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Boiler Plus (2018)

Initial Policy Review

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Any enquiries regarding this publication should be sent to us at:
buildingheat@beis.gov.uk

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Glossary

The following terms are used throughout the report.

Term	Definition
Additional measures	"Additional measures" refers to the four additional measures to be installed alongside a gas-fired combination boiler at the point of installation under the Boiler Plus standards. These include: • Flue Gas Heat Recovery (FGHR) • Load compensation • Weather compensation • Smart controls
Boiler interlock	Boiler interlock refers to a wiring arrangement that ensures the boiler is switched off when there is no demand for space heating or water heating. For a combination boiler this can be achieved simply by having a room thermostat. For a system or a regular boiler the controls need to be wired such that the boiler and pump will turn off when neither the space heating nor the hot water cylinder requires any heat input.
Combination, system, and regular boilers	There are three main types of gas boiler used in domestic properties: • Combination boilers, also known as **combi** boilers, combine both water heating and central heating in a single unit. They provide hot water directly at the time that it is required, rather than it being stored in a separate hot water tank or cylinder. • A **system** boiler heats hot water in advance, storing hot water in a separate hot water tank or cylinder. It is fed directly from the mains water supply rather than a cold-water storage tank. • A **regular** boiler is fed by a cold-water storage tank (usually in a loft or attic). Hot water is heated in advance and stored in a separate hot water tank or cylinder, from which it is released when needed (i.e., independently of the boiler being fired).
Energy-related Products (ErP) efficiency	Ecodesign regulations set the minimum energy product performance standards for energy-related products[1] including for those used for

[1] A product which has a direct or indirect impact on energy consumption during use

	space heating[2]. Ecodesign aims to phase out the least efficient energy-related products from the market through minimum energy performance requirements. BEIS recently published a response to a call for evidence focused on energy related products[3] (ErP). ErP determines the efficiency of a domestic heating boiler. In addition, this methodology is also used to establish the energy classes on energy labels required for a number of energy-related products including boilers[4]. This methodology was introduced in 2015. It is different to that previously used in the UK, known as Seasonal Efficiency of Domestic Boilers in the UK, or SEDBUK. The Boiler Plus standards set the new minimum performance standard for domestic gas boilers in English homes to 92% ErP.
Flue Gas Heat Recovery (FGHR)	FGHR systems recover heat from waste flue gases to preheat the cold water entering the boiler, lowering the amount of energy needed to warm the water up to the required level. This means that the effectiveness of FGHR does not depend on householders using it in certain ways or making any sort of adjustments to their behaviour. Some FGHR systems use electricity to power them, while others (known as Passive FGHR) do not.
Hydraulic balancing	When a central heating system is properly balanced, radiators will heat up throughout the house at the same rate. If the system is out of balance, the hot water may not reach some radiators as quickly as others, or in some cases not at all. It is an expected practice within the Building Regulations (Part L) that installers make repetitive adjustments when commissioning or servicing a boiler to ensure the system is balanced and uses no more fuel and power than necessary.
Load compensation	A load compensator is a device that measures the gap between the internal temperature of the home and what the user wants it to be, then modulates the temperature of the boiler output so that it is just hot enough to provide the extra heat needed. This allows the boiler to operate in condensing mode for more of the time, thus saving more fuel than just standard time and temperature control.

[2] https://www.legislation.gov.uk/eur/2013/813/contents
[3] https://www.gov.uk/government/consultations/energy-related-products-call-for-evidence
[4] https://www.legislation.gov.uk/eur/2013/811

Smart controls	Smart thermostats are products that let consumers remotely control their home temperature via a tablet, smartphone or desktop. To comply with Boiler Plus, a smart control can include either load or weather compensation, otherwise it must include both of: • **Automation**, where the device automatically controls the heating system output in response to programmed demand or occupancy detection (for example using the GPS on the users' smartphones). • **Optimisation,** meaning the device works out what time it should switch the boiler on so that it gets to the temperature on the thermostat at the chosen time, while using the least amount of energy.
Room thermostat	A central or room thermostat allows consumers to set their preferred temperature in their home. If the heating is turned on, the boiler will send water to the radiators such that the temperature on the thermostat is reached and then maintained, but not exceeded. Without a thermostat or any other heating controls, the boiler will keep heating the home until the heating is switched off, thereby using far more energy, and resulting in higher bills.
Thermostatic radiator valves (TRVs)	These allow consumers to change how much hot water flows into each radiator. This may mean, for example, that more heat can be sent to a room that is naturally colder or less heat to a spare room that is rarely used. Thermostatic controls allow consumers to set different temperatures in each room.
Timer	A timer allows consumers to set the heating to come on at specific times of the day to meet their routines without daily action on their part. Some systems have a 24-hour timer, which allows consumers to set the heating to switch on and off at the same time each day. More advanced timers, or timer functions within a programmable or smart thermostat, allow for different times to be set on different days, for example to reflect varying weekday and weekend routines.
Weather compensation	Weather compensation interacts intelligently with the boiler to provide just enough heat to keep the home warm, by adjusting the temperature of the boiler output to account for changes in the weather. Operating at a lower temperature makes the boiler more efficient. Weather compensators can be an external sensor feeding

	weather data back to the boiler, or digital products using weather data from the internet.

Executive Summary

Introduction

Background

Direct CO2 emissions from residential buildings accounted for 15% of the UK's carbon emissions in 2019. The main source of these emissions is the use of natural gas for heating and cooking[5]. The vast majority of homes in England, around 90%, utilise gas or oil boilers to provide space heating and hot water[6], and of these homes, around 86% are currently connected to the gas grid[7]. Government policies have therefore sought to improve the efficiency of boilers and domestic heating systems, to support bill savings for consumers and help reduce emissions.

The Boiler Plus standards[8], introduced in April 2018, strengthened existing Building Regulations, raising standards for heating systems and requiring the following:

- All new gas and oil boilers installed into existing dwellings in England should be fitted with time and temperature controls, and boiler interlock.
- All gas boilers installed in an existing dwelling, either as a new installation or as a replacement to an existing boiler, in England, must have an ErP efficiency of at least 92%.
- Additionally, for gas-fired combination boilers installed in existing dwellings in England, either as a new installation or as a replacement to an existing boiler, at least one of the following energy efficiency measures should be installed. The measure(s) chosen should be appropriate to the system in which it is installed. The four options are:
    - flue gas heat recovery,
    - load compensation,

[5] https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2019, p18.
[6] https://www.gov.uk/government/statistics/english-housing-survey-2018-energy-report
[7] https://www.gov.uk/government/statistics/sub-national-estimates-of-households-not-connected-to-the-gas-network
[8] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/651853/Boiler_Plus_final_policy_and_consultation_response.pdf p32.

- weather compensation,
- smart controls with optimisation and automation features.

Aims

The Department for Business, Energy and Industrial Strategy (BEIS) commissioned Ipsos MORI and the Energy Saving Trust to:

- Determine levels of compliance with Boiler Plus standards.
- Understand the impact of the Boiler Plus standards on manufacturers, installers, and consumers.
- Collect the views of manufacturers on the potential extension of requirements for installation of approved energy saving technologies alongside the installation of combination boilers to all gas-fired boiler types (i.e., extending the requirement from gas-fired combination boilers to gas-fired system and regular boilers).
- Assess the views of manufacturers and installers on the extension of Boiler Plus standards to include hydraulic balancing and maximum flow temperatures.

Methodology

This report presents the findings of this research, drawing on:

- Collation and analysis of market data with the aim of understanding levels of compliance with the regulations. This strand was subject to significant uncertainties and data gaps that had been identified prior to the commencement of the project. These, along with additional uncertainties and data gaps uncovered during the analysis, are discussed in detail in Chapter 5.
- Qualitative interviews with industry associations (x3), boiler manufacturers (x9), controls manufacturers (x10) and installers (x20), undertaken by telephone, to gain in-depth insight into their views of the Boiler Plus standards; how the standards are being implemented in the field; the impacts on their businesses; and their views on potential future policy areas (e.g., hydraulic balancing and mandating maximum flow temperatures).
- Qualitative interviews (x12) and online video focus groups (x2, each with six participants) with consumers who had recently had a gas combination boiler installed, undertaken by telephone, to understand their experiences and expectations, and the role of the Boiler Plus standards in their decision-making and installation experiences.

Key findings

Manufacturer views of Boiler Plus

There were mixed views on the extent to which Boiler Plus has impacted boiler manufacturers: some found the scheme to be a minor administrative obligation, whereas others said they had been required to launch new products to meet the requirements. In general, boiler manufacturers reported that the requirements' impact on the boilers themselves was limited, although some manufacturers had made adjustments to meet the 92% ErP criteria.

Since the introduction of Boiler Plus, sales of smart controls had increased significantly, although some manufacturers felt this was part of a wider trend in the market and not driven by Boiler Plus specifically.

Manufacturers reported an increase in sales of load compensators and – to a lesser extent – weather compensators, but could not attribute this entirely to Boiler Plus. However, they generally agreed Boiler Plus has had limited impact on the sales of FGHR systems, due to the higher cost. Any increases in sales, particularly in the form of boilers with built in FGHR, were largely seen as being driven by new build installations, which are not in scope of the Boiler Plus standards.

Boiler Plus was seen by manufacturers as benefitting consumers by promoting the correct use of boilers and increasing efficiency to yield both cost savings and improved comfort. Some manufacturers also felt that consumers benefit from the additional control functionality that results from Boiler Plus.

Where negative views towards Boiler Plus were voiced by manufacturers, these tended to focus on the potential for non-compliance. Concerns focused on a lack of monitoring and enforcement and the availability of cheaper non-compliant products, or the lack of guidance or incentives to choose the most appropriate additional measure to maximise efficiency gains. Some potential unintended consequences were highlighted, particularly low consumer acceptance of lower flow temperatures as a result of the installation of load and weather compensators.

Installer views of Boiler Plus

Installers had a broad awareness of Boiler Plus but not all had detailed knowledge of all of the requirements. They had obtained information regarding Boiler Plus from a range of information sources and training sessions, such as Gas Safe technical bulletins, industry magazines, training sessions from manufacturers, and word of mouth from other installers.

Installers noted that since the introduction of Boiler Plus, all boilers offered to consumers now meet the 92% ErP requirement. Some further noted that manufacturers no longer offer boilers with an ErP below 92%. However, aside from the need to meet the 92% ErP requirement, factors determining the installers' choice of boiler had not changed following the introduction of

Boiler Plus. Consideration of customer circumstances (e.g., budget) and the installer's preferred brand(s) still played key roles in this decision.

Installers tended to focus on one additional measure and install this as standard, rather than selecting the most appropriate measure for each household. In most cases smart controls were the measure favoured by installers, often due to their relatively low cost, ease of installation, and the ability to offer more or less complex versions depending on the budget, needs and digital literacy of the consumer. Some installers also noted that it was easier to explain the benefits of this technology than for the other additional measures. Additionally, installers reported that some customers make a specific request for smart controls, which is rarely the case for the other measures.

Overall, installers had mixed levels of knowledge of FGHR, load compensation and weather compensation. Those who installed these measures were particularly positive about them when provided built-into a boiler, but installers not installing these often perceived them to be technically complex.

Installers stated that they did not discuss the Boiler Plus requirements with consumers where they perceived there would be limited consumer interest in this topic (e.g., where they perceived consumer focus was on a quick replacement within their budget). The requirements were more likely to be discussed where the installer provided a choice of measure, where consumers had carried out their own research leading to relevant questions, or when providing rationale for installation costs. Installers largely agreed that the implementation of Boiler Plus had increased the cost of installation for consumers, referencing the cost of additional measures, rising cost of compliant boilers, and cost of additional labour time (frequently comprising of the time spent explaining smart control operation to consumers).

Consumer experiences of Boiler Plus

Consumers typically replaced their boilers either due to dilapidation or as part of home renovations. Their priorities for replacement boilers included: the upfront cost (to the consumer budget); availability of the boiler (for those with no working boiler); the ability to site the boiler in a particular space (e.g., where the previous boiler had fitted); and ensuring that the boiler was powerful enough for the home. Whilst those replacing old boilers anticipated that a new boiler would be more energy efficient, energy efficiency was seldom, if ever, the main motivation driving boiler choice.

When sourcing an installer, word of mouth and recommendations from friends, family and neighbours played a key role. Though some consumers obtained quotes from multiple installers, few carried out extensive research to inform their choice of installer, boiler or any additional measures.

No consumers recalled being informed of Boiler Plus requirements by their installer. Once prompted on the requirements, including the additional measures, participants recognised smart controls. Prompted awareness of the other additional measures was very low.

Consumers had very limited interest in having a choice of boiler, trusting the installer to make the appropriate recommendations, and there were mixed experiences of being provided with such a choice. Where choice was provided this tended to focus on a range of prices and brands. Warranty length was also discussed.

There was very little evidence from consumers that they were provided with a choice of additional measures beyond smart controls (which were sometimes actively requested by the consumer), reflecting the findings from installers that most have a chosen additional measure that they install unless the consumer requests otherwise. Whilst smart controls were often the easiest measure for consumers to understand and engage with, those who currently had these reported mixed use, often using the smart control as they would a traditional 'on/off' thermostat.

Consumers generally found the other measures – FGHR, Weather Compensators and Load Compensation – hard to understand. They felt they would most likely be interested if the other measures were presented with tangible benefits including upfront cost savings. There was very limited appeal in technical aspects of these measures. Although they were keen to know the cost implications of additional measures, some consumers reflected that any additional cost could be off-putting.

Compliance levels with Boiler Plus

The analysis suggests that all installations meet the minimum requirement of 92% ErP efficiency, and nearly all meet the requirement for time and temperature control. There may be a low level (<5%) of non-compliance with the requirement for boiler interlock.

There is insufficient data to produce a reliable estimate of compliance levels for the additional measures requirement. The available data and the views of industry suggest that compliant installations are common, but there may also be non-compliance with this requirement. There was consensus among both boiler and controls manufacturers that a lack of mechanisms for monitoring compliance and enforcement probably contribute to any non-compliance. Furthermore, the lack of monitoring itself led to the lack of data to be able to reliably estimate compliance levels.

Where compliance with the additional measure requirement is achieved, this is through a mix of technologies. Smart controls appear to be the most common, reflecting the views of installers and consumers, followed by compensators. Very few FGHR systems are being installed, probably due to the higher capital cost.

Views on extensions of Boiler Plus / future policies

There was general concern among installers that if standards were not adequately monitored and enforced, there would be mixed levels of compliance for any regulation, with those choosing not to comply financially under-cutting those who do.

Not all installers carry out hydraulic balancing as standard when installing a new boiler, even though the Boiler Plus Consultation Response made it clear that this was expected practice[9]. Those not carrying this out were concerned about the time it would add to boiler installations and the impact of this on the consumer (increased cost) and installer business (reduced capacity to take on new jobs). There were also concerns that if not mandated, hydraulic balancing would not be carried out as standard. Some manufacturers recommended strengthening the use of the Benchmark commissioning checklist to support compliance.

Manufacturers noted limited design and installation of low flow heating systems. Key questions regarding setting a minimum standard for flow temperatures focused on whether 55°C would be adequate for houses with older heating systems. Where significant changes would be required to the house (e.g., new radiators), there was concern regarding cost and overall appeal to consumers. There were also concerns that if not pre-set by manufacturers, flow temperatures could be manually changed, leading to issues around compliance.

Consumers, for their part, did not generally think about the heating in their home as a 'heating system' and therefore were not spontaneously considering issues related to radiators as part of their boiler installation.

Based on the findings detailed above, a full reflection of the lessons learnt can be found in Chapter 7.

[9] P16, Boiler Plus Consultation Response

1 Introduction

Background and aims

Boiler Plus policy background and context

Direct CO2 emissions from residential buildings accounted for 15% of the UK's carbon emissions in 2019, with the main source of these emissions coming from the use of natural gas for heating and cooking.

The vast majority of UK homes, over 90%, utilise gas or oil for this purpose [10]. Government policy aimed at maximising the efficiency of domestic heating systems plays a key role in reducing overall UK CO2 emissions, ultimately contributing to the target of net zero by 2050 in accordance with the Climate Change Act[11].

Since 2005, minimum efficiency standards set through the Building Regulations mean that, unless there are exceptional circumstances[12], gas boiler installations must be condensing models[13]. Oil boiler installations were also required to be condensing models from 2007 by similarly raising their minimum efficiency. The requirements for boilers were strengthened in April 2018 with the introduction of the Boiler Plus[14] standards.

Through the Boiler Plus standards, outlined in the consultation response, the aims were to:

- Drive the market for the highest performing boilers, providing clear expectations and standards as to the levels of efficiency required.
- Ensure all households have a reasonable level of choice and control to enable them to achieve comfort and efficiency without increased bills.
- Support manufacturers and installers and facilitate exports by aligning the metric for minimum standards with the European Energy Related Products Directive (ErP).

