2027 and 175% in 2029 for MT heat pumps and 143% in 2027 and 153% in 2029 for HT heat pumps.**	**4. More ambitious preferred way forward** **(Initial Proposal 3)**	**5. Less ambitious preferred way forward** **(Initial Proposal 1)**
Net present social value (with brief description, including ranges, of individual costs and benefits)	Under this option there would be no change from business as usual. So only the small improvements in overall efficiency in the market factored into our baseline would take place, with the majority of worst performing products remaining. As such there are no additional costs or benefits associated with this option.	As described in the rationale for not pursuing this option we do not believe this would produce significant further savings to those already in the baseline. As such, there are no additional costs or benefits associated with this option.	The benefits of this policy will come from the reduction in energy consumption, and the policy costs are derived from higher product prices as a result of setting higher efficiency standards. The assumption is that these costs will be transferred from manufacturers to consumers. The total NPV is £831m. The benefits of this policy compared to the	The benefits of this policy will come from the reduction in energy consumption, and the policy costs are derived from higher product prices as a result of setting higher efficiency standards. The assumption is that these costs will be transferred from manufacturers to consumers. The total NPV is £4,749m. The benefits of this policy compared	The benefits of this policy will come from the reduction in energy consumption, and the policy costs are derived from higher product prices as a result of setting higher efficiency standards. The assumption is that these costs will be transferred from manufacturers to consumers. These proposals will not exceed the predicted market MEPS so will not

			baseline scenario are the following: • carbon emissions savings = £61m • reduced long variable running costs = £2,134m • air quality improvements = £2m Expected carbon savings: • CB5 = 0.13 MtCO2 • CB6 = 0.26 MtCO2 • To 2050 = 0.95 MtCO2 The policy cost is -£1,366m associated with upgrading heat pumps to meet new efficiency standards.	to the baseline scenario are the following: • carbon emissions savings = £465m • reduced long variable running costs = £16,220m • air quality improvements = £17m Expected carbon savings: • CB5 = 0.94 MtCO2 • CB6 = 1.94 MtCO2 • To 2050 = 7.14 The policy cost is -£11,954m associated with upgrading heat pumps to meet new efficiency standards.	have costs or benefits by implementing.
Public sector financial costs (with brief description, including ranges)	N/A	N/A	There are no public sector financial costs associated with applying new MEPS thresholds.	There are no public sector financial costs associated with applying new MEPS thresholds.	There are no public sector financial costs associated with applying new MEPS thresholds.

Significant un-quantified benefits and costs (description, with scale where possible)	N/A	N/A	Whilst the value of energy savings to households and businesses have been captured in our impacts above, there is an unquantified saving to public finances from the reduction in energy generation/infrastructure costs as a result of reduced demand.	Whilst the value of energy savings to households and businesses have been captured in our impacts above, there is an unquantified saving to public finances from the reduction in energy generation/infrastructure costs as a result of reduced demand.	Whilst the value of energy savings to households and businesses have been captured in our impacts above, there is an unquantified saving to public finances from the reduction in energy generation/infrastructure costs as a result of reduced demand….
Key risks (and risk costs, and optimism bias, where relevant)	Misaligned market incentives outlined above continue or become worse. Risk of dumping of more inefficient products onto the GB market as other countries improve standards. Loss of potential energy/carbon savings and resulting societal costs.	Misaligned market incentives outlined above continue or become worse. Risk of dumping of more inefficient products onto the GB market as other countries improve standards. Loss of potential energy/carbon savings and resulting societal costs.	Risk of external factors moving the key assumptions that underpin the policy decisions (market distribution, costs, efficiency) deviating from what has been predicted. The Post-Implementation Review will assess if this is the case and adjustments to the policy made if needed.	Risk of the elimination of too high a proportion of the market, reducing customer choice and risking the overall strategic objective to accelerate the electric heating transition.	Risk of improvements in energy efficiency on the market outpace implementation of MEPS, rendering the MEPS levels set less effective.
Results of sensitivity analysis	N/A	N/A	The modelling is sensitive to the deployment of heat pumps, particularly over the late 2020s-2030s when MEPS are expected to have their largest impact. If the total sales of heat pumps in these periods is higher or lower than predicted this is directly	Sensitivities to key assumptions are the same as discussed for the preferred way forward.	Sensitivities to key assumptions are the same as discussed for the preferred way forward.

			proportional to the costs and benefits expected. Sensitivity to other key variables is shown in the tables below.		