Boiler Plus requires that time and temperature controls with boiler interlock be fitted whenever a gas and oil boiler are installed in an existing dwelling, and also requires that all newly installed gas boilers must be at least 92% ErP efficient. This did not represent a major step

[10] https://www.gov.uk/government/statistics/english-housing-survey-2018-energy-report
[11] https://www.legislation.gov.uk/ukpga/2008/27/contents
[12] Exceptional circumstances defined in Guide to condensing boiler installation assessment procedure for dwellings, ODPM, 2005
[13] Condensing boilers capture additional heat from the hot gases released from the flue that would otherwise be wasted energy and use it to help heat water. Condensing boilers are therefore more efficient than non-condensing boilers
[14] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/651853/Boiler_Plus_final_policy_and_consultation_response.pdf

change in efficiency, as most boilers already met this standard, however it aimed to ensure that the lowest performing boilers were removed from the market.[15]

When a gas combination boiler[16] is installed, an additional energy efficiency measure (from a list of four) is also required. The requirement is flexible in allowing four different measures such that a choice can be made appropriate to the nature of the building and the needs of the household, reflecting the diversity of housing stock. All technologies/measures are expected to help households to achieve comfort and efficiency without increased bills.[17] The measures were all on the market prior to the introduction of Boiler Plus: as such, the policy aimed to encourage adoption of existing technologies, rather than to drive the development of new technologies.

The four measures are:

Flue gas heat recovery (FGHR) systems

FGHR systems recover heat from waste flue gases to preheat the cold water entering the boiler, lowering the amount of energy needed to warm the water up to the required level. This means that, unlike some heating controls, the effectiveness of FGHR does not depend on householders using it in certain ways or making any sort of adjustments to their behaviour. Actual savings will vary according to actual and relative domestic hot water and space heating demands, the volume of thermal storage and the extent to which space heating and domestic hot water demands overlap. Some FGHR systems are powered by electricity, while others (known as Passive FGHR) are not. As described below, there is some overlap between the other three additional measures as smart controls can include weather and/or load compensation functionality. FGHR systems can therefore be seen as distinct from the other measures.

Load compensation

A load compensator is a device that measures the gap between the internal temperature of the home and what the user wants it to be, and modulates the temperature of the boiler output so that it is just hot enough to provide the extra heat needed. This allows the boiler to operate in condensing mode for more of the time, and thus saves more fuel than just standard time and temperature control.

For example, if the heating has been off all night and the home is cold, the boiler will send warmer water to the radiators. As the home warms up, less heat is needed to keep the rooms warm enough, so the boiler temperature turns down. Load compensation therefore reduces

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15 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/651853/Boiler_Plus_final_policy_and_consultation_response.pdf

16 A combination boiler provides hot water directly at the time that it is required, rather than it being stored in a separate hot water tank or cylinder

17 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/651853/Boiler_Plus_final_policy_and_consultation_response.pdf

fuel consumption and bills, while improving comfort and the longevity of the boiler. The greatest savings will be to those whose bills are currently highest. Load compensation may be included as a function in some smart controls.

Weather compensation

Condensing boilers are most efficient when the central heating system runs at lower temperatures, requiring a return flow temperature below 55°C to operate in condensing mode. Weather compensation interacts intelligently with the boiler to provide just enough heat to keep the home warm, by adjusting the temperature of the boiler output to account for changes in the weather.

For example, if the weather is cold the boiler will send warmer water to the radiators. In warmer weather, less heat is needed to keep the rooms warm enough, so the boiler temperature turns down. Operating at a lower temperature makes the boiler more efficient, which saves fuel without compromising user comfort. Weather compensation is best suited to more thermally efficient properties and relatively constant use of the heating system. Weather compensators can be a simple, inexpensive external sensor feeding weather data back to the boiler. Digital products also offer weather compensation – using weather data from the internet rather than an external sensor – alongside other functions.

Smart controls with optimisation and automation features

Smart thermostats are products that let consumers remotely control their home temperature via a tablet, smartphone or desktop, and allow consumers to do more with their central heating than a typical timer and thermostat. Smart thermostats can be more expensive than basic load compensators or weather compensators, but they have the potential to save more energy. They can offer a wide range of features, including load or weather compensation which would make them compliant with Boiler Plus. Without these, to be a compliant additional measure, a smart control must include:

- **Automation**, where the device automatically controls the heating system output in response to programmed demand or occupancy detection. For example, an advanced smart control can automatically switch off the central heating if it detects the home is empty using the GPS on the users' smartphones.
- **Optimisation** means the device calculates how long it takes the property to reach the desired comfort level (i.e., the temperature on the thermostat), and times the systems operation to minimise the amount of work it has to do. This means the device works out what time it should switch the boiler on so that it gets to the temperature on the thermostat at the chosen time, while using the least amount of energy.

Research aims

The primary purpose of the research is to understand the effects of the Boiler Plus standards, two years after implementation, to inform wider policy thinking. Where possible, market intelligence was gathered on the sales for combination boilers and the technologies included in

Boiler Plus. The Department for Business, Energy and Industrial Strategy (BEIS) has therefore commissioned Ipsos MORI and the Energy Saving Trust to undertake a programme of research to increase understanding of how Boiler Plus standards are being implemented in a real-world setting, and to better explore the impacts of the standards, and the levels of compliance.

This research aimed to:

- Determine levels of compliance with Boiler Plus standards.
- Understand the impact of the standards on manufacturers, installers and consumers.
- Collect views of manufacturers on potential extension of requirement for installation of approved energy saving technologies alongside installation of combination boilers to all boiler types (i.e., extending the requirement from only combination boilers to also include standard boilers).
- Assess views of manufacturers and installers on extension of approved energy saving technologies to include all types of gas boilers and mandating installation practices including hydraulic balancing and setting maximum flow temperatures.

The full list of research questions is included in Appendix A.

Methodology

To answer the key research aims shown above, the study employed inputs from a range of stakeholders, including industry associations, manufacturers, installers and consumers. The work comprised the following main strands:

- Collation and analysis of market data with the aim of understanding whether it was possible to estimate levels of compliance with the standards.[18]
- Qualitative interviews with industry associations, manufacturers and installers to gain more in-depth insight into their views on the Boiler Plus standards , how they are being implemented in the field, and their views on potential future policy areas (e.g., hydraulic balancing and mandating maximum flow temperatures).
- Qualitative interviews with consumers (households with recent boiler installations) to understand their experiences and expectations, and the role of Boiler Plus in their decision making and installation experiences.

More details about these strands are given below. All research was carried out in accordance with the requirements of the international quality standard for Market Research, ISO 20252.

[18] As detailed in the Limitations section, further in this chapter, this strand was subject to significant uncertainties and data gaps that had been identified prior to the commencement of the project. These, along with additional uncertainties and data gaps uncovered during the analysis, are discussed in detail in Chapter 5.

Market data analysis and interviews with industry associations and manufacturers

The analysis of market data to provide estimates of compliance with the standards compromised of multiple strands. Data collected from interviews with industry associations and manufacturers was also used to inform the project more broadly.

Interviews with trade associations

Representatives from three trade associations, providing broad coverage of the sector, were interviewed primarily to gather quantitative market data. The data requested is listed in Appendix B. However, all three offered additional qualitative insight around compliance levels and issues, as well as some of the other research questions. These insights drew on participants' long standing and valuable relationships with many key industry players to provide a considerable contribution to insights about the industry. The following trade associations were recruited through contacts held by Energy Saving Trust, and have agreed to be referenced in this report:

- Heating and Hot Water Industry Council (HHIC), who represent the UK residential supply chain for heating and hot water appliances and installation.
- British Electrotechnical and Allied Manufacturers' Association (BEAMA), the UK trade association for manufacturers and providers of energy infrastructure technologies and systems, including heating controls.
- Chartered Institute of Plumbing and Heating Engineering (CIPHE), the professional body for the plumbing and heating industry in the UK.

Interviews with boiler manufacturers

Nine boiler manufacturers were interviewed to understand their views of Boiler Plus, and to help in establishing sales figures (or estimates thereof) to feed into the assessment of compliance levels.

Manufacturers were identified through contacts held by Energy Saving Trust and from BEIS contacts, and included manufacturers of all sizes representing the majority of the UK's boiler market. These interviews were carried out by telephone and covered:

- Their estimates of sales figures related to Boiler Plus compliance, such as how many combination boilers were sold to existing homes rather than new builds; or how many were sold as compliant packages (such as with built in FHGR or smart controls).
- Whether Boiler Plus has impacted on their sales figures of particular boiler types or the additional measures.
- Modifications they have made to combination, system or regular boilers to facilitate compliance with the standards.

- Their views of extending the combination boiler specific aspects of Boiler Plus to all types of system and regular boilers; of mandating maximum flow temperatures, and of hydraulic balancing.

The manufacturer interview discussion guide is available at Appendix C.

Interviews with heating control manufacturers and FGHR manufacturers

In total 10 interviews were conducted with manufacturers of heating controls and one with a manufacturer of FGHR devices. Once again contacts were sourced by Energy Saving Trust and BEIS, targeting those with the largest market share, with interviews completed by researchers from Energy Saving Trust.

During the interviews, the manufacturers were additionally asked to provide sales data of compliant technologies since the standards were introduced. Several of the manufacturers were members of trade associations already mentioned above, with whom they have existing data sharing arrangements. The potential overlap between different data sources was monitored to ensure totals were added correctly to avoid double counting in the assessment of market data.

Survey of installers

During interviews, one boiler manufacturer offered to survey their database of installers to ask specific questions about compliance routes and levels. The survey was completed online by 327 installers using SurveyMonkey, and the survey sample included a mix of installers loyal to the manufacturer and more occasional customers. The questions were developed by Energy Saving Trust to support the market data analysis. Questions concerned the installation of boilers in existing homes and what Boiler Plus compliant technology the installers typically install alongside the boiler.

This survey was not part of the initial project design, and there was no opportunity to ensure a representative sample or to design out bias[19]. Response and error rates are therefore not available, and the results should be treated with caution. However, in the absence of other information to enable calculations, the results of the installer survey have been used to support the market data analysis, though care is exercised in its use because of the methodological limitations mentioned above. These are discussed further in Chapter 5.

Published literature and datasets

A desk-based search of market data was conducted by the Energy Saving Trust to identify available public datasets and reports: data from these sources was combined with datasets passed on by manufacturers and industry bodies as part of the interviews described above. Where these published sources are used in our calculations they are referenced within the body of the report.

[19] The biases are complex, and specific to particular measures. These are explored in more detail from Page 61 onwards

Calculations and synthesis

Compliance with the minimum boiler efficiency requirement was assessed using data collected by HHIC, the trade body for boiler manufacturers. The boiler interlock and time and temperature control requirements were assessed using data from the survey of installers, cross referenced with sales figures for relevant controls and stock figures for existing compliant systems.

To estimate compliance for the additional measures requirement, the data collected was first used to calculate a baseline figure for the number of relevant boiler installations. Sales data published market assessments, and interviewed participants' views on the importance of alternative compliance routes were used to develop estimates, where possible, for installation numbers for each of the additional measures.

Installer interviews

Twenty qualitative interviews with installers were conducted by Ipsos MORI, covering:

- The impacts of Boiler Plus on the boilers and measures they install, and cost, both trade prices and consumer charges.
- How they have adjusted to the requirements, including any training undertaken and challenges faced.
- How Boiler Plus is presented to consumers, which measures are offered or recommended and why.
- The perceived benefits and drawbacks to maximum flow temperatures and hydraulic balancing; their current practices regarding these approaches; and their views of them becoming mandatory parts of installations.

Interviews were carried out by telephone in Autumn 2020, lasting 45-60 minutes. The installer interview discussion guide is available at Appendix D.

Installers were recruited by specialist qualitative recruitment agency Criteria Fieldwork[20] using free-find methods. All installers interviewed were Gas Safe registered, had at least four years' experience, and carried out installations in England. To ensure a range of installers' views were captured, quotas were set on the region they work in and size of their business, and years' experience and age of installers were monitored so that a spread was interviewed (without hard quotas being set). The achieved sample profile was as follows:

[20] https://www.criteria.co.uk/

Installer Characteristic		Achieved Sample
Company Size	Micro-business (<10 employees)	17
	Small / Medium / Large businesses (10 or more employees)	3
Installer Age	18-34	5
	35-44	9
	45-54	3
	55+	3
Years' experience	Less than 10 years	5
	10-19 years	15
	20+ years	3
Region[21]	North	6
	Midlands	6
	South	6

Consumer interviews

Twelve qualitative interviews with consumers were carried out by Ipsos MORI, focusing on:

- Their motivations and priorities for getting a new boiler and how they chose the installer.
- The range of boilers, if any, they were offered and how they chose, and how this process compares to other major household purchases.

[21] These definitions are based on groupings of the nine regions of England. Specifically: 'North' contains the North East, North West and Yorkshire and the Humber; 'Midlands' contains the East and West Midlands; and 'South' contains the East of England, Greater London , the South East and the South West

- Discussions they had with installers about the Boiler Plus requirements in general, and the four additional measures specifically.
- Their views on the additional measures, including whether they would want to have the choice about whether to have them installed.

The consumer interview discussion guide is available at Appendix E.

Consumers were asked if they consented to taking part in a video interview to allow them to show the interviewer their boiler or materials received and allowed the interviewer to build a 'timeline' of the installation and share this with the participants on screen. Two consumers took part in such video interviews with the remainder taking place by telephone. Interviews lasted approximately 60 minutes.

Consumers were recruited by specialist qualitative recruitment agency Criteria Fieldwork using free-find methods. All consumers selected for interview had their boiler replaced in the previous three months to maximise recall of the process. Additionally, they were screened to ensure relevance to the Boiler Plus requirements (the replacement was a combination boiler and not in a new build property). To ensure a range of consumers' views were captured, quotas were set on participant gender, age, socioeconomic group and region. The achieved sample profile was as follows:

Consumer characteristic	Achieved sample	Consumer characteristic
Gender	Male	5
	Female	7
Age	18-34 years	4
	35-64 years	5
	65+ years	3
Social Grade[22]	ABC1	8
	C2DE	4

[22] Social grade is a widely used demographic classification, originally developed for the National Readership survey, that is based on the occupation of the Chief Income Earner, including the qualifications they hold and the number of people they are responsible for. Grades ABC1 include those in managerial, administrative, professional, supervisory or clerical roles; grades C2DE include manual and casual workers, and those not in work. Further information is available at http://www.nrs.co.uk/nrs-print/lifestyle-and-classification-data/social-grade/

Consumer characteristic	Achieved sample	Consumer characteristic
Region	North	4
	Midlands	4
	South	4

Consumer focus groups

Two online consumer focus groups were carried out that built on the emerging findings from installer and consumer interviews. These focus groups aimed to extend the sample of consumers included in the research, and to encourage discussions about heating more broadly and potential impacts for new policy. These discussions covered:

- Their motivations and priorities for getting a new boiler, installer selection, the make and model of the boiler and additional measures offered and how they chose, and awareness of the Boiler Plus requirements for combination boilers (similar coverage to the in-depth interviews).
- Awareness and experiences of smart controls, including discussions with installers about the controls, whether they are installed, perceived benefits and barriers to use, and how households who have smart controls use them.
- Participants' maintenance of their heating systems, including when radiators were last upgraded, how they are used/controlled, the extent to which radiators are serviced by professionals or consumers, perceived efficiency of their system, and the links made in consumers' mind between their boiler and their radiators.

The consumer focus group discussion guide is available at Appendix F.

The focus groups were video enabled, carried out using Microsoft Teams, and lasted for 90 minutes each. Each group contained six participants: all were recruited based on having had a replacement combination boiler installed within the previous three months. Recruits were selected to include a range of demographic groups and experiences. Recruitment was completed by Criteria Fieldwork using free-find methods.

Qualitative analysis

All sessions were recorded with consent from the participants and detailed notes taken by researchers following the interviews and group discussions. A framework for the analysis of each set of interviews and the focus groups was developed based on the respective research

discussion guides. These frameworks enabled a thorough thematic analysis for each audience, with the research team looking for themes and patterns across the data. This analysis was supported by iterative research team discussions, which facilitated the triangulation of key themes between the various interview strands.

This report

Context

This report presents:

- Insight into Boiler Plus compliance levels, including consideration of the various routes to compliance and an assessment of the data gaps limiting accurate compliance estimation. This work draws on the limited market data available, supplemented by a survey of installers, and interviews with relevant trade bodies and other stakeholders.
- The impacts of Boiler Plus on manufacturers, installers and consumers based on qualitative research with these audiences, as well as their views of possible extensions (mandatory hydraulic balancing and mandated maximum flow temperatures).
- Lessons learned from this research for how BEIS can use policy tools to support households in improving the energy efficiency of their heating systems.
- The findings detailed in the report bring together specific participant comments, details from the market analysis and research team observations. They do not represent the opinions of BEIS, or indicate future government policy.

Limitations

The following limitations should be taken into consideration when reading this report:

- **Uncertainties and gaps in market data analysis**: while this strand draws on a range of data sources in considering compliance levels, all estimates are subject to several uncertainties and data gaps, as had been identified from the outset of the research. These are set out in detail in Chapter 5 of this report.
- **Consumer recall of their installation**: to maximise their recall of the process, consumers were only included in the research if their installation had taken place within the last three months. Consumers had good recall of their motivations, installer selection process and boiler priorities, as well as the broad discussions they had with installers. However, most consumers did not recall discussions of more technical aspects such as the specific boiler models they were offered, or the additional measures. It is not possible to discern if such discussions did not take place, or if they did but consumers have not recalled them.
- **Self-selection and social desirability biases among installers**: the research team explained to installers at all stages of recruitment and during the interview that they are

independent of BEIS; that the research was not a compliance check; and that personal data would not be shared beyond the research team. Nevertheless, it is possible that installers that do not always comply with the Building Regulations would be less willing to take part in this research (self-selection bias), or that they did take part but did not describe their own non-compliance (social desirability bias). As such, the qualitative research may have missed the views and practices of non-compliant installers.

- **The qualitative nature of the findings**: other than the estimates of compliance in chapter 5, this report is based on qualitative data. This means that it does not aim to provide a quantified, representative picture of the impacts of Boiler Plus or views of future policies that can be generalised to the relevant populations (for example, of boiler installers). Rather, it explores the range of experiences and views, and the reasons these are held. Where appropriate, the report refers to whether a view was a consensus, mixed, or held by a small minority. Verbatim quotes are included throughout the report to illustrate particular views and experiences.

2 Manufacturer views of Boiler Plus

Chapter summary

This chapter details findings from qualitative interviews with manufacturers of boilers and the additional technologies. It explores the impacts of Boiler Plus on boiler manufacturers in terms of the types of boilers they sell, and on the sales volumes of the additional measures for all manufacturers. This chapter also discusses challenges they faced meeting the standards, and their views on how they might benefit consumers, as well as unintended consequences.

Key findings:

- There were mixed views on the extent to which Boiler Plus has impacted manufacturers. Some found the scheme to be a minor administrative obligation, whereas others were required to launch new products to meet the requirements.
- The requirements had limited impact on the boilers themselves, although some manufacturers had made adjustments to meet the 92% ErP efficiency criterion.
- Since Boiler Plus was introduced, sales of smart controls have increased significantly, although some manufacturers felt this was part of a wider trend in the market rather than being driven by Boiler Plus specifically.
- Manufacturers who sell compensators reported an increase in sales of load compensators and – to a lesser extent – weather compensators. However, they generally agreed Boiler Plus has had limited impact on the sales of FGHR systems due to the higher cost of an FGHR unit.
- Boiler Plus was seen as benefitting consumers by promoting the correct use of boilers and increasing efficiency to yield both cost savings and improved comfort. Some manufacturers also felt consumers benefitted from the additional control functionality that results from Boiler Plus.
- Where negative views towards Boiler Plus were cited, these tended to focus on the potential for non-compliance. Concerns focused on lack of monitoring and the potential availability of cheaper non-compliant products, or the lack of guidance or incentives to choose the most appropriate additional measure to maximise efficiency gains.

While the views in this section are from the manufacturers participating, additional explanatory notes have been added by the research team at points to clarify the significance of the

comments. These have been labelled appropriately to distinguish them from the participant responses.

Impact on product sales

Impacts on boilers and additional measures sold

It was widely agreed that sales of boilers were not greatly impacted by the scheme because boilers generally met the minimum 92% ErP efficiency requirement already.

> *"Boilers not at all, they still buy the boiler they were buying before Boiler Plus came about." (Manufacturer)*

However, in some cases, boiler manufacturers had to discontinue their older, less efficient products that could not meet the new minimum 92% ErP efficiency standard. This had led to an improvement in the efficiency of these manufacturers' product stock.

> *"Some of the models in that rank didn't meet the 92%, they were 91 or 90. So we had to effectively end one of the boiler platforms early and move to one of the newer ones, but in the grand scheme of things it's not a big problem." (Manufacturer)*

Furthermore, manufacturers that already sold Boiler Plus compliant packages prior to the standards coming into force did not notice an impact on product sales.

> *"We haven't actually seen a huge shift in what controllers people are buying. Because what we had before was already Boiler Plus compliant." (Manufacturer)*

However, impacts were reported on sales of the four additional measures. A few manufacturers reported that the most noticeable impact of Boiler Plus was a shift in overall sales from mechanical controls and time clocks, to controls which fulfil the Boiler Plus additional measures requirement (though some questioned the causality – see Smart Controls below).

> *"We do sell the more traditional mechanical thermostats and time clocks. And we've seen the sales of those in remission because people are moving to the more intelligent controls [such as] smart control or have [those with] compensation functions-built in." (Manufacturer)*

The impacts of Boiler Plus on each of the additional measures is discussed below.

- **Smart controls**: Manufacturers had seen an "*exponential*" increase in sales of smart controls in the last couple of years, though they felt that this was because of a general growth trend in technology due to consumer demand for smart products, rather than

specifically being driven by Boiler Plus. Several mentioned selling controls that are smart but also incorporated some compensation functionality.

"I would say that it's difficult to see that Boiler Plus has been the reason for the increase in sales of smart controls, because there's probably a number of things feeding into that." (Manufacturer)

- **Load compensation**: Those manufacturers already selling load compensators had observed an increase in sales of this additional measure since Boiler Plus was introduced. Although manufacturers who have load compensators in their product ranges, either as a stand-alone product, or as part of a smart control, saw an increase in sales of load compensation, not many stated they offered it, and none had started selling them as a result of Boiler Plus.
- **Weather compensation:** Several manufacturers observed an increase in sales of weather compensators following the roll out of Boiler Plus. It was widely believed that this was because weather compensators were a cost-effective way of meeting the requirements. However, other additional measures had been more popular. While sales of both types of compensator had increased, the increase had been greater for load compensation.

  "Initially there was some interest in weather compensation controls, and there still is. We probably sell 5000 more [per] year than we were selling before." (Manufacturer)

- **Flue Gas Heat Recovery (FGHR):** Boiler manufacturers who sold boilers with built in FGHR and FGHR manufacturers generally agreed that Boiler Plus has had limited impact on sales of FGHR systems. Any increases in sales, particularly in the form of boilers with built in FGHR, were largely seen as being driven by new build installations and therefore unrelated to Boiler Plus. Some suggested that the limited impact of Boiler Plus on FGHR could be a result of FGHR being more expensive when compared to the other additional measures.

  "I'd be really surprised if an installer has gone to the expense of fitting a flue gas heat recovery unit to comply with Boiler Plus." (Manufacturer)

One manufacturer questioned the reasoning behind allowing a choice between additional measures, arguing that they are all complementary in operation and so should all be mandated.

Challenges faced in meeting the new standards

There were mixed experiences amongst manufacturers of implementing the requirements. Some reflected that they had not experienced significant challenges in complying with the scheme themselves, due to the existing availability of compliant products, along with the advanced notice of the requirements that they were given.

However, some boiler manufacturers had to make some changes to meet the minimum ErP efficiency of 92%. These participants reported that they had needed to upgrade products and as a result there were implications to their business. These manufacturers varied in their views as to the severity of this challenge. Some felt the impact was minor because they were able to redevelop existing models with additional functionality, taking only a few months. Others felt the impact was considerable because they had to relaunch all aspects of the product including packaging, labelling and online tools, which resulted in considerable expense to the businesses.

It should be noted that impacts on packaging and labelling are likely to be due to Ecodesign[23] and Energy Labelling requirements[24] rather than from Boiler Plus. Under these requirements, boiler manufacturers are required to provide technical data on boiler performance as well as providing consumer facing energy labels, and some of the reported challenges may have related to this. However, even those that said they were impacted by meeting the Boiler Plus ErP efficiency requirement acknowledged its benefits in terms of increasing minimum boiler efficiency.

> *"From a consumer perspective it [the increase in minimum efficiency] is fantastic. And we of course will continue to push this message." (Manufacturer)*

While there were limited challenges in implementing the requirements, manufacturers mentioned two key challenges faced by the scheme itself in terms of achieving its objectives. Some felt that awareness of the scheme with installers and consumers has remained low, limiting implementation and effectiveness. Others described the lack of any mechanisms for monitoring and enforcing compliance as a key issue, particularly for the additional measures requirement.

> *"Because there is no method to register which method they have chosen to meet the boiler plus regulations there is no way of knowing which is the chosen technology, which one is being deployed on mass. Traceability after the event is the issue." (Manufacturer)*

In particular, it was felt that lack of monitoring and enforcement could be enabling the installation of cheaper, non-compliant versions of the additional measures that are available on the market (for example by purchasing from countries with less stringent standards) and still being sold to householders, with no way of monitoring or eliminating these sales.

Wider impacts of Boiler Plus

Many boiler manufacturers felt that Boiler Plus brought about **benefits to the consumer.** These manufacturers believe that as well as increasing the efficiency of condensing boilers,

[23] https://www.legislation.gov.uk/eur/2013/813/contents
[24] https://www.legislation.gov.uk/eur/2013/811

the scheme promotes good practice amongst boiler installers, such as correct sizing and balancing of boilers and radiators, and better controls. However, it should be noted that the installers interviewed as part of this research did not identify such benefits themselves, indicating a potential disconnect between manufacturer and installer views on this potential benefit.

In combination, manufacturers felt these improvements help consumers benefit from cost savings and improved thermal comfort, thus giving greater value for money. Manufacturers felt that both their businesses, and their customers, benefitted from the system improvements enabling optimum operation of the boiler in line with its warranty.

> *"I think it is giving homeowners true value for money…We often hear that homeowners, who are replacing an older boiler with a new one with weather compensation, can save in the region of 30% on their running costs." (Manufacturer)*

Some manufacturers thought that Boiler Plus was making the market more accessible to the consumer and encouraging them to engage with additional control functionality other than simply turning boilers on and off.

> *"An indirect benefit is that consumers are aware of the additional controls and it's working well for consumers, which I guess then reflects on you as a business." (Manufacturer)*

However, as described in Chapter 4 of this report, consumers themselves did not tend to highlight these benefits.

Manufacturers also reflected on their **engagement with installers**. They reported that they had been encouraged by installers to produce their own set of communication materials about the regulation and Boiler Plus compliance. These were distributed through the manufacturers' media channels and websites, increasing engagement with installers and even consumers.

> *"It actually also helps our sales team engage installers on system design. And have more of a discussion about how a boiler should be installed." (Manufacturer)*

In addition, manufacturers noted that they had been able to incorporate the scheme into existing training schemes for installers.

Looking forward, some manufacturers saw benefits of the scheme in the context of **future low carbon heating policies**. Boiler Plus was seen as providing an interim opportunity to save energy prior to the roll out of heat pumps in future. In addition, some manufacturers thought that raised awareness of weather and load compensators has already increased market and householder readiness for future low flow temperature systems such as heat pumps.

Unintended consequences

Some manufacturers had experienced only positive impacts of the scheme, such as improved engagement with installers, as mentioned above, and reported no unintended consequences. However, there were a number of negative impacts of the scheme raised by other manufacturers.

One issue mentioned by several boiler manufacturers was consumer acceptance of lower temperature radiators, as a result of weather or load compensators. (Explanatory note: When a weather or load compensator is operating correctly, it reduces the flow temperature and hence the temperature of the radiators, but only at times when this can be done while still maintaining the required room temperature.) Householders were reported as complaining about the cooler radiators, in the belief that the room itself was now cooler. This resulted in manufacturers reporting complaints from consumers, both to themselves and to the installer.

> *"An end user now has a weather sensor fitted to their new boiler installation and we had certain people complain that the radiators aren't as hot as they're expecting them to be" (Manufacturer)*

However, it should be noted that installers themselves did not report consumer complaints related to lower flow temperatures as a result of compensators being fitted.

A further unintended consequence mentioned was that of householders being driven to compliant products by brand recognition, rather than appreciation of suitability or potential efficiency gains, while others are opting for the cheapest option and sometimes getting a non-compliant installation as a result.

> *"There still are homeowners now that are being sold non-compliant systems. And it really depends on the brand there." (Manufacturer)*

Some boiler manufacturers expressed concern over the use of Time Proportional and Integral (TPI) controls, described by some as 'fake load compensators', particularly in the early days of the Boiler Plus scheme when definitions of compliant systems were less clearly understood. (Explanatory note - TPI controls modulate the output of a boiler by turning it on and off repeatedly, whereas a full load compensator "speaks" to the boiler and so adjusts the boiler thermostat to modulate the output). Manufacturers noted that the effect can be similar, but TPI controls were claimed by participants not to realise the same efficiency benefits, and to shorten the life expectancy of the boiler.

> *"We were quite concerned that with this sort of 'fake load compensation' it's something we'd like to see closed out in any future update or full revision [of Boiler Plus." (Manufacturer)*

3 Installer views of Boiler Plus

Chapter summary

This chapter details findings from qualitative interviews with installers. It explores awareness of Boiler Plus, related adjustments made to installer businesses, impacts on discussions with consumers, the challenges facing the implementation of the requirements and installers' perceptions of the impact on installation prices.

Key findings:

- Installers had a broad awareness of Boiler Plus although not all had detailed knowledge of all of the requirements.
- When the standards were first introduced, information regarding the Boiler Plus requirements had come from a range of information sources and training sessions, such as Gas Safe technical bulletins, industry magazines, training sessions from manufacturers, and word of mouth from other installers.
- Installers noted that since the introduction of Boiler Plus, all boilers they offer to consumers now meet the 92% ErP efficiency requirement. Some also noted that manufacturers no longer offer boilers with an ErP efficiency below 92%.
- Aside from the need to meet the new minimum efficiency requirement, factors determining installers' choice of boiler had not changed following the introduction of Boiler Plus. Consideration of customer circumstances (e.g., budget) and the installer's preferred brand(s) still played key roles in this decision.
- Installers tended to focus on one additional measure and install this as standard: in many cases installing smart controls. Smart controls were often favoured by installers due to their relatively low cost, ease of installation, and the ability for installers to offer more or less complex versions depending on the budget, needs and digital literacy of the consumer. Some installers also noted that it was easier to explain the benefits of this technology when compared to other additional measures. Additionally, installers reported that some customers make a specific request for smart controls, for example because they had a friend or family member who already owned a particular model, which is rarely the case for the other measures.
- Overall, there were mixed levels of knowledge of FGHR, load compensation and weather compensation. Participants installing these were particularly positive about them when provided built-into a boiler, but installers not installing these often perceived them to be technically complex.

- Boiler Plus combination boiler requirements were not discussed with consumers where the installer perceived limited consumer interest in this (e.g., they perceived consumer focus was on a quick replacement within their budget). The requirements were more likely to be discussed where the installer provided a choice of measure, where consumers had carried out their own research leading to relevant questions, or when providing rationale for installation costs.
- Installers largely agreed that the implementation of Boiler Plus had increased the cost of installation for consumers referencing: the cost of additional measures; rising cost of compliant boilers; and cost of additional labour time (which was often time spent explaining smart controls).

Awareness of Boiler Plus

Familiarity with the requirements

Installers were largely familiar with Boiler Plus. Most described Boiler Plus as a set of recently introduced regulations with the intention of increasing the efficiency of new boilers. While some provided a detailed overview of all four additional measures, others had only partial knowledge of the standards. For example, some were not aware of all the four additional measures or were unaware of the requirement for an efficiency rating of at least 92% ErP. Others were not aware of the term Boiler Plus itself but were familiar with the requirements. Installers with less detailed knowledge explained that they had only familiarised themselves with new standards to the extent that would be necessary to do their job.

> *"I wouldn't say I know everything about Boiler Plus [but I] know enough to do my work and comply with Building Regulations." (Installer, North)*

In practice, this meant learning only about one or two of the additional measures (and using only these measures on all subsequent installations). Across the interviews, installers displayed a high degree of awareness of smart controls, though not necessarily of the specifics around automation and optimisation, of which degree of understanding varied. Levels of awareness of the other additional measures was more varied. Among the aware, some were already installing the additional measures before the standards were introduced, while others had made it their business to learn more about them to ensure compliance.

Participants varied in how / where they first heard about the Boiler Plus standards. Some spoke of the newsletters (including e-newsletters) sent by Gas Safe, other regulatory bodies, manufacturers, and British Gas, as well as the technical bulletins sent out by Gas Safe. Others first came across them at training sessions (organised by manufacturers and British Gas), through conversations with their peers in the industry, or through various online sources.

Relevant training

Participants frequently reported having received training on the new standards. Those who work (or had previously worked) for larger companies were offered training through their employer - for some this was the first time they had been made aware of Boiler Plus. For sole traders or those in smaller businesses, experiences varied: some had attended training organised through large companies to which they had been subcontracted, while others had attended training organised by manufacturers. Training sessions were either held in person or over the internet in a seminar format.

The installers felt the comprehensiveness of the information provided via training was varied. Sessions organised by large organisations such as British Gas, which were designed to cover Boiler Plus, had provided installers with a detailed overview of the requirements and how to comply, including guidance regarding which additional measure would be appropriate in various scenarios. In contrast, training sessions organised by manufacturers regarding correct installation of their products (which participants noted they were sometimes required to attend for warranty reasons) were not designed specifically to cover Boiler Plus requirements and were therefore felt to be less comprehensive.

> *"[At the manufacturer's course] we took a look inside boilers, stripped them down and looked at each component to see how it worked. They should have gone into Boiler Plus a lot more, but I guess that wasn't really the courses main aim" (Installer, North)*

A number of participants had not received any training in the requirements. For some this was simply a personal preference; they felt that the information obtained through other sources, such as industry magazines or newsletters, was sufficient for them to ensure compliance on future installations, and others mentioned lack of time as a barrier to attendance. Others were not aware that training sessions were available; some would have liked to attend training session if they had been aware of such opportunities.

Other information sources

Participants had obtained information about Boiler Plus standards from a range of sources. Some were first informed by industry magazines or newsletters/online newsletters, including those from Gas Safe. Boiler manufacturers and merchants were also mentioned as information sources: either through magazines/newsletters, or through marketing events/ trade shows, or updates about their new products in which additional instruction was provided regarding the correct installation of new boilers to ensure compliance. Many installers sought out further information after initially hearing of the introduction of a new standards. They did this by consulting their peers within the industry, looking up information online, or seeking information from the plumbers' merchants that supply them with boilers and other central heating parts.