Assumption	Impact	Risk
Performance Improvement	High – The assumed rate of improvement in Heat Pump efficiency each year is 1% based on analysis of market data. Varying this assumption by +/- 1 percentage point results in an +/-45% variation in NPV.	High – The market for heat pumps is evolving rapidly with the rate of innovation still high. A key role of the PIR will be to assess changes in the market in case adjustments in MEPS levels are needed.
Cost Increase	Medium – Overall costs are sensitive to the cost increase of a heat pump after MEPS, so a +/-10% variation in cost increase results in a +/-95% variation in NPV	Medium – The cost increases are estimated from analysis of the current heat pump market. But market shifts and innovation as sales increase could alter this cost profile.
Prices	High – Varying the Long Run Variable Costs of energy used to either the high or low scenarios instead of the central values results in a +/-22% variation in NPV	Medium– These assumptions are updated regularly as part of yearly updates to assumptions for Green Book analysis[23]. While we have used the latest available these will vary over time as the result of government policy and external factors affecting prices.
Energy Consumption	Medium – Benefits are directly proportional to energy consumption, so a 10% variation in energy consumption results in a +/-26% variation in NPV.	Medium – The average energy consumption is the result of DESNZ analysis on the demand for the current housing market. Significant changes in requirements for new builds, or much larger increase in insultation could lower this demand.
Carbon Values	Low – Varying the Carbon Values used to either the high or low scenarios instead of the central values results in a +/-4% variation in NPV.	Medium– These assumptions are updated regularly as part of yearly updates to assumptions for Green Book analysis[24]. While we have used the latest available these will vary over time as

[23] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

[24] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

		the result of government policy and external factors affecting prices.

Scenario	Low (NPV)	Central (NPV)	High (NPV)
Performance Improvement	£1,202	£831	£474
Cost Increases	£1,605	£831	£46
LRVC electricity prices	£613m	£831m	£1,046m
Energy Consumption (+/- 10%) (Carbon savings to 2050 also shown)	£605m To 2050 = 0.86 Mt	£831m To 2050 = 0.95 Mt	£1,045m To 2050 = 1.05 Mt
Carbon Values	£794m	£831m	£856

Annex 1 - Key assumptions and modelling approach for Heat Pumps

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.

The main purpose of the model is to assess the impact of policies around Heat Pumps. 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 traded carbon savings from using more energy-efficient products.

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

- Stocks and/or sales of 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.

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

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

Table A1: Overview of the key inputs into the cost/benefit analysis for Heat Pumps

Variable	Source(s)	Values / Assumptions:
Stocks/sales	DESNZ Heat Pump Deployment modelling.	Heat pump deployment estimates: Deployment data was taken from DESNZ projections on heat pump deployment. Product projection estimates capture the current central estimate of expected deployment to 2050. The modelled decarbonisation pathway is an updated version of the high electrification scenario presented in the Net Zero Strategy[25] (where hydrogen is not used for heating buildings). 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. The vast majority of deployed heat pumps are assumed to be MT ASHP, with smaller components from HT ASHP and GSHP. True Low-Temp heat pumps (not being able to deliver water to 52'C) have not been included in the deployment estimates as they cannot provide hot water.
	MCS product database provided by external research partners	Product market analysis: Heat pump product data from monitoring of heat pump installations by MCS[26]. The dataset included all unique ASHP and GSHP products registered by MCS with SCOP values reported at different flow temperatures. This data was used to find the market sizes and performance ranges for heat pumps that were able to deliver a performance report (SCOP) at 55C, making them medium-temperature product compliant, and those that delivered a SCOP report at 65C, making them able to be classified as high-temperature products. The data showed there to be 1322 MT ASHPs, 483 MT GSHPs, 254 HT ASHPs, and 16 HT GSHPs. The total number of ASHPs and GSHPs registered in the database was 2075.