Not all installers felt that the information they had obtained through the avenues noted above was adequate at the time the new standards were introduced. Though participants stated that

they were sufficiently knowledgeable at the time of interview to ensure compliance on their installations, some had experienced initial confusion. For example, when Boiler Plus was first introduced in 2018, it was not clear to all participating installers that when installing combination boilers only one of the four additional measures was necessary to ensure compliance. Some participants reported difficulties understanding how to install and set up some of the new technologies. This had initially led some to seek out further information through colleagues or online. Even at the time of interview, many installers said they were not as familiar as they would like to be with the Boiler Plus standards, or with all four of the additional measures - beyond the one or two which they usually installed.

Adjustments to installer businesses

Boilers offered to consumers

Participants reported that when carrying out boiler installations they tended to favour a small number of brands based on their knowledge and experience, though they varied with regard to which brand(s) they preferred. Overall, the introduction of the Boiler Plus standards had not impacted on installers' preferred choice of boiler brand(s) and most participants continued to favour the same brand(s) as previously. Participants explained that they felt confident that their preferred brand(s) would keep up to date with regulatory requirements with regard to the required 92% ErP minimum efficiency rating.

The Boiler Plus requirements had also resulted in little change in the approach that installers took to identifying appropriate boilers for consumers. They noted that the primary decision-making factors continued to be consumer budget and individual circumstances (e.g., the need to install a boiler quickly and have it fit into the space available).

> *"I can't say our job has been that different. The requirement is only one out of the four [measures], and we've always fitted new controls on boilers. So it hasn't changed our job that much". (Installer, North)*

Participants were divided between those who said that all their preferred models of boiler had already met the 92% ErP minimum efficiency rating prior to the introduction of Boiler Plus and those who said that many of the boilers they installed had not previously met this benchmark. Whilst some participants in the latter category did not have much awareness of ErP ratings prior to the new requirements, they felt that all boilers installed since the introduction of the requirements were compliant because all major manufacturers now exclusively offered boilers that are fully compliant.

Additional measures offered to consumers

Across participants there were mixed experiences of installing the additional combination boiler measures prior to the introduction of Boiler Plus. With the introduction of the standards, participants all had a solid understanding of at least one of the four additional measures (the

minimum required to ensure compliance). In general, installers tended to be aware of and stick to installing one type of measure (usually smart controls). There was typically mixed knowledge of the other additional measures, beyond their usual choice. However, a small number of participants said they did make a choice of additional measure depending on the consumer's circumstances on a case-by-case basis, and a few said they installed more than one measure as standard.

Installer views towards each of the four additional measures are discussed below.

Smart controls

Across the four additional measures, smart controls were the preferred option for installers. All installers interviewed said they had set up smart controls on at least some of their new installations (making it the only one of the four supporting measures which had been universally adopted by installers across this research). Many reported that they installed these for all new boilers, and where installers had just one preferred measure they tended to install, this was by far the most popular option.

> *"People aren't into the other [measures], they just want the gadgets. If they can pull their phone out and can change the temperature, that's more appealing." (Installer, Midlands)*

Participants spoke positively of the relative ease of installation when compared with the other options and the relatively low installation cost, both for consumer and installer.

A further interviewee reported upside to this technology was the variety of options available, as installers were able to offer a range of systems to suit a variety of consumer budgets and/or options based on the perceived degree of digital literacy, as some smart controls monitor and learn preferences whereas others rely on manual input[25]. However, digital literacy of consumers raised some challenges around smart control installation (discussed later).

Installers also found smart controls relatively easy to install, though ease of installation depended on the make/model of boiler and smart control. 'Plug and play' systems were noted as especially easy to install, while OpenTherm was cited by some as a cheaper option for those with lower budgets.

It was also noted by installers that out of the four Boiler Plus measures, smart controls were the only measure that customers tended to be aware of and regularly requested when asking for a quotation.

25 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718569/Boiler_Plus_Factsheet_v3.pdf

Flue Gas Heat Recovery (FGHR)

There was significant variation between installers levels of knowledge of FGHR. Some were not at all familiar with the technology and had never installed it.

Some of those familiar with FGHR but not installing it regularly said that they were not always aware whether the boilers they were installing had built-in FGHR, whereas the fact that FGHR is built-in to preferred models was mentioned as the main reason for installation by those who did install it regularly. These installers noted that the frequency with which they installed FGHR systems had increased greatly since Boiler Plus came into force. These installers also noted that they sometimes installed a further additional measure.

Across those familiar with FGHR, there was agreement that when this system is not built into the boiler by the manufacturer, it is excessively expensive and cumbersome to install, requiring a greater degree of technical knowledge, additional work for the installer and space in the consumer's home when compared to other Boiler Plus additional measures. Participants offering this option also reported that consumers tended to reject it due to the device's higher cost.

Load compensation

A few participants had been installing this measure on almost all installations since Boiler Plus came into force; they viewed it positively as a relatively inexpensive addition to a boiler installation. They also noted that it is often built into boilers and is easy to integrate with compatible smart controls. Taken together, this makes the installation straightforward from the installer's perspective and useful from the consumer's perspective.

Those with little awareness of technology said that not enough information about load compensators was available and expressed a desire to learn more about this technology and its benefits.

Weather Compensation

Levels of awareness and understanding of this technology were limited. For example, one participant felt that a key benefit of this technology was the prevention of frozen pipes when the home is left unoccupied for long periods of time in the winter, though it can be complicated to fit an external sensor to the roof of the home. While frost prevention could be a potential benefit to the consumer, it is not the primary purpose of a weather compensator. The small number who were fitting weather compensators said they did this alongside other measures, in particular for boiler installations in homes with exposure to the elements. Across the research few installers were aware that some types of weather compensator (namely those that retrieve weather information from the internet) do not require the fitting of an external sensor, though a few said, with some uncertainty, that they thought certain brands of smart control monitor the outside temperature.

Impacts on discussions with consumers

Installers observed that the nature and content of the discussions they had with consumers prior to installation varied depending on consumer concerns and priorities. Different installers took different approaches to these conversations, varying in the degree of technical detail that they provided, and the extent to which they discussed the Boiler Plus requirements (if at all).

Installers commented that a large proportion of consumers did not wish to receive detailed technical or legal information about their new boiler. In these cases, installers felt that consumers trust them to make the right decision and show little interest in the technology or other requirements. For these consumers, the primary concerns were to have the new system operational, within a reasonable budget, in a suitable time, and in an appropriate location (often focusing on the boiler fitting in to the space the previous boiler had occupied). In these cases, the installer avoided mentioning government requirement altogether.

> *"You see their eyes fogging over and they go 'Oh this is all a bit too much for me, just do what you think is best' and you get on with it."(Installer, East of England)*

Consumers themselves agreed with this, demonstrating very little appetite to understand the minimum requirements, as described in the next Chapter. Installers noted that they did make consumers aware of Boiler Plus in the following situations:

- **Where the installer was keen to make the consumer aware of the additional measure requirements**. This is especially true of installers who provided consumers with a choice of additional measures, where an overview of Boiler Plus framed their conversations concerning which additional measure(s) to install. Some installers said that they mentioned government requirements without mentioning Boiler Plus explicitly, preferring instead to explain that the boiler must meet a certain standard of efficiency to meet existing requirements, though they do so more often since the introduction of Boiler Plus.
- **Where consumers had undertaken their own research leading to relevant questions.** Many installers observed that a growing number of consumers now undertake their own research prior to requesting a quote. Installers noted that through research, consumers may already be aware of Boiler Plus when they approached the installer, though this happens infrequently. Where consumers had undertaken their own research, a more detailed discussion of government requirements and technical details may follow, especially where consumers made requests for a specific set of smart controls or a specific model of boiler. Installers observed that age frequently correlated with the level of interest a consumer displayed with younger consumers more likely to search for information online and take greater interest in the details than many older consumers, for example, asking questions about the functionality of smart controls.
- **When explaining the installation cost**. A number of installers stated that when speaking to consumers who wished to keep the cost as low as possible (often the case

for landlords in particular), a discussion of Boiler Plus is necessary to justify the increased cost of the installation. Given these concerns about cost, installers explained that the additional measure(s), which increased the cost of the installation, were legally required, and could not be omitted.

"When I'm changing the boiler, I'll say 'I need to put some new controls in'. They say 'I've got that clock, the thermostat, why can't I just use those' and I'll explain that it's legislation now, I've got to do it.... Google Boiler Plus and it will explain there what it is. I'm not trying to fleece you for money, it's work that I have to do" (Installer, North)

- Some installers approached such situations without mentioning legal obligations, instead emphasising the benefits of having the extra measure, whether in terms of long-term cost or consumer convenience.

Challenges faced in implementing Boiler Plus

Two key challenges of implementing the Boiler Plus requirements emerged across the installers who participated: technical challenges related to installing additional measures, and challenges related to engaging consumers in these.

Technical challenges

The perceived complexity involved in installing separate FGHR systems or weather compensators was cited as a key factor behind many installers' preference for other additional measures. Installers explained that weather compensators can require complex wiring which adds an extra hour or two to the installation time and installing external FGHR systems could mean finding a new location for the boiler, adding further complexity and cost.

"For heat recovery and compensators, the engineer would have to be quite savvy with electrics, you need to read the manuals and make sure it's set up properly, you might have to ring the manufacturer to check you've done it right" (Installer, Southeast)

With this in mind, many installers chose to install smart controls to meet the Boiler Plus requirements and reflected that such installations do not impose a significant technical burden on them.

Some stated that the installation may take a little longer than before due to the need to install an additional measure. However, they also spoke positively of recent improvements in smart control technology, including the increasing availability of 'plug and play' smart control systems which removed the need for wiring.

"Boiler Plus hasn't made fittings take that much longer to be honest. A lot of the smart controls are wireless and easy to fit. Half an hour maximum." (Installer, North)

Although installers did not comment that lack of understanding or knowledge gaps were impacting their ability to comply with the Boiler Plus standards, not all installers were aware of or felt confident in the technical requirements for installing all Boiler Plus additional measures as with the aforementioned more technical measures FGHR and weather compensators.

This suggests that technical knowledge plays a role in limiting the types of measures considered or installed by installers to ensure compliance, although to some extent this could be mitigated by the training sessions described earlier in this chapter.

Consumer engagement challenges

During the installer research, two key challenges related to consumer engagement emerged: the cost of additional measures, and complexity of using smart controls.

Explaining the cost of additional measures

As discussed, installers commented that many consumers were price sensitive, particularly landlords, and cost sensitivity was a key driver in their decision to meet the Boiler Plus requirements by installing smart controls. In addition, installers felt the cost of boilers had increased with the need to meet the minimum efficiency requirement of 92% ErP. When consumers asked about specific costs, installers said they explained that the newer boilers meet a higher efficiency standard than previous models and stressed that the extra cost would be outweighed by reductions in energy bills.

Explaining smart controls

Installers observed that many consumers, especially older consumers, needed to have the workings of the smart thermostat demonstrated to them, and some also asked the installer to download the relevant app onto their smartphone and set up a user account for them (depending on the type of smart control installed). Installers were mitigating these challenges by installing more basic (and generally cheaper) smart controls that are easier to operate and come with fewer customisation options than the more upmarket options, or dedicating time to explain controls to consumers (often taking a further hour or so). Some installers reported that this extra time had increased the cost they charge to consumers, while others said the extra time had not impacted cost. The potential for consumer call-backs was also mentioned, with one participant explaining that some consumers called back when their smart control battery had run out concerned that it was related to an issue with their boiler.

Impact on price

Installers largely agreed that the implementation of Boiler Plus had increased the cost of installation. The increased cost arose from a few related factors:

The cost of additional measures

The exact price of the additional measures varies significantly depending on the measure, and installers usually passed these costs directly on to the consumer. Installers noted that most smart thermostats can range from £50-£200, but a FGHR system could cost several hundred pounds. Lower costs frequently drove installer preferences for smart controls over other measures.

The cost of the boiler itself

Some installers felt that the boilers themselves are more expensive, but explained that this is part of an ongoing trend for boilers to increase in price as technology improves. The cost of the boiler varies by make and model, so some installers said they offered consumers a range of options appropriate for different budgets. Others tended to encourage consumers to purchase a more expensive boiler because, in their view, they are more reliable and last longer. Installing a more reliable boiler with greater longevity was seen to benefit the consumer and installer, decreasing the likelihood of the consumer complaining of a faulty boiler shortly after installation.

The cost of additional labour

Some installers reported that newer systems take less time to install than the old ones (in spite of the requirement to install the additional measures). In these cases, no increase or decrease in the cost of the labour was reported as these installers were already regularly installing smart controls as part of domestic boiler installations before Boiler Plus. Those who did not frequently install any additional measures prior to Boiler Plus felt that installations do now take longer primarily due to the length of time required for the installation itself, but in some cases also because of the time required to explain the smart controls to the consumer, which was not always charged for.

4 Experience of consumers

Chapter summary

This chapter details findings from interviews and two focus groups with consumers. It explores consumer experiences of getting a new boiler, their awareness of Boiler Plus requirements and their appetite for choice over boilers and additional measures.

Key findings:

- Consumers typically replaced their boilers either due to dilapidation or as part of home renovations.
- Consumers' priorities for replacement boilers included: the upfront cost (to consumer budget); availability for the boiler for those with no working boiler until their replacement arrived; the ability to site the boiler in a particular space (e.g. where the previous boiler had fitted); and ensuring that the boiler was powerful enough for the house. Whilst those replacing old boilers anticipated that a new boiler will be more energy efficient, wider motivations for boiler choice around energy efficiency were not spontaneously cited.
- Word of mouth and recommendation from friends, family and neighbours played a key role in sourcing an installer. Whilst some consumers obtained multiple quotes, few carried out research to inform their choice of installer, boiler or any additional measures.
- Consumers did not recall being informed of Boiler Plus requirements by their installer. Once prompted on the additional measures, participants recognised smart controls. Prompted awareness of the other additional measures was very low.
- There were mixed experiences of being given a range of boilers to choose from. Where choice was provided this tended to focus on a range of prices and brands. Warranty length was also discussed. Consumers had very limited interest in having a choice of boiler, trusting the installer to make the appropriate recommendations.
- There was very little evidence from consumers that they were provided with choice of additional measures beyond smart controls (which were sometimes actively requested by the consumer). Whilst smart controls were often the easiest measure for consumers to understand and engage with, those who currently had these, reported mixed use, often using them as they would a traditional 'on/ off' thermostat, rather than making use of their functionality.
- Consumers found other measures complex to understand. They were most likely to be interested if these other measures were presented with tangible benefits including

cost savings. There was very limited appeal in technical aspects of these. Whilst keen to know the cost implications of additional measures, some consumers reflected that any additional cost could be off-putting.

Getting a new boiler

Drivers of decision to get a boiler replaced and priorities for replacement

Consumers cited a range of factors driving their decision to get their boiler replaced. These drivers tended to inform their priorities for the replacement boiler and often their engagement in the decision.

Boilers are generally distress purchases: the most recent BEIS public attitudes tracker found that more than half of adults in the UK (55%) would only replace their heating system when the current one breaks down or deteriorates.[26] This research similarly found that most consumers replaced their boiler due to problems with the existing one; most of these consumers had already paid for repairs several times for a boiler often described as being "*on its last legs*". It was therefore deemed more economical to replace the boiler. The consumers participating in research all had new combination boilers installed between July and October 2020. It is possible consumer behaviour could change according to seasons, with a purchase in winter potentially being driven by a more urgent priority to have a working heating system during colder months.

Changes to property ownership were an important driver for some, with consumers motivated to replace the boiler in order to make it more attractive to potential buyers; and recent buyers identifying an old boiler as something to replace as part of their general renovations. Boilers were also replaced in order to create space, for example moving them from the kitchen to the loft or bathroom.

Priorities for replacement boilers

Boiler replacements were considered expensive, with consumers noting that they paid between £2,000 and £3,000. Therefore, the **cost** of the new boiler was a key priority when arranging a replacement. This was particularly the case for those replacing due to dilapidation, as this expenditure was less likely to have been planned in advance.

Availability of the boiler was also crucial for those who were replacing due to dilapidation and would therefore have no working boiler until their replacement arrived: it was imperative to get a new one quickly.

[26] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/959442/BEIS_PAT_W36_-_Cross_tabulation_tables__PDF_.pdf

For many consumers, the **siting and required space for the boiler** was also an important consideration. This was a key focus for those replacing the boiler as part of planned home renovations. For example, one participant with an old-floor standing boiler wanted the replacement to easily fit into the kitchen while using the existing flue, as there was asbestos in the wall cavities.

The **power** of the boiler was also noted by a few as important; these participants were keen to know that the boiler installed would be powerful enough for the size of their home/ number of occupants.

Across participants, **energy efficiency** was a consideration but not generally their main priority when arranging their boiler replacement. Consumers noted that replacing an old boiler (that may be 20 years old) with a brand new one would inevitably mean it was more efficient and had not thought any further about efficiency.

> *"I can't quote the figures but I read that a new boiler can save something like 20%." (Consumer, North)*

Whilst participants mentioned energy efficiency, this was typically associated with 'a better running boiler' and the related benefit of this was a positive impact on their energy bill and cost savings. Participants did not typically associate energy efficiency with carbon savings.

How installers are found and selected

Word of mouth played a major role in how installers were found and selected by consumers. They tended to go to a single engineer that had been recommended by friends, family or neighbours. This provided confidence and trust and therefore consumers either did not seek any additional quotes, or just a single extra quote to sense check the one provided by the recommended installer. As such, consumers tended not to spend much time deciding which installer to go with. Only one participant reported gathering more than two quotes; in this instance the participant had carried out extensive research and was keen be thorough in their choice of installer.

Where quotes had been obtained by methods other than word of mouth, consumers generally used Google or platforms such as Checkatrade to search for local installers. Participants suggested that large national installers were found to be much more expensive and therefore were typically not selected. For example, one participant reported that their local installer was £800 cheaper.[27]

A couple of participants noted that they had used an online one-stop shop, which provided price comparison, boiler selection and installation in a single package, in one case having been recommended the company by a neighbour. As part of this process, participants had been asked a number of questions (both online and over telephone) to help the company determine

[27] This consumer recalled such a price difference; however it cannot be verified that they were comparing an identical boiler installation by the different installers.

appropriate boilers for the property. Participants had then been provided with a choice of boilers. Reflecting this process, where participants had used a one-stop shop they had often considered a greater range of options when compared to other participants. Although it should be noted that these participants did not recall any mention of Boiler Plus or additional measures beyond smart controls (which often came as standard).

Sources of information used

For most consumers, the main source of information regarding their installation and boiler choice was the installer. This supports the BEIS Public Attitudes Tracker, which found that more than half (54%) of those who have replaced their heating system used information from their installer to make their decision, compared with one in five (20%) that had found information themselves online, and that tradespeople were the most commonly cited trusted source of advice on which heating system to install.[28]

Overall, four broad levels of information gathering, and research carried out by consumers emerged across participants:

- **No research of their own at all**: for these consumers, their concern was that they could afford the boiler, and trusted the recommendation of the installer to deliver a boiler that met the needs of their home.
- **Sense checking of the installer's recommendation**: these consumers looked at Google reviews of the models recommended by the installer but did not investigate any other options.
- **General searches on how to choose a boiler**: these consumers searched for example "how to choose a boiler" or searched for their house type. Such searches gave them additional information on what to look for and may have highlighted models not recommended by the installer, for example when their search led them to an online one-stop shop. However, these models were not researched in detail, therefore the ultimate choice remained between the models recommended.
- **Detailed research into additional models of boiler**: one consumer carried out more in-depth research which resulted in them choosing a boiler not recommended by the installer. Mentioned only once, the research suggests that this high level of engagement is rare.

Boiler Plus standards

Consumer awareness of Boiler Plus was very low, though it is not mandatory for installers to explain the standards, and consumers told us it was not a priority to understand them.

[28] https://www.gov.uk/government/statistics/beis-public-attitudes-tracker-wave-33

None of the consumers who participated in this research recalled the term “Boiler Plus” being mentioned by their installer, and when provided with a description of the overall requirements by interviewers, they tended not to be familiar. As described above, consumers prioritised factors such as the cost, siting, space and availability of the boiler, not the technical or regulatory aspects: some participants therefore reflected that it was possible that their installer did mention the requirements but that they simply did not engage with this information.

> *"I might have zoned out at that point." (Consumer, North)*

For the most part, consumers also did not recall any discussion of the specific requirements of Boiler Plus, that is the 92% minimum ErP efficiency rating, or the four additional measures for combination boilers. However, the requirements were occasionally mentioned as related to smart controls: since consumers may not have previously expected to pay for these, the installer would explain that the controls were mandatory.

> *“The Wi-Fi control panel is programmable. I think [the installer] said that's to do with 2019 regulations [sic.], that's why we need a programmable box.” (Consumer, Midlands)*

Explanations of aspects of Boiler Plus, where provided, were limited to what was relevant to the consumer and did not cover the other three measures nor the overall requirements.

Choice of boilers and supporting measures

Choice of boiler

Consumers were offered a limited choice of boilers but felt this to be appropriate, trusting the installer to make a recommendation.

A couple of consumers had only been recommended a single boiler, with no choice provided at all. Those who were offered choice were typically presented with a small range of around three boilers, generally at different price points, suggesting that installers understand the importance of price to consumer decisions. Consumer recall of the specific detail of the options offered was limited. Participants reported that installers either recommended boilers of a similar specification/ size but made by different manufacturers or would offer several different boilers by their preferred manufacturer.

> *"He showed me the three brands…and the ones that would be appropriate, and said 'if you look at the three, and the prices, then pick which one you want to go for'". (Consumer, Midlands)*

As described above, many consumers cited **cost** as a priority for their new boiler, and this influenced the choices ultimately made, for example one consumer was offered three boilers and opted for one that was the cheapest, £500 lower than the others. However, some consumers felt that the cost of the boiler may reflect the quality of the boiler, particularly where

a more expensive brand was recommended by a trusted installer. This meant that some consumers chose a more expensive option, anticipating that they were purchasing a better-quality, more reliable boiler.

The **brand** of the boiler also played a role in consumer decision-making, with participants reflecting that when given a choice they were more likely to choose a brand that they had heard of.

The research also revealed the importance of the length and cost of the warranty. For a given model of boiler, consumers could be offered a range of **warranty** options, and were typically willing to pay for a longer warranty. For example, one paid £250 for a 10 year rather than five-year warranty, and one had even opted for a 13-year warranty.

Although consumers were offered a limited choice of boilers, they did not appear to desire more choice. Rather, they **trusted installers** to provide them with relevant information and were happy to be guided by their recommendations. Primarily, this was because consumers considered boilers to be complicated, technical products that they seldom purchase. Therefore, they often have limited experience of making such purchases and had little (pre-existing) knowledge about the range of boilers on the market. Participating consumers therefore struggled to understand the differences between the various models if presented with a choice. Across the research it was clear that they preferred a simple choice with their key focus on getting a functioning boiler that works and is right for their home. They trust installers to provide this information.

> *"I don't know much about boilers…If there was too much choice I would get baffled by it all." (Consumer, North)*

Further limiting the appetite for choice was that, as highlighted by several consumers, boilers are not an 'exciting' purchase. They were often placed out of sight, meaning that aesthetics – which can be an important part of the decision-making processes for other major household purchases – were not relevant. Again, this reinforced the desire for simply a boiler that works.

> *"A boiler is a boiler to me, there's nothing fancy around it. It heats the house and provides hot water." (Consumer, focus group 1)*

Choice of supporting measure

While some choice of boiler was offered, there was very limited evidence of consumers being given a choice between the different Boiler Plus additional measures or discussing them with installers at all beyond smart controls.

Across the research with consumers, it was clear that smart controls were discussed far more often than the other measures. Installers would discuss the smart controls that they installed where relevant, but this was typically presented as part of the overall boiler installation package, not as part of a choice between other energy efficiency measures. These discussions tended not to be detailed. Instead, installers briefly explained what they were installing and

why. As described in the previous chapter, some installers said they would take time to ensure consumers understood how to operate their smart controls. However, participants did not recall receiving a thorough demonstration of how to use the smart controls from the installer and were typically unsure about all of the functionality available.

Across the research it emerged that smart control owners tended not to make the most of their ability to save energy. Rather, they use them in a similar vein to a conventional thermostat, switching the heating on when they are cold. Participants were not aware of the optimisation or automation features of smart controls when prompted by this information. This may suggest that these are not being used or are being used without consumer awareness.

In some cases, consumers raised the topic of smart controls themselves at the point of getting a quotation, either because they already had smart controls on their previous boiler and wanted to maintain functionality, or because they were aware of smart controls from discussions with friends, relatives or neighbours. As such, smart controls were the only measure where consumers were making an active choice regarding installation.

Amongst those less familiar with smart controls, it was clear across the research that this was the easiest measure to understand and engage with. Participants could easily see the tangible benefits of smart controls (e.g. greater control and comfort for the consumer) and they reflected that they would be interested in being informed of this and making an active choice about the installation of smart controls.

Most participants had no recollection of discussing compensators or FGHR systems, and once prompted with descriptions of these measures could be confused about what measures were included in their boiler installation. Some participants appeared to incorrectly believe they had certain measures (such as considering frost protection to be a weather compensator, or that all thermostats would work like a load compensator). In some cases, participants did mention aspects of their boiler that suggested that these may have been part of their installation. For example, one participant confirmed after checking the boiler documentation that it has *“uSense and weather compensation”,* and another believed their boiler had an FGHR system after hearing a description. However, it should be noted that in these instances, participants did not recall making a choice regarding this type of technology or discussing it with the installer, and smart controls were also installed.

During the interviews and focus groups, participants often found the technologies complex and difficult to understand. They were more engaged in measures where they could more easily understand how the technology worked and/ or how it would benefit them. For example, a few consumers expressed a preference for FGHR systems over the compensators: they found it relatively easy to see a link between the description of FGHR systems and saving energy, whereas the benefits of compensators were seen as less tangible meaning they were less interested.

“I don't really understand it. It's got to get to that temperature anyway, so I don't really see the point - if you've set the temperature to 20 degrees and it's 5 or 15 outside, it's still got to get to 20” (Consumer, North)

Overall, interest in FGHR systems and compensators was determined by a straightforward financial case, whereby they would be open to **any** measure that might lead to a cost saving. However, they reflected that they would want to know the extra cost to install it, and how much it would save each year, to help decide if it was financially worth installing.

"I think anything that saves energy, saves cost and adds to convenience at the same time, definitely I'd consider that." (Consumer, Midlands)

With this in mind, participants noted that they would be interested to know about these measures, but did not need to, or were unlikely to understand the technical aspects of these.

"As long as it works, and it keeps the house warm [I’m happy]. [The detail] doesn’t mean anything to me, I’m just a man with a house that wants warming up” (Consumer, Midlands)

Whilst not top of mind for most, once prompted, participants felt that knowing the positive environmental impact of these measures would also be useful, with some noting that they would be keen to consider options that had a positive impact.

Consumers felt that it would be useful to know if there were ways to save money at the point of boiler installation and felt that the installer should raise these as suggestions. Some felt that presenting these as financial outlays vs. financial savings would be the most useful way to help them make a decision.

“I would have liked to know…I don’t know if it’s because he [the installer] was replacing with like for like [combi replaced with a combi boiler], and it’s a new model but I just assume that it’s going to be better and save me more money…but I would like to know more energy efficient things to do really, especially if you save money from it.” (Consumer, focus group 2)

However, others reflected that if presented as an additional cost, they may be reluctant to pay this extra, especially given that a new boiler was a large and often unexpected expense. During the research participants were informed that some Boiler Plus measures may be provided ‘out of the box’ and a few participants questioned whether a built-in approach could help deliver energy savings (and positive environmental benefits) without the consumer needing to make a choice.

"I don’t think people need to know, it’s just a system that’s saving both energy and the environment... sometimes I think you shouldn't give people too many choices because if they don't fully understand things, they won't go for it." (Consumer, North)

5 Compliance levels with Boiler Plus

Chapter summary

This section summarises investigations into the level of compliance with the Boiler Plus standards, and with each individual requirement. Data from trade bodies, equipment manufacturers, installers and published data sets was used to inform these investigations.

Key findings:

- The analysis suggests that all domestic gas boiler installations meet the minimum requirement of 92% ErP efficiency, and nearly all meet the requirement for time and temperature controls.
- There may be some low level (<5%) of non-compliance with the specific requirement for boiler interlock.
- There is insufficient data to produce a reliable estimate of compliance levels for the requirement for additional measures to be installed alongside combination boilers. However, it does appear that there is some non-compliance in this respect.
- Smart controls appear to be the most commonly selected additional measure, reflecting the views of installers and consumers, followed by compensators. Very few FGHR systems appear to be installed.

Introduction

All domestic boiler installations in England must comply with Building Regulations. Compliance is currently monitored through an installer self-certification scheme, rather than being assessed by local building control officers. The self-certification scheme for gas boilers (The Gas Safe Register) focuses on correct installation practices to ensure gas safety, but currently the Gas Safe record does not document information regarding the energy efficiency measures selected alongside a boiler installation. This chapter therefore considers compliance levels on the basis of market data and other sources.

There are a number of gaps in the available data on sales of products, and limited firm relevant data on installation practices. This chapter seeks to identify what data is available, what can and cannot be inferred from this data and what that tells us about possible compliance levels for the different elements of Boiler Plus. In addition, the chapter explores what missing data would be particularly helpful in providing firmer estimates of compliance.

This chapter is divided into sections covering the different requirements of the current standards. Each section begins by outlining the data sources available and their applicability and validity. We then consider what can be inferred from the data, from our knowledge of the regulatory and operational environment for domestic boiler installation, and from qualitative feedback gained through the research work. Each section concludes with an assessment of what conclusions can be drawn in relation to compliance levels for the requirement in question.

Numbers in this chapter have been rounded for reporting purposes. Where the figures, particularly those relevant to the additional Boiler Plus measures, are based entirely on known, reliable data sets, numbers are presented to three significant figures or (for larger numbers) the nearest hundred. Where there is less certainty, numbers are presented to two significant figures or the nearest thousand.

This does not represent the level of confidence in each number but provides some balance between the need to represent the arithmetic processes of the analysis comprehensibly and the need to avoid inappropriate implications of precision. The reliability or validity of any number in this chapter will be dependent entirely on the caveats that are provided specifically for that number or for the section of report containing it.

Some calculations presented in the report will appear slightly inaccurate due to rounding of all numbers presented, rather than just the conclusion of the calculation.

Boiler efficiencies

Boiler Plus requires that all new gas boiler installations in existing homes in England have an ErP efficiency of at least 92%.

Data sources

All domestic boilers sold in the UK are required to have an ErP efficiency rating, under the Ecodesign for Energy-Related Products Regulations. All boilers are therefore effectively tested for compliance with the minimum efficiency requirement in Boiler Plus.

The Office of Product Safety and Standards (OPSS) are the Market Surveillance Authority responsible for checking compliance of all energy-related products with respect to the relevant Ecodesign and Energy Labelling requirements. This includes boilers. Market surveillance activities range from investigating complaints and assessing information through to carrying out market surveillance testing and documentary checks on a risk basis.

However, despite boilers being advertised with an Energy Label based on their ErP rating, sales figures for boilers are not currently being collected centrally on the basis of ErP efficiency.

However, HHIC collects sales data for all boilers sold into the domestic UK market subdivided by efficiency, but these are segmented on the basis of older efficiency methodology utilising

SEDBUK 2005 efficiency bands, and SEDBUK 2009 efficiency rating[29]. It is not possible to develop a calculation methodology to convert a SEDBUK 2005 or 2009 efficiency rating to an ErP efficiency rating. This is because the schemes have different testing regimes and so one boiler may perform better under one regime while another performs better under the other. HHIC has therefore investigated a sample of the boiler models in their sales data to establish their ErP efficiencies. They found that all the models they investigated had an ErP efficiency of 92% or more. In addition, the most recent data shows that 99.2% of boilers sold had the top A rating under the 2005 methodology.

Inference and other indications

HHIC considers it highly likely that all the boiler models in their sales data, and therefore all boilers sold for installation in existing homes in England, are at least 92% ErP efficient.

Those boiler manufacturers interviewed also confirmed that they no longer sold boilers in the UK domestic market that did not meet this minimum ErP efficiency.

Conclusion

On this basis, we also conclude that it is highly likely that all boilers sold for installation in existing homes in England are at least 92% ErP efficient, and so compliance with this requirement may well be at or close to 100%.

Time and temperature controls

Boiler Plus requires that time and temperature controls be present when a new boiler is installed in an existing home. This might be achieved by maintaining existing controls when a boiler is replaced, or by installing new controls with a new boiler.

Data

BEAMA have provided sales data from their members for time and temperature controls from 2013 to 2019 inclusive. However, these figures do not represent the full market. We therefore spoke to the main providers of controls who are not members of BEAMA – primarily smart controls manufacturers – to obtain sales figures or estimates. Any remaining data gaps in the market were estimated on the basis of most recent published market assessment from 2017.[30]

In combination, this data suggests sales of complete time and temperature control systems, whether conventional or smart, of 1.6 to 1.8 million systems a year in the UK. This represents

[29] SEDBUK (Seasonal Efficiency of a Domestic Boiler in the UK) was introduced in 2005 as an A to G rating scheme for boiler efficiency. In 2009 it was changed to a calculation methodology that produced winter, summer and seasonal efficiency ratings for each boiler.
[30] Smart Home Report 2020 Statista Digital Market Outlook – Market Report, Statista, August 2020, https://www.statista.com/study/42112/smart-home-report/

90% to 100% of total UK boiler sales per year, and this proportion has been broadly consistent for at least the past eight years.

Data from previous English Housing Surveys (2011/12 and 2013/14) was used to establish the likely prevalence of existing time and temperature control in systems likely to be replaced since April 2018. These surveys suggested time and temperature controls for the existing stock of regular, system and combination boilers is 93% and 95% respectively.[31] [32]

Inference and other indications

It is possible that some time and temperature controls, particularly smart controls, are sold as a separate item for fitting to an existing boiler, rather than alongside a new boiler. The sales figures of 1.6 to 1.8 million control systems do not therefore on their own confirm high levels of compliance with the requirement for time and temperature controls.

However, the English Housing Survey data above suggests that the vast majority (93% and 95%) of systems being replaced since April 2018 would already have had time and temperature control in place, and so the installation would comply with Boiler Plus in this respect even if no new controls were fitted.

Installing time and temperature controls is well established as good practice, in previous versions of the Domestic Heating Compliance Guide and other documents, and so high levels of compliance might be expected across the sector.