[25] BEIS (2021), 'Net Zero Strategy: Build Back Greener' (https://www.gov.uk/government/publications/net-zero-strategy).
[26] https://mcscertified.com/

		SCOPs of MT ASHPs range from 2.32 to 4.55, and MT GSHPs range from 2.59 to 4.44 (performance reported at 55C). For HT ASHPs, SCOPs range from 2.55 to 3.25 (reported at 65C). HT GSHPs range from 2.35 to 3.35 SCOP. The MCS dataset has performance levels reported at temperatures between 35C to 65C, in 1C increments. For the purpose of maintaining the broad policy strategy of implementing MEPS for specific product categories - medium-temp and high-temp products which are distinguished by delivering water at 55C and 65C, respectively – only these two temperature brackets have been analysed.
Usage / Heat Demand / Consumption	MCS product database, MCS Installation database, MCS SCOP and SSHEE Discussion Paper on PEFs, CHA CB6 V3 Model, EoH Demo project data analysis report by ESC,	Market distribution of performances: The MCS product database was used to produce market distributions of the range of products available on the market – the database has information on recorded performance at different temperatures. This allowed us to analyse the percentage of products at each performance level (SCOP), at different product temperature brackets (e.g. standard temperature products delivering 55C water, HT products delivering 65C). In order to set MEPS levels consistent with units used in existing regulations, these SCOP distributions have been translated to SSHEE % units using a PEF factor of 1.9. This distribution analysis shows the market average efficiency of standard temperature ASHPs is 162%, high-temperature ASHPs is 140% and standard temperature GSHPs is 175%. These figures are analysed using 2023 product data. The sample size of 16 for HT GSHPs is too small for us to make market assumptions. - Market distributions show GSHPs to be less spread out, and due to sample size and deployment estimate, we proposed only include MEPS for “MT HPs” and “HT HPs”, not GSHP specifically. - Low-Temp HPs are also a small market and we have not included these in MEPS intervention – products that cannot deliver 55C.

		MEPS levels have been set here for standard-temperature ASHPs, high-temperature ASHPs and standard-temperature GSHPs at specific efficiency levels along their efficiency distribution in order to cut out the worst 40% performing products currently on the market. Another set of MEPS are then proposed to be introduced two years later, at “Tier 2”, in order to further improve the market, and cut out the worst 50% performing products in that year. Tier 1 and Tier 2 are proposed for 2027 and 2029, respectively. Annual technological improvement of 1% has been applied in the model until 2035 to forecast increasing market average product efficiencies and set MEPS at 2027 and 2029 relative to our estimation of product efficiencies in these years. In 2023, we analysed the average product efficiency in the market for an ASHP to be 162%, using the MCS Product Database, and in 2027 we expect this to rise to 166.6%. Similarly for HT ASHPs, we expect them to rise from 140% to 144%. For standard-temperature heat pumps, MEPS of 168% and 175% are proposed to be introduced at Tier 1 and Tier 2, which will improve average product efficiencies by 4.4% then 7.8% to 171% then 178%. For high-temperature heat pumps, MEPS of 145% and 153% are proposed to be introduced in Tier 1 and 2, which will improve average product efficiencies by 3% then 6% to 147% then 153%. These are then converted into in-situ SCOP values for use in energy reduction calculations using the assumptions listed below. This results in step changes in performance over the period of MEPS changes, followed by a return to a new stead state of HP efficiencies HP Performance units: The Primary Energy Factor (PEF) has been changed from 2.5 to 1.9 in the model to align with the policy development in other areas of the space heating consultation. The current value of 2.5 does not represent the current energy mix in the UK, and 1.9 would help align the energy performance of space heaters with actual primary energy used by consumers.

		The PEF has been used in the model to convert between Seasonal Space Heating Energy Efficiency (SSHEE) and Seasonal Coefficient of Performance, when translating performance figures from MCS databases to efficiency standards being set in this MEPS policy.
		Product heat demands: The annual heat demand for the products in the stock forecasts have been taken from DESNZ heat pump deployment projections. We have assumed an illustrative annual heat demand assumption of 10,000kWh – this is based on the average 2022 England & Wales domestic gas consumption from the National Energy Efficiency Data-Framework (NEED)[27] which has been adjusted to account for gas boiler efficiency as well as an assumed 8% uplift in heat demand for a home using a HP to account for a more constant heating profile associated with lower flow temperature. This heat demand is kept constant over the appraisal period and the same demand is used for the different heat pump technologies (whereas in reality GSHP and HTASHP might be expected in homes with higher than average heat demand). Annual Technological Progress: An annual technological progress of 1% has been applied to the energy efficiency of products in the model up to 2035, after which the modelling conservatively assumes efficiencies have become stable over time. This is a compound improvement applied to average market product efficiencies extracted from the MCS Product Database, which is a 2023 snapshot of products available on the market – the standard-temperature ASHP market in 2023 demonstrated a weighted average product efficiency of 161.7%, and with an annual 1% increase this grows to 166.6% (SSHEE unit). This improvement envelope is conservative in comparison to the improvement of average COPs seen in heat pumps installed in the MCS Installation database between 2017 and 2023, which shows annual improvements closer to 2%. This 1%/year improvement is difficult to attribute discrete quantifiable factors to, and so the model assumes that this is a baseline improvement