We have also used the results from the installer survey to consider compliance with this requirement. The survey was offered to us by a single boiler manufacturer with a database of installers who have purchased their boilers. We were able to define the survey questions specifically for this research, but there was no opportunity to generate a representative sample of the full installer market. The survey results are based on those representatives of the subset of the market that chose to respond, and should therefore be used with caution.

Survey question: When you fit a new boiler in an existing home, do you always ensure the system has both time and temperature control (e.g. programmable thermostat or separate room stat and programmer) either because you fitted it yourself or it was already present and working?

Over four fifths (84%) of respondents answered "Yes always", a further 12% answered "always, except in very exceptional circumstances" and 2% answered "Around 90% of the time." The full results suggest that this requirement is being complied with almost all of the time (around 99%) among the installers surveyed.

[31] https://www.gov.uk/government/statistics/english-housing-survey-2011-to-2012-household-report

[32] https://www.gov.uk/government/statistics/english-housing-survey-2013-to-2014-headline-report

Conclusion

In combination, the installation and housing stock data suggest that high levels of compliance with the time and temperature requirement are inevitable, and almost certainly higher than 95%.

The installer survey approach did not generate a representative sample due to the voluntary nature of survey participation, in that those responding are likely to be more engaged around compliance and potentially more conscientious than the average installer. The wider compliance rate may therefore be less than that indicated for the sample. However, the survey supports the general conclusion of a high level of compliance provided by the installation and sales data.

Boiler interlock

Boiler Plus requires that whenever a new boiler is installed in an existing home, the controls must be wired in a way that ensures boiler interlock.

Data

The term boiler interlock describes a wiring arrangement and does not require the purchase of any specific equipment. Compliance with this requirement therefore cannot be calculated from any sales data, and there is no evidence of existing compliance in the English Housing Survey.

Inference and other indications

Boiler interlock is another widely recognised piece of good practice, included for many years in the Domestic Heating Compliance Guide, so should be widely complied with across the sector. For actual evidence of compliance, we only have the installer survey to rely on.

Survey question: When you fit a gas regular or system boiler in an existing home, do you always include boiler interlock wiring?

82% of respondents answered "Yes always", a further 9% answered "always, except in very exceptional circumstances" and 4% answered "around 90% of the time." The remainder reported much lower compliance rates. In combination, the numbers indicate that almost all (97%) installations as reported include Boiler Interlock, suggesting that this requirement is almost always being complied with for this group of installers.

Conclusion

The survey results, in combination with long established guidance to promote boiler interlock, suggest compliance levels may well be high but it has not been possible to generate a specific figure. Again, there is a risk that the sample surveyed is unrepresentative, and that compliance among all installers may be lower than for this sample.

Relevant boiler installations for additional measures

Boiler Plus requires that whenever a new gas combination boiler is installed in an existing home, at least one of four additional measures must also be installed. To consider compliance with this requirement we need to know the number of boiler installations where this requirement would apply – that is, the number of combination gas boiler installations in existing homes in England during the relevant period.

Data

Total sales of domestic gas boilers in the UK for the period April 2018 to August 2020 were provided by HHIC. Numbers of existing gas heated homes in each devolved nation were taken from the most recent housing surveys, to provide a weighting of gas installations by nation. New build data for England per quarter and by property type and size were matched to different heating types, using HHIC's existing assumptions, to give numbers for new build installations over the same period.

Inference and other indications

In combination, these data suggest the following figures:

Gas boiler installations	**Number**
Total UK gas boiler installations – April 2018 to August 2020	3,754,000
Gas boiler installations in England	3,275,600
Less: Combination gas boiler installations in new build properties in England	(238,800)
Less: Regular / System gas boiler installations in new build properties in England	(56,700)
Combination gas boiler installations in existing homes in England	2,325,000
Regular / System gas boiler installations in existing homes in England	654,900

Conclusion

This suggests that by the end of August 2020 there had been around 2,325,000 boiler installations where an additional measure would have been required to comply with Boiler Plus.

Smart controls

Data

The BEAMA sales data for heating controls from 2013 to 2019 is subdivided into several categories, one of which (app capable devices) can be taken as a proxy for smart heating controls. This suggests 192,000 sales of smart controls from April 2018 to December 2019. Again, this only includes sales data from BEAMA members and therefore represents only a proportion of the smart heating control market, and does not cover the full relevant period up to August 2020.

One key market player dominates the current smart controls market, and is not a member of BEAMA. They have provided an estimated figure for sales from April 2018 to September 2020 of 800,000. The 2017 market report from Statista Ltd[33] suggests that this player and the BEAMA members in combination constitute 87% of the market for smart heating controls.

In combination, and extrapolating the BEAMA figures based on the 2019 trend, these data sources suggest total smart control sales for the UK from April 2018 to August 2020 of around 1,145,000.

Inference and other indications

To estimate the number of smart control sales leading to Boiler Plus compliance we need to allow for:

- The number sold for installation in the UK, but outside England.
- The number sold for installation with a regular or system boiler.
- The number of smart control products sold that do not meet the Boiler Plus requirements.
- The number sold for retrofit to an existing boiler rather than as part of a boiler installation.

The first two can be estimated using data from the ‘Relevant boiler installations for additional measures’ section above, making some allowance for an assumed skew towards English combination boiler installations as a result of Boiler Plus.

The Boiler Plus requirements for smart heating controls are more specific than the wide range of controls that can be labelled as “smart”. However, the two largest suppliers of smart controls have confirmed to us that all their products sold since April 2018 do meet the requirements, either because they did prior to the new standards, or because upgrades were included to existing models to enable the specified functionality. Some smaller suppliers have made similar statements regarding their product and, on that basis, we estimate the vast majority of

[33] Smart Home Report 2020 Statista Digital Market Outlook – Market Report, Statista, August 2020, https://www.statista.com/study/42112/smart-home-report/

controls on sale on the market to be compliant, and have made no adjustment to compliance estimates to take account of potentially non-compliant controls systems.

Sales for retrofitting smart controls to existing boilers was initially expected to be significant, given the history of high-profile consumer focused advertising and the availability of smart thermostats through retail outlets. However, given the established norm of fitting new controls alongside a new boiler, we would expect an increase in retrofit smart sales to result in an increase in total control sales. Assessment of sales trends in smart and non-smart heating controls shows no sign of this, suggesting that sales to accompany a boiler installation far outweigh those sold for fitting to an existing boiler.

In addition, several interviewees have expressed the opinion that smart control sales to accompany new boilers represent a major proportion of the market. We therefore considered it reasonable to assume a sales of smart controls accompanying new boilers make up considerably more than 50% of the total sales.

If we assumed that 80% of sales accompany a boiler, taking all of the other factors above into account, this suggests total sales of smart heating controls alongside replacement combination gas boilers in England between April 2018 and August 2020 of around 860,000. However, we do not have data to support an assumption of 80%.

If we consider the extreme value of 100% of sales accompanying a boiler, and extreme values for all other assumptions, we get a maximum figure of 1,150,000 smart control systems installed alongside new combination boilers in England in the relevant period.[34] Again, we do not have the necessary evidence on which to base these assumptions.

Conclusion

This analysis suggests that a top estimate of sales of smart heating controls alongside replacement combination gas boilers in England between April 2018 and August 2020 is likely to be less than one million and is unlikely to be significantly higher. This suggests, when compared to the total relevant boiler installations, that the installation of smart controls is likely to be delivering compliance with the additional measures requirement, in at most less than half of total cases.

Weather and Load Compensator

Data

Most manufacturers were unwilling or unable to share sales figures for load compensators, weather compensators, or boilers with compensators built in. One boiler manufacturer reported shipping all their boilers with weather compensation included, but they represent only a small

[34] This figure is slightly higher than the estimate for total smart control sales, as realistic rather than extreme assumptions were taken to calculate the latter.

proportion of the market (around 3%). Another provided specific figures for 2019 – 106,000 sales of packages with load compensation built in, and 4,000 with weather compensation. No other manufacturers provided usable estimates, and so we have been unable to estimate total sales from market data.

There is data in the English Housing Survey[35] on existing weather compensator installations, showing them to be present in 2.6% of homes with central heating. However, the most recent published data is for 2018 so this tells us little about installations from April 2018 to August 2020.

Inference and other indications

The installer survey included a question on choice of additional measures:

When you fit a gas combi boiler in an existing home, which of these technologies do you routinely install?

- *Flue gas heat recovery*
- *Smart control with automation and optimisation*
- *Weather compensation*
- *Load compensation*

The respondents included some installers who only bought boilers from the manufacturer running the survey. If we exclude these, and consider only those installers with less direct links, 28% reported fitting weather compensators to comply with Boiler Plus, while 10% reported fitting load compensation, and 57% reported fitting smart controls. If the survey respondents were representative of the wider installer sector this would suggest that total compensator installations are around 67% of smart control installations, or about 570,000 accompanying combination gas boiler installations from April 2018 to August 2020. However, we know the survey is not representative and so we cannot use this to estimate compensator installation rates.

There is a known bias amongst the surveyed installers, in that they all have links to a boiler manufacturer that promotes weather compensators. While it is possible that the sample includes a lower frequency of compensators relative to the wider installer sector, it is much more likely that the frequency is higher. This could be taken to suggest that the ratio of compensator installations to smart control installations across the sector is unlikely to be higher than 67%.

Applying this assumption to the maximum figure of 1,150,000 for smart controls installations, we get a suggested maximum figure of 770,000 compensator installations between April 2018 and August 2020. This would represent about 33% of total relevant boiler installations over the

35 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/898342/Energy_Chapter_2_Figures_and_Annex_Tables.xlsx

same period. However, there is insufficient market data, or other industry data to produce an accurate estimate via this route, and the figure may be higher or lower than this.

Anecdotal evidence on the relative frequency of smart controls and compensators has been inconsistent, with some respondents observing a householder preference for smart controls over compensation controls, while others report load compensation as the cheapest and hence most popular solution.

Conclusion

There is insufficient market data to provide an estimate for the likely number or proportion of boiler installations that have complied with the additional measures requirement by fitting a load or weather compensator. There is some information which can be extrapolated to suggest that the proportion may be no more than 33%. The real number could well be lower or higher.

Flue Gas Heat Recovery

Data

Sales figures for FGHR systems, and for boilers with FGHR built in, have only been provided by two manufacturers. The data supplied suggests total FGHR sales currently around 50,000 units per year, including separate and built-in systems. However, there are some significant gaps in the data and so the real figure could differ significantly from this estimate.

Inference and other indications

Several respondents suggested that nearly all FGHR systems are installed in new build properties, due to their potential to improve the Dwelling Emission Rate. Sales accompanying boiler installations in existing homes were considered to be relatively small due to the high cost of the technology compared to fitting a weather or load compensator, particularly for FGHR systems that incorporate storage.

If we apply the proportions from the installer survey, as with the compensator estimates above, we get a suggested FGHR installation number of 24,000 and a maximum of 33,000. However, we know the installer survey does not represent the wider installation sector and so these figures are of little value, other than to suggest that FGHR installations most likely represent a small proportion of the total installations. Unlike with compensators, we do not know of a particular bias in the installer sample either for or against FGHR installations. As the bias is unknown, we cannot take it into account and therefore we do not have greater confidence in the suggested maximum figure for FGHR than for compensators.

Conclusion

It is not possible to provide any reliable estimates of FGHR installations as a means of compliance with the additional measures requirement, other than to say that they represent a small proportion of the total.

Aggregated Additional Measures Compliance

Inference and other indications

The sections above can broadly be summarised as:

- Smart heating controls are the most common measure fitted, leading to compliance in probably no more than 45% of relevant boiler installations.
- Load and weather compensators (in combination) account for most of the other compliant installations. It is less clear what the maximum number of resulting compliant installations is, but it may be no more than 33% of relevant boiler installations.
- FGHR installations are the least common additional measure. We cannot provide a realistic estimate of numbers, but the figure appears to be an order of magnitude lower than either of the other categories.

Amongst heating controls manufacturers there was consensus that key boiler manufacturers are supporting compliance with the Boiler Plus standards, including at the manufacturing stage and through their associated installers. They see compliance as necessary rather than optional for their businesses, although they believe there are other elements of the boiler installation market that are less likely to comply. A couple of manufacturers reported that the product categorisation was too broad and lacked clarity leading to confusion over differentiating between compliant and non-compliant products.

There was consensus among both boiler and controls manufacturers that the lack of mechanisms for monitoring compliance and enforcement probably result in lower compliance for the additional measures requirement and expected practices. The scope of Gas Safe registration, in comparison to other Competent Person Schemes for other technologies, was cited as a particular limiting factor, as currently the record does not document information regarding the energy efficiency measures selected alongside a boiler installation. This is despite the Gas Safe self-certification covering all aspects of Building Regulation installation standards.

Many respondents expressed an opinion on aggregate levels of compliance with the additional measures requirement. Eight offered a view of compliance levels that can be expressed numerically - the lowest estimate provided was 40% compliance, and the highest “80 to 90%”.

Conclusion

It is not possible to estimate the level of compliance with the additional measures requirement on the basis of the market data currently available. In particular, the data is insufficient to provide us with a reliable estimate of weather and load compensator sales.

Both the available data and the views of industry suggest that compliant installations are common, but there may also be non-compliance.

Key Data Gaps

Data gaps in current assessment

Sales data

Smart controls sales figures - while we have sales data covering most key players in this sector, we do not have sales separated between those that accompany a new boiler installation and those which are sold to households as an upgrade to an existing heating system. This is the most significant data gap leading to uncertainty for the smart controls estimate. We also do not have sales figures specific to England, or for controls sold along with a combination boiler, but these have a lesser impact on the total.

Compensator sales figures - we currently do not have sufficient data on this to allow an estimate of compliance through the installation of weather or load compensators. This is the most significant area of uncertainty in estimating compliance overall.

FGHR sales figures - issues with FGHR sales data have generated similar uncertainties to those seen in the compensator data. However, it is clear that total FGHR sales are low compared to other additional measures, and so the impact of uncertainty in this area on the total compliance figure is much lower.

Installation data

There is no comprehensive data on installations whether through self-certification or reporting by installers, post installation inspections or any representative survey of installer behaviour. The English Housing Survey reports numbers of weather compensators installed, but this does not yet cover a significant period since the introduction of Boiler Plus. It is also unclear whether a post-installation survey would always be able to determine whether a system includes weather (or load) compensation.

Additional data required for improved assessment.

More complete sales data from manufacturers would provide a basis for estimating compliance levels but would incur a new area of uncertainty in having to assess levels of overlap between one compliant solution and another. A more comprehensive set of sales data would therefore

need to be complemented by information at the installation level to determine the number of installations with more than one compliant additional measure.

A representative survey of installers would provide a realistic estimate of the relative frequency of each additional measure, as well as the relative frequency of installations with multiple measures. However, any installer survey is at risk of respondents over-reporting compliance so it would be important to calibrate responses using real data, either from sales or from monitoring of installations.

Monitoring of installations as they occur, including reporting back to a central database, monitoring body or group of bodies, would provide the most robust data on compliance levels. This would remove the need for better sales data or installer surveys.

6 Views on extensions of Boiler Plus/ future policies

Chapter summary

This chapter discusses views across installers and manufacturers regarding potential future policies around hydraulic balancing and mandating maximum flow temperatures of 55°C, as well as any potential future extension of Boiler Plus to include system and regular boilers. It also reports on findings from two consumer focus groups exploring views towards heating systems as a whole.

Key findings:

- Not all installers carry out hydraulic balancing as a standard practice when installing a new boiler.
- Those not carrying this out were concerned about the additional time this would add to boiler installations and the impact of this on the consumer (increased cost) and installer business (reduced capacity to take on new jobs).
- There were concerns among installers that if not mandated, hydraulic balancing would not be carried out as standard. There were recommendations from manufacturers to strengthen the use of the Benchmark commissioning checklist to support compliance.
- Installers reported not setting flow temperatures to 55°C as standard, and manufacturers noted that the design and installation of low flow heating systems is uncommon in the UK.
- Key questions regarding setting a minimum standard for flow temperatures focused on whether 55°C would be adequate for houses with older heating systems. Where significant changes would be required to the home (e.g., new radiators) there was concern regarding cost impact and overall appeal to consumers.
- There were concerns that if not pre-set by manufacturers, flow temperatures could be manually changed by installers or consumers leading to issues around compliance.
- There was a general concern that if not enforced there would be mixed levels of compliance for any regulation, with those choosing not to comply financially under-cutting those who do.
- Consumers did not think about the heating in their home as a ‘heating system’ and therefore were not spontaneously considering issues related to radiators as part of their boiler installation.

Hydraulic balancing

Current practice

The Boiler Plus consultation government response[36] notes that although hydraulic balancing is not explicitly mentioned in the Domestic Building Services Compliance Guide, it is an "expected practice" for boiler installations.

Installers typically referred to hydraulic balancing as 'balancing'. They noted that they would carry out balancing as standard when fitting an entire heating system with new radiators but there were mixed practices when installing only a new boiler in an existing heating system.

Those who carried out balancing as standard for boiler installations commented that this was to ensure that "the system is working as it should" and was included in their quote.

> *"It's one of those things that's just part and parcel of the job." (Installer)*

Others noted that they only carried out balancing as part of a boiler installation where consumers voiced concerns and problems with radiators not heating up.

The inclusion of balancing in manufacturer guides was also noted by couple of installers who reflected that some warranties required this.

> *"I think the manufacturers have probably got it covered by stating it in their installation guide where hydraulic balancing must be carried out." (Installer)*

There were mixed views from manufacturers regarding current practice. Some felt that this was being carried out as a matter of course whilst others reflected that this may not be happening as it is not mandated.

Benefits

Whilst balancing was not always being carried out at the point of boiler installation, installers recognised the benefit of this practice. System efficiency was cited as the key benefit, resulting in cost savings for consumers.

> *"Because the idea is to bring everything up to the same temperature at the same time. There's [sic.] no good having one radiator you could fry an egg on and another radiator that's quite cold. It's not efficient that way, it's not efficient at all." (Installer)*

Benefits to the installer were also noted, focusing on reducing the potential for call-backs from consumers and delivering a good consumer experience. For example, one installer noted that

36 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718569/Boiler_Plus_Factsheet_v3.pdf

a positive consumer outcome as a result of balancing could increase credibility of the installers' business, and potentially lead to positive word of mouth recommendations leading to new customers.

Installers reflected that mandating hydraulic balancing would not be popular amongst all installers, especially those who lacked the skills to carry out this practice. Those keen to note that they themselves had the skills required (and therefore no need for additional training) felt that less professional installers may lack these skills and mandating balancing could help address this.

> *"[Balancing] is very technical, hard for someone without much training to do...But I would be happy doing it." (Installer)*

Manufacturers echoed the view that some installers would need training on hydraulic balancing. Overall, they felt that a key benefit of mandating balancing would be the positive impact on boiler longevity. They felt that this would not only benefit the consumer, but also their own business, with fewer calls to customer services and the associated costs savings of this.

Manufacturers also noted a potential market for tools to help balancing, for example one raised a potential sales opportunity for developing technologies – such as 'digital tools' - that could make balancing easier. Another noted that there could be sales advantages to pump and valve manufacturers.

Barriers

Those already balancing systems as part of the installation of a new boiler did not identify barriers to mandating this.

Those who were not carrying out balancing as standard expressed concern regarding the additional time that this process could add to each job carried out. Installers reflected that the extra time required could vary, with the potential for installations stretching into a further day in some cases. They were concerned about the cost impact this would have on consumers noting that this additional cost would need to be passed on in the final bill. There was also some concern for what this might mean for businesses e.g., longer jobs would mean that they would potentially impact on capacity to take on new jobs or incur extra costs for additional materials required.

A few participants reflected that they did not personally know much about balancing and felt less sure about this being mandated. For example, they felt that they would need additional training on this topic and one commented that they felt that mandating balancing was adding unnecessary complication to boiler installations, noting that they did not carry out balancing but did set thermostatic radiator valves (TRVs) when installing a new boiler.

Overall, there was some concern that even if mandated, not all installers would carry out balancing. This reflected broader concerns regarding compliance to regulations amongst some installers and the potential wider impact of this on the industry. Concerns focused on the

potential for non-compliant installers to under-cut the costs of compliant installers, and therefore attract more consumers.

> *“I don't see how you can make those that don't do it do it…It's just those unscrupulous ones that probably take the money and run, you're trying to drive them out of the industry as fast as you can really." (Installer)*

Manufacturers concurred that additional cost to the consumer for the extra time taken by the installer to carry out balancing was a potential barrier to mandating the practice. They felt that this could be supported by the provision of training to installers (to ensure they understood the best, simplest and easiest way to balance), and consumer education[37] regarding the benefits of balancing.

Manufacturers were asked if there were other ways to promote hydraulic balancing that would be equally or more effective than setting a minimum standard through Building Regulations’ guidance. Some expressed the view that mandating would be central to ensuring balancing was happening. Education and training were also considered crucial. Suggestions included training refreshers for installers, a promotional campaign around its introduction into Building Regulations, promotion via trade associations and education for consumers on the benefits of balancing in combination with other measures.

Manufacturers also felt that there was opportunity to better use the Benchmark commissioning checklist which includes balancing. One suggested that this be made a stronger requirement in Building Regulations, and another suggested that placing the warranty checklist online could help increase its completion rate which in turn would ensure that installers completed all elements listed in the checklist, including balancing.

As noted above, some installers mentioned that manufacturer warranties already include balancing requirements in some instances, however manufacturers themselves did not raise this as an approach to encourage balancing.

How to make it attractive to consumers

There were mixed views on how easy or difficult it might be to explain hydraulic balancing to consumers. However, there was agreement that consumers were less likely to be interested in the technical detail of balancing and were more likely to find the outcomes of the balancing - including all radiators in the home heating up and cost savings - interesting and engaging.

> *"They'd like the end result but aren't interested in how we get there. They don't expect balancing, but they'd expect all radiators to get hot at the same time, and so they should." (Installer)*

[37] The HHIC has produced a guide on balancing, available at https://www.hhic.org.uk/uploads/5ACCA2408554F.pdf. It is a resource installers can distribute to consumers to help them understand the importance of balancing.

Maximum flow temperature

This next section looks at manufacturer, installer, and consumer views of setting a maximum flow temperature of 55°C.

Current practice

Since 2005, minimum performance standards in Building Regulations mean that, unless there are exceptional circumstances, gas boiler installations have to be condensing models[38]. A condensing boiler is more efficient than a non-condensing boiler as it is able to recover heat from the flue gas. It does this by converting water vapour condensation into heat.

For this type of boiler to work towards optimal efficiency, in condensing mode, the heat exchanger (return temperature of water in the heating system flowing back into the boiler) needs to be equal or below the dew point temperature of approximately 55°C. This is set out in Building Regulations' guidance which advises setting return temperatures at lower than 55°C for condensing boilers.[39] A return flow temperature of 55°C would mean the boiler has flow temperatures set to 75°C.

The lower the return temperature below the dew point, the greater the boiler can condense, leading to additional efficiencies. This is how compensators operate and support efficiency.

Installers do not currently set flow temperatures to 55°C. They reported mixed current practices around flow temperatures with a range of temperatures cited. Some simply noted that this was something that they set in line with the manufacturer guidance.

Safety of temperatures was mentioned, with hot water temperatures set lower for households with vulnerable residents.

> *"I go from the manufacturer's instructions[40], but if they are elderly or have young kids then I'd reduce it for safety reasons." (Installer)*

Manufacturers held the general view that the design and installation of low flow heating systems is relatively rare. It was noted that the UK is a "replacement market", and therefore boilers were being installed into existing systems from the 1980s/ 1990s rather than new systems designed for low flow temperatures. Comments were also raised relating to the size of heating systems, and that heating systems may be oversized in some homes (for example, due to improvements to building insulation over time) which could impact the size of boiler installed.

[38] Exceptional circumstances defined in Guide to condensing boiler installation assessment procedure for dwellings, ODPM, 2005
[39] Source: HM Government, Domestic Building Services Compliance Guide, 2018.
[40] The wider experience of the research team is that suggested temperatures by manufacturers can vary, and some instructions suggest setting it lower to increase boiler efficiency, however 70 to 75 degrees is typical

Manufacturers felt that there was a culture to replace boilers without giving much attention to the rest of the existing heating system (radiators/ other heat emitters and pipework). New builds were deemed to be an exception, although it was noted that this was a small part of the market.

Benefits

Installers recognised that mandating maximum flow temperatures to 55°C would be more energy efficient and therefore lead to cost savings. Some identified wider benefits including an increased boiler lifespan (as less stress would be applied to the boiler), improved safety and the potential for less corrosion in pipework, and less expansion and contraction leading to fewer leaks.

Some participants reflected that it would not be difficult to implement this at installation although there were broader concerns regarding explaining this change to consumers, and whether homes would heat adequately.

Manufacturers echoed energy efficiency as a key benefit of setting a minimum standard for flow temperatures. They also noted the benefit of consumers engaging in the links between the thermal comfort of their home, low flow temperatures and energy efficiency, and building household readiness to adapt to low carbon heating systems.

Barriers

The key concern amongst installers in relation to setting a minimum standard for flow temperatures was whether this would be appropriate for all households. Echoing comments made by manufacturers, installers felt that this could be beneficial in houses with new systems, new builds, houses with many radiators, or those with large sized radiators, but expressed concern about how this would work in other households.

Many installers felt that maximum flow temperatures of 55°C were not hot enough and that homes would take too long to heat. This was a particular concern for large homes, those with poor insulation, those with old systems with issues such as sludge[41], old pipework and old radiators, and when outside temperatures were particularly low. Installers expressed concern that homes would not heat adequately, and a few felt that this would negate any aims to improve energy efficiency, as heating systems would need to be on for longer.

> *"I think that's [mandating maximum flow temperatures to 55°C] unnecessary, and I'd be a bit concerned about what that would do to the effectiveness of how a*

[41] The Boiler Plus Consultation Document states "When replacing a boiler, a heating engineer is required to thoroughly clean the system to comply with Building Regulations. Failure to do this will often mean any sludge or debris that has accumulated in the pipework since it was installed, maybe half a century ago, will remain where it is. As well as causing the heating system to not work properly, this sludge can get pumped through the new boiler causing internal damage.

house is heated. It could take a long time to heat a big home if it's only running at a maximum of 55C and you've got lukewarm radiators". (Installer)

There was some concern that lower temperatures could lead to consumer callouts from those who thought that there was an issue with their radiators not heating up enough.

Cost to the consumer was also for a priority for installers who felt that in some instances, homes would need significant investment such as larger radiators, improved insulation, or a high kW boiler. Some expressed reticence towards the idea of suggesting that consumers outlay a large financial sum to make savings in the future noting that their quote would become much higher than those presented by other installers.

"I don't [advise] spending lots of money outright to save money in long run, and gas engineers don't work like that either. Everyone's trying to undercut each other." (Installer)

There were mixed views regarding how simple setting the maximum flow temperature to 55°C would be for installers. Some felt that it would be simple; a case of "5 minutes extra work". Others reflected that it could be tricky to do this and felt that additional training for installers on this topic would be useful.

A range of viewpoints emerged regarding the potential for regulating maximum flow temperatures to 55°C. Some suggested that this could be mandated for new builds or new full system installations (including boiler and radiators). Some also wondered whether a blanket approach was appropriate, as setting this temperature could impact consumers differently based on a range of variables such as age of property, insulation, size of the heating system and size of radiators.

"That'd be good on certain systems rather than all. Just sticking it in on everything is a bit risky to me." (Installer)

Others questioned how this type of regulation would be enforced noting that the temperature could be changed manually on the boiler by consumers. Some queried whether temperatures could be pre-set by manufacturers. Overall, there was some concern that even if mandated, if this were not pre-set on boilers, not all installers would adhere.

This reflected broader concerns regarding compliance to regulations amongst some installers and the potential wider impact of this on the industry. Concerns focused on the potential for non-compliant installers to under-cut the costs of compliant installers, and therefore attract more consumers.

Manufacturers also cited the challenges of mandating maximum flow temperatures to 55°C for existing heating systems, expressing concerns for mandating a low flow for a retrofit market. They also queried whether installers would have up to date knowledge and skills in this area, particularly around heat loss calculation, and felt that it would be important to carefully address this knowledge gap.

Manufacturers also expressed concern around compliance and enforcement with one participant noting the potential for introducing a 'grey market' where installers may offer cheaper services without providing a whole system evaluation which would disadvantage those adhering to regulation in this space.

How to make it attractive to consumers

Installers felt that explaining maximum flow temperatures being set at 55°C to consumers would be important, so that they would understand why their radiators may feel less hot to the touch. However, they anticipated that explaining this would be complicated and time-consuming.

Installers felt that it would be particularly difficult to explain why a lower temperature would be beneficial as they found that consumers often focused on how quickly their home heated up and aligned how hot their radiators were with how well their heating system was working. For example, one installer noted that this was often a positive part of a boiler installation, when radiators were turned on and consumers were pleased with how quickly they heated as a result of the new boiler. Others reflected that thinking differently about the temperature of radiators could require a shift in mindset.

> *"[It] will take a long time to change people's attitudes to how hot they expect a radiator to get." (Installer)*

Installers felt that there would need to be significant tangible benefits to present to consumers to engage them in lower temperatures. For example, clear numbers regarding improved efficiency and how this equated to financial savings. Some reflected that even with tangible benefits, it would still be difficult to explain the technical aspects of flow temperatures and they felt that consumers would need considerable reassurance that their homes would still be warm.

Manufacturers echoed the view that there would need to be a shift in consumer knowledge and perspective with regards to heating the home in a different way, particularly around radiators being less hot and ensuring that they did not misuse controls to request higher output from the boiler than was possible. They raised the issue of additional costs associated with replacing radiators and redecorating, with one participant noting that with this additional cost consumers would be unlikely to see financial pay back in efficiency gains. They also anticipated that the additional costs required for consumers would be off-putting, encouraging consumers to opt for repairs rather than new heating systems.

Manufacturers queried the available sources of information for consumers on this issue. They recognised that consumers would be reliant on the installer to provide information, and one participant suggested that training for installers could support these conversations. Other participants suggested the provision of unbiased and impartial guidance to support consumers in making decisions about technologies and related running costs.

Consumer views towards heating systems

Two focus groups were carried out with consumers who had recently had a new gas combination boiler installation. The focus groups are described in detail on page 24 of this report. During these groups they were asked about their radiators, whether any work had been carried out to their radiators during their boiler installation, and their views towards such work.

Overall, it was clear that consumers did not think about the heating in their home as a 'heating system'; they tended to think about their boiler and radiators separately. Therefore, unless their boiler had been installed as part of a larger home renovation project (which also involved installing new radiators), they had not automatically thought about their radiators when having a new boiler installed.

There were mixed experiences of installers having mentioned or carried out any work related to radiators when participants had their boiler installed. Some noted that the installer had looked at and felt radiators in the house but were not sure why they were doing this. One participant recalled the installer asking whether there were TRVs on each radiator. A couple of participants noted that the installer had bled some of the radiators or had recommended that they do this a few days after installation, and a further couple noted that they had their system power-flushed and that this had been recommended by the installer as their radiators were old.

When thinking about their radiators more generally, participants reflected that these had either never been replaced, or had been replaced on a single radiator basis when a specific room had been decorated. Whilst some had considered upgrading their radiators, they had not looked into this due to the anticipated cost.

When thinking about the efficiency of their radiators some participants noted that some radiators in their home got hotter than others. Bleeding radiators was spontaneously mentioned by some as a way to resolve this issue, for example, one participant had looked for guidance online about radiators not heating up and had found information about bleeding.

Across the focus group participants there were mixed behaviours reported around bleeding radiators. Some had never done this, others relied on other people in the household to carry this out. "Once in a blue moon" was a phrase used by some to describe the frequency at which they bled their radiators; this was only done if there was an issue with the radiators not working properly.

> *"[I only bleed my radiators] if I notice there's an issue with one of the radiators it…I wouldn't think to do it as part of maintenance." (Consumer, focus group 2)*

Others did it more frequently for example, one participant described how they bled a couple of radiators every six months, noting that these were the oldest radiators in the property.

Participants noted that they had TRVs on their radiators but described mixed use of these. Some were using them to set lower temperatures in rooms used infrequently or bedrooms.

Others were leaving these on full and controlling the heating by switching the heating on or off (rather than varying heat by room).

There were mixed spontaneous views regarding whether participants would expect the installer to look at anything related to radiators when installing a new boiler. Whilst some expected that they would do (and recalled their installer looking at their radiators), others had not thought about this before.

> *"I assume that if they're doing the boiler, they're doing the boiler, and not the radiators." (Consumer, focus group 2)*

However, once provided with information about balancing, bleeding and power-flushing, participants reflected that they were interested to know about any practices that could improve the running of their boiler, and through increased efficiency save money. Once made aware of these practices, participants reflected that they relied on installers to raise these and with this in mind felt that installers should look at these at the point of boiler installation, making recommendations that would improve the efficiency of the boiler and save the consumer money.

Extension to system and regular boilers

Currently the requirement for additional energy saving measures only applies to gas combination boilers. Manufacturers were asked if they saw any barriers to extending the combination-specific measures to all types of system or regular boilers.

Manufacturers held a range of opinions on the barriers to extending the requirements to include all boilers. Some felt that the only barriers were cultural and around educating the industry. While there are existing technical solutions to all the issues, there is limited awareness of these amongst installers, and inconsistent understanding within BEIS. The key issue raised was legionella control in hot water cylinders. The assumption made by some was that this would be difficult to manage with the reduced flow temperatures that may result from the extension of additional measures to system and regular boilers. Others felt that there would be some technical development work required to make their system or regular boilers compliant with Boiler Plus additional measures.

In meeting the requirements for gas combination boilers, some manufacturers noted that they had already addressed potential compliance issues in their system and regular boilers by making modifications to enable independent modulation of a separate heating circuit, enabling low flow temperatures without impacting legionella control.

> *"Actually, this is what our road map is based on…We've invested in that area to make sure we were prepared, and it's the same for the heat pumps" (Manufacturer)*

“We also changed the printed circuit board to make sure that, should regular boilers come under the scope of Boiler Plus, that you could fit a load or weather compensation controller to them.” (Manufacturer)

However, several manufacturers voiced the opinion that extending the regulation to all boilers would not greatly influence the overall impact of Boiler Plus because gas combination boilers are much more common in the UK.

“We are definitely a combination boiler nation. So, Boiler Plus covered the majority there.” (Manufacturer)

It was widely considered that FGHR would not be included in any new requirements for system and regular boilers – many boiler and controls manufacturers presumed that this technology could not be made to work with anything but a combination boiler. However, one participant commented that there is a FGHR system available that could be fitted to system and regular boilers.