[27] https://www.gov.uk/government/collections/national-energy-efficiency-data-need-framework

		separate to efficiency improvements resulting from interventions made in this policy (MEPS). In terms of modelling, the MEPS incur a step change in market average product efficiency in the year that they are implemented, which occurs simultaneously to the annual 1% improvement. Design vs In-situ product performance difference: Based on large in-situ heat pump trials we have seen that the performance of heat pumps installed in homes is often significantly less that the test performance. To better reflect the impact of the policy on electricity demand, energy costs and carbon emissions, we have scaled the BAU and policy trajectories of heat pump performance down to align with the in-situ performances observed in the Electrification of Heat (EoH) study, conducted on behalf of DESNZ by Energy Systems Catapult[28] for the different heat pump technologies.
		Other MEPS Policy Scenarios: The MEPS levels outlined above for MT HPs and HT HPs are the preferred options that have been modelled in detail with carbon and energy savings calculated. There are other policy scenarios that were initially proposed and analysed for the ASHP market, that are described at a high level in section 5 of this Options Assessment, but the impacts of those intervention levels have not been quantified. For MT HPs, there were 3 initial policy scenarios with varying MEPS, but none were proposed for HT HPs.
Costs of product	DESNZ NHM model using Eunomia as evidence base for products costs, MCS Installation Database, DESNZ Heat Pump Cost Reduction Report.	Current product capex costs: An average product unit capex cost, in 2021 prices, of £4,200 has been applied to the policy cost modelling for MT ASHPs, and an average unit capex of £5,800 and £6,400 for HT ASHPs and GSHPs, respectively. Product costs increase relative to capacity, and the above figures have been calculated using an average heat pump capacity of 9.44kW extracted from the MCS Installation Database (domestic installations). Whilst this capacity

[28] https://es.catapult.org.uk/report/electrification-of-heat-home-surveys-and-install-report/

		and cost could be high compared to long term trends, the cost impacts of this modelling are based on cost differences before and after MEPS introduction which has less impact overall than overall variation in cost of a heat pump. We have used the central value for each product technology, however, low and higher sensitivities have been captured in the model for a more detailed sensitivity analysis. For MT ASHPs, the higher range average unit capex is £5,400, and the lower is £3,500.
		Cost reduction trajectories: We expect that heat pump capex should reduce over time as the market ramps up through a combination of innovation and economies of scale. In terms of heat pump cost reduction, these have been adapted from the trajectories developed in the *Cost of Domestic and Commercial Heating Appliances* [29]report, developed by a synthesis of the work of Eunomia, Delta-LCP[30] and internal DESNZ assumptions around the trajectory and breakdown for future capex reduction for ASHPs linked to DESNZ projection for ASHP deployment rates. For MT ASHPs and HT ASHPs, the assumption is that average unit capex is reduced in real terms by 15% by 2028, by 33% in 2035, and by 50% in 2050 compared to 2021.
		Cost vs Performance estimates: The average costs for MT and HT Air Source Heat pumps and Ground Source Heat Pumps were taken from recently published market surveillance work carried out by Eunomia. As part of this study Eunomia also investigated the relationship between stated heat performance (SCOP/COP) and cost (£/kW). This concluded that no clear relationship could be established between performance and cost for domestic air and water source heat pumps, with cost variation being likely more driven by differences in other technical features and price differences between manufacturers. So further work has been

[29] https://eunomia.eco/reports/title-the-cost-of-heating-appliances-a-comprehensive-uk-database/

[30] https://delta.lcp.com/whitepaper/whitepaper-what-is-the-potential-for-cutting-the-cost-of-an-installed-heat-pump/

		undertaken to understand the potential scale of any product cost increases arising from this policy. We have assumed the policy cost to the consumer when buying a heat pump is the cost increase that results from setting higher efficiency standards on the market. Cost increases have been estimated using analysis of heat pump component costs and the theoretical relationship between ASHP performance and the unit capex cost and total installation costs. We assume a 'best available technology (BAT)' ASHP product would be 24% more expensive than an average performance one, and we applied this increase factor to the efficiency improvements resulting from our MEPS policies (4.4% improvement and 7.8% for MT ASHPs in tier 1 and tier 2), resulting in unit capex cost increases of £12 in tier 1 and £56 in tier 2. These cost increases are calculated and used for NPV calculations separate to cost reductions applied as a function of time. In the absence of specific research for HT ASHPs, the same percentage cost increases have been applied to HT ASHP unit capex costs, resulting in £0 increases in tier 1 and £39 in tier 2. For GSHPs, we have assumed a BAT product would be 17% more expensive than the market average, and after applying this to our market analysis and MEPS impact calculations, results in unit capex increases of £132 in tier 1 and £172 in tier 2. This is slightly higher than for ASHPs as the difference in average and BAT for GSHPs is lower.
Technologies		Technologies included in scope and definitions: The types of heat pumps that have been accounted for in the savings modelling are medium-temperature ASHPs, high-temperature ASHPs, and medium-temperature GSHPs. These product categories are aligned with the MCS Product Database and the MCS Installation Database that have been used to product market distributions that support carbon/energy and monetized cost savings in the modelling. Our proposed policy regulations will set minimum efficiency standards (MEPS) for Medium-Temperature heat pumps (MT HPs) and High-Temperature heat pumps (HT HPs), which cover the product types analysed in the modelling.

		In terms of definitions, our policy proposal defines MT heat pump space heaters as a heat pump heater declared to be capable of being used in a medium temperature application. A medium temperature application is where the heat pump space heater or heat pump combination heater delivers its declared capacity for heating at an indoor heat exchanger outlet temperature of 55 °C. We define a HT heat pump space heater as a heat pump heater declared to be capable of being used in a high temperature application, and a high temperature application is where the heat pump space heater or heat pump combination heater delivers its declared capacity for heating at an indoor heat exchanger outlet temperature of 65 °C.
Lifespans		For all products, an average product lifespan of 18 years for ASHPs and 20 years for GSHPs was used in the calculation of accumulated stock based on deployment statistics and therefore accumulated energy consumption forecasting. This figure is aligned with heat pump deployment modelling developed by others in DESNZ and are the general assumptions used by the department.
Monetized benefits and NPVs	HMT Green Book Supplementary Guidance tables[31].	Discounting rate used in the model: The Standard Discount Factors of 3.5% each year have been used from the HMT Green Book Supplementary Guidance, with 2024 being used as the base year.
		LRVC Tables 9-13 were used to look up HMG's assumptions on long-run variable costs of energy supplies - the central values for Electricity LRVC, within the 2026-2050 period, were applied to domestic energy consumption forecasts of the heat pump stocks in the model, to calculate monetized LRVC savings resulting from setting efficiency standards on the heat pump market in this policy.
		Electricity Emissions Factor The consumption-based, long-run marginal, electricity emissions factors in Table 1 were used to convert the electricity consumptions of heat pump stocks in our model to carbon

[31] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

		emissions, and therefore carbon savings associated to reductions from setting MEPS on the heat pump market in this policy. Carbon Values The central carbon price values, within 2027-2050 period, in Table 3 was used to calculate the monetized savings associated to carbon reductions from setting efficiency standards (MEPS) on heat pump market in this policy.
		Air Quality Activity Costs Table 15 was used for HMG's assumptions on air quality impacts of electricity consumption of heat pump usage between 2027 and 2050, to calculate monetized air quality impact savings resulting from setting efficiency standards on the heat pump market in this policy.
		Retail Fuel Prices Tables 4-8 were used to look up assumptions on fuel prices of energy supplies – the central values for retail electricity prices (p/kWh), within 2027-2050 period, were used to calculate the bill savings associated to the energy savings of the national heat pump stock from setting MEPS on the heat pump market in this policy.