7 Lessons learned

The lessons learned detailed here bring together specific participant comments, details from the market analysis and research team observations. They do not represent the opinions of BEIS, or indicate future government policy.

The effectiveness of the current scheme

As described in Chapter 1 of this report, the Boiler Plus standards aimed to:

- Drive the market for the highest performing boilers, providing clear expectations and standards as to the levels of efficiency required.
- Ensure all households have a reasonable level of choice and control to enable them to achieve comfort and efficiency without increased bills.
- Support manufacturers and installers and facilitate exports by aligning the metric for minimum standards with the European Energy Related Products Directive (ErP).

In assessing the effectiveness of the scheme, it is therefore important to note that the standards did not aim to transform the domestic heating industry and generate new practices, rather to ensure that the existing best practices are embedded.

The European Energy Related Products Directive (ErP) continues to apply to the UK market, as it was replicated in UK law following the end of the Transition Period.

In terms of meeting these broad aims, the research suggests that:

- Boiler Plus has, on balance, helped to drive the market for the highest performing boilers:
    - Boiler Plus has contributed to the removal of the least efficient boilers from the market by mandating a minimum of 92% ErP efficiency, although most boilers met this standard already.
    - The Boiler Plus standards may have led to a significant increase in the installation of the additional measures to improve efficiency alongside a domestic gas combination boiler.
    - One of the greatest challenges to this report has been the lack of accessible data around the installation of the additional measures alongside gas combination boilers. This has hindered the research in robustly assessing compliance rates meaning the precise extent to which Boiler Plus has driven the market cannot be determined.

- Most households did not have much choice or control over decisions regarding their heating system, or the additional energy efficiency measures selected. They typically did not demand a specific measure.
    - Choice between boilers was not always explicitly provided by installers to consumers, and where it was, was broadly between equivalent boilers from different brands. However, consumers trusted installers to recommend a boiler that met their needs and did not demand more choice. Consumers generally prioritised cost, as well as availability of the boiler and the size constraints of the available space, rather than technical details and specifications.
    - Consumer engagement with the choice of the additional measures installed tended to be very limited: installers tend not to offer a selection of all four additional measures, with many only offering smart controls as an option. In addition, the other additional Boiler Plus measures were found to be complex for consumers to understand, with limited demand for more choice. Consumers reported they would have been most interested if other measures were presented with clear, tangible cost savings.
    - There appears to be a range of smart controls on the current market, covering a range of price points, and providing consumers with a broad range of functionally. While manufacturers noted their compliance with the Boiler Plus standards, some models may be more beneficial to the consumer due to the level of functionality offered.
    - Additionally, much like the range of smart controls, and the functionality provided, there are different operational protocols in use across industry. A number of products on the market appear to use open communication protocols.
    - In some cases, consumers may not fully understand the functionality of their new heating controls, and may therefore not be benefitting from the potential savings that the additional measure requirement is intended to achieve, or utilising the technology in the most efficient way.
    - Conversely, FGHR systems – which can yield savings irrespective of householder interaction – are by far the least common measure installed.

Barriers limiting the impact of Boiler Plus.

As described above, the full impact of Boiler Plus on domestic energy efficiency may be limited by a lack of consumer understanding and engagement to maximise the savings of their new heating system, lack of choice actively offered by installers, and a lack of enforcement and monitoring of installations. The research has identified some key issues driving these limitations.

Consumer engagement

The evidence collected suggests that **consumers** are not playing a key role in driving adherence to Boiler Plus and the installation of additional measures. There is a range of entrenched barriers to consumers taking a more proactive role at the point of a new boiler installation:

- The infrequent and often urgent nature of boiler replacements leads to the prioritisation of cost and the availability of boiler and speed of installation at the point of needing a new boiler.
- It appears there is low consumer engagement, particularly around the low number of focus group consumers independently carrying out personal research into a boiler purchase, and what to expect during a new boiler installation.
- Findings suggest consumers place heavy reliance and trust in the installer to make appropriate recommendations and decisions on their behalf.
- Consumers reported a very limited awareness of boilers, heating systems and control technologies and low appetite to learn about these, linked to their perceived 'technical' nature.

There is scope to better engage and educate consumers in Boiler Plus measures through the presentation of related tangible benefits such as cost savings. This may also represent an opportunity to provide consumers with more information about the environmental benefits of additional measures. However, the source, content and potential impact of these messages would need to be further explored and tested.

Consideration should also be given to additional measures that are impacted by consumer interaction once installed. The research indicates that **consumer behaviour** regarding smart controls may impact the potential for this Boiler Plus measure to achieve increased energy efficiency. Where there is limited consumer awareness or understanding and use of smart control functions (including optimisation and automation features) it is likely that smart controls are not being used to their full capacity.

This limitation may also apply to weather and load compensators. Some boiler manufacturers reported cases of customer dissatisfaction about cooler radiators, which could be due to poor understanding of the beneficial impacts of compensators on the efficient operation of heating systems, and may lead to inappropriate usage.

Lack of choice offered by installers.

The role of installers in Boiler Plus is also influencing the impact of the scheme. This research suggests that compliance with the additional measures requirement for combination boilers is often (although not always) focused on additional measures that are considered to be cost effective and simple to install. A range of factors are shaping this installer decision-making process including:

- Varied knowledge of the additional measures.
- Mixed awareness of ‘out of the box’ compliance.
- Perceptions of consumer needs and priorities.
- Perceptions of consumer tolerance for additional costs and interest in Boiler Plus measures.

These factors not only shape the installation of additional measures, but also the way in which installers interact with consumers about these issues.

Enforcement and monitoring

Levels of compliance with the requirements may be being impacted by the different ways in which compliance with building regulation is monitored. All domestic boiler installations are currently monitored through a self-certification scheme[42], and so will not normally be scrutinised by building control officers.

As such, there is no active monitoring and enforcement mechanism in place. While there appear to be high levels of compliance with the efficiency requirements, and requirements for time and temperature controls and boiler interlock, this lack of monitoring and enforcement may be permitting lower levels of compliance for the additional measures requirement.

A number of factors emerged, which may be contributing to potential non-compliance of the additional measures requirement, including:

- Price competition between installers, leading to an unwillingness to place additional costs on consumers.
- Lack of awareness, understanding or interest in the long-term financial savings, or other benefits.
- Variable understanding of the all the additional technology options among installers.

By contrast, the time and temperature control and boiler interlock requirements were already well established as good practice before the Boiler Plus standards were introduced, widely understood by installers and unlikely to be viewed as an additional cost given their existing widespread inclusion.

Similarly, the minimum ErP efficiency requirement presented few challenges to boiler manufacturers who were already complying with earlier minimum efficiency requirements. The small number of market players may also have influenced compliance rates, with no one manufacturer wanting to risk a drop in market share by continuing with any non-compliant

[42] A self-certification scheme is where an installer joins an approved scheme (i.e., Gas Safe), certifies that the installation complies with the Building Regulations covered by the scheme, and the approved scheme lodges the certificate with building control. By comparison, many other building works require a building control officer to visit the site and sign off the works as compliant.

models. This may make boiler manufacturers a fundamentally easier sector to drive compliance than the installer sector.

The fact that Boiler Plus requirements are not currently falling within the scope of existing enforcement mechanisms has meant that there is no effective monitoring of compliance taking place. No organisation has any statutory or business need to collect the necessary data.

Potential extensions of the scheme

In addition to providing lessons learned about the implementation of Boiler Plus to date, this report also considers three possible extensions of the scheme. The key learnings related to these possible extensions are summarised below.

Extending the additional measures requirement to system and regular boilers

Manufacturers held a range of opinions on the barriers to extending the requirements to include all boilers. While extension does not appear to create any technical challenges, except in the case of FGHR which was considered by the majority to not be able to work, barriers were raised, including installer awareness, and some questioned the benefits of extension.

The key issue raised related to legionella control in hot water cylinders, which was also flagged in the original 2017 Consultation[43]. Comments related to the low flow temperature created by the additional technologies, and whether technical innovation was required for system and regular boilers to avoid any legionella risk. One example given of managing this risk was the modulation of a separate heating circuit, enabling low flow temperatures without impacting legionella control. Generally, this challenge was believed to be technically solvable. However, given the dominance of combination-boilers in the market, questions were raised about the benefits extending to system and boilers could have, given the smaller market share.

Mandating maximum flow temperatures

The idea of mandating maximum flow temperatures has raised some technical questions around legionella control, but as discussed above, this is generally believed to be technically solvable. Concerns about consumer acceptance of lower temperature heat distribution systems may be more difficult to address. Some have argued that there would need to be allowance for flexibility where the home's characteristics or householder requirements required this, which would negate a blanket requirement for manufacturers to permanently fix the maximum temperature.

Increased installation of load and weather compensators, for example as standard, could provide a way to achieve lower flow temperatures while taking account of broader home

43 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/651853/Boiler_Plus_final_policy_and_consultation_response.pdf

characteristics. Load and weather compensators are designed to lower the flow temperature whenever it is possible to do so without reducing room temperatures. In reality, a set maximum flow temperature would require consideration of radiator sizing and insulation levels where a compensator requirement does not. They are therefore not truly comparable, but the two elements do need to be considered together due to their interaction, and due to the common concern about householder acceptance.

Mandating hydraulic balancing at installation

Hydraulic balancing was widely regarded as a good thing, but one it would be difficult to mandate without adequate enforcement, due to the significant additional time required. However, due to the nature of hydraulic balancing, as a technique which occurs typically at the point of installation, it may be challenging to prove a system was not balanced by the installer unless immediate checks take place after an installation occurs.

Appendixes

Appendix A Full list of research questions

RQ1. What impact has Boiler Plus had on manufacturers?

- How, if at all, have production/sales volumes for relevant technologies changed since Boiler Plus legislation came into force?
- Have there been any unintentional consequences? What should be considered for future policies?
- Have boiler manufacturers modified their combi boilers to deliver 'out of the box' compliance
- What are the barriers to extending Boiler Plus to all types of gas boiler?
- Have boiler manufacturers modified their system boilers or regular boilers to make them compatible with the energy saving devices included in Boiler Plus?

RQ2. What impact has Boiler Plus had on installers?

- What adjustments have installers made in response to the introduction of the new standards? (e.g. training)
- What have been the costs and benefits of the boiler plus regulations to installers?
- How have conversations changed with consumers?
- Have there been any unintentional consequences? What should be considered for similar future policies?

RQ3. What has been the experience of consumers?

- How is the installer presenting the boiler plus regulations (i.e giving the consumer a choice, making them aware of the requirements)
- What was the rationale for the choice of additional boiler technology they made?

RQ4. What are the benefits and risks of using hydraulic balancing to drive further efficiencies?

- What are the benefits of balancing systems? (energy efficiency increases, carbon savings and even heat distribution)
- What are the barriers to balancing more systems (I.e. cost to consumer, skilled installers, time taken)?
- How can real world efficiency improvements to heating systems (such as balancing) be made visible and attractive to homeowners?

RQ5. What are the benefits and risks of mandating maximum flow temperatures of 55˚C to drive efficiency improvements?

- To what extent are heating systems, in particular boiler heating systems, being designed and installed to operate at low flow temperatures?
- What are the benefits to setting a minimum standard for flow temperatures? (i.e. energy efficiency increases and carbon savings)
- What are the technical challenges to setting a minimum standard for flow temperatures? (e.g. product capability)
- What are the non-technical challenges to setting a minimum standard for flow temperatures? (e.g. installation practices, training, customer acceptance)
- How can real world efficiency improvements to heating systems (such as low flow temperatures) be made visible and attractive to homeowners?

RQ6. What are consumer, installer, and manufacturers' views on possible future policy options?

- What policy options could help to further drive boiler efficiency?

Appendix B Data Wishlist

Sales/Installation numbers for the following in dwellings in England.

- Different gas boiler types (combi and system/regular; gas, oil and LPG)
- Boiler systems installed with time and temp control
- Regular/system boiler installations with interlock
- Flue gas heat recovery (FGHR)
- Boilers with built in flue gas heat recovery
- Smart heating controls with automation and optimisation
- Weather compensation
- Load compensation

The proportion of all of these going into new builds vs existing homes.

For FGHR, the proportion of these provided together with a new boiler rather than for retrofitting to an existing boiler.

For Smart Controls, Weather Compensation and Load Compensation, the proportion provided together with a new combi boiler, rather than with a regular or system boiler or for retrofitting to any existing boiler.

What is the overlap in sales of the four Boiler Plus options?

Appendix C Manufacturer discussion guide

Introduction:

Calling from Energy Saving Trust regarding the BEIS Boiler Plus research.

We are doing some research for BEIS to understand the effects of the Boiler Plus standards, since its implementation in April 2018.

[Boiler Plus background if needed -The Boiler Plus requirements came into force in April 2018, as part of the Building Regulations for England, and apply to all new or replacement boilers fitted in existing homes. All gas boilers must have a minimum efficiency of 92% (ErP rating). All gas and oil boilers must be installed with time and temperature control, and regular/system boilers must be installed with boiler interlock. All gas combi boilers must be installed with at least one of the following additional measures:

Background to this research:

This work is being carried out on behalf of the Department of Business, Energy and Industrial Strategy (BEIS) and should be completed by the end of the year. It has three key focuses:

Evaluating the level of compliance with the new regulations since they were introduced

Assessing the impact the regulations have had on businesses like yours

Seeking feedback on some possible additional requirements that could be introduced in the future (such as requiring hydraulic balancing of the system post installation and limiting maximum flow temperatures to 55˚)

Our questions will therefore focus primarily on your response to the regulations so far, and your views on the possible changes, but we will also have some follow up questions on your views on the level of compliance at the point of installation

Consent and data protection:

Although you have already signed a consent form in advance of this interview, your participation in this research is entirely voluntary and you can change your mind at any time

Your feedback will be used to help us understand industry's views on the policy. Conclusions of the study will be published, but no data or inputs will be included and attributed to you or your organisation unless you expressly give consent. IF RELEVANT: However, please note that the nature of your business may mean that your feedback could identify you or your business without it being named. We can check this with you at the end of the interview

Are you happy to proceed with the interview on this basis? IF NECESSARY: If you would like further information about how your data will be used I can email you a copy of our privacy notice

To help with note taking, the call will be recorded but will be deleted within six months of the end of the research project, along with any personal data we hold on you. Your personal data will not be shared with BEIS, and will be stored in line with GDPR requirements.

Introductory questions

- Can we just check our understanding of the role of your business in the boiler and heating supply chain? e.g. do they manufacture boilers, controls, other technologies?
- Approximately, what is your business':
- Annual turnover
- Annual sales volume of boilers
- Total number of employees

Impact of Boiler Plus

- Has your business been impacted by Boiler Plus requirements? If so, how would you describe the overall impact of the Boiler Plus requirements on your business? IF APPROPRIATE – probe for impact on different product types and business activities
- What do you think is working well about the scheme?
- Has your business faced any challenges related to compliance with Boiler Plus? PROBE ON: What have been the most difficult elements of compliance with Boiler Plus for your business.
- How, if at all, have production/sales volumes for relevant technologies (flue gas heat recovery; smart controls; weather compensation and load compensation) changed since Boiler Plus legislation came into force?
- Do you think the Boiler Plus regulations have resulted in any unintended consequences?
- Examples if asked for:
    - householders being sold a system that is less efficient than an alternative option simply because it complies
    - products being discontinued because they do not contribute to compliance
- What impact, if any, has meeting the minimum ErP efficiency of 92% had on your business?
- If they say they have had to carry out product development to meet the requirement – ask how long this took

- Have you modified the combi boilers you sell in order to facilitate compliance with the regulations? (For example, including an additional measure such as FGHR within the product as sold, or making changes to improve compatibility with additional measures)

- Have you made any modifications to regular or system boilers?
    - We are not assuming this will be the case, as most requirements currently apply only to combis. We are just checking in case it has happened.

As we mentioned earlier, BEIS are considering options for extending the Boiler Plus requirements. One option is to apply some of the specific requirements for combi boilers to regular and system boilers as well. Please note, these following questions are for research only, and do not imply any firm proposals to make any specific changes to the legislation.

- Do you see any barriers in extending the combi-specific Boiler Plus requirements to all types of system and regular boilers? Ask about each specific requirement:
    - Smart controls including automation and optimisation
    - Weather compensation
    - Load compensation
    - And regarding flue gas heat recovery, either built into the boiler or separate unit added at installation – is there any potential to introduce this, or something similar or equivalent, for regular and system boilers? (We believe this may be technically impossible)

Benefits and risks of mandating maximum flow temperatures of 55˚C to drive efficiency improvements

- To what extent are heating systems, in particular boiler heating systems, being designed and installed to operate at low flow temperatures?
- What are the benefits to setting a minimum standard for flow temperatures? (i.e. energy efficiency increases and carbon savings).
- What are the technical challenges for your business to setting a minimum standard for flow temperatures, for the boilers themselves and for the rest of the heating system? (e.g. product capability, legionella management*, larger radiators).
- And what are the technical challenges for the wider supply chain to setting a minimum standard for flow temperatures?
- What are the non-technical challenges to setting a minimum standard for flow temperatures? (e.g. installation practices, skills / training, customer acceptance, compliance).
- How can real world efficiency improvements to heating systems (such as low flow temperatures) be made visible and attractive to homeowners?

Views on possible future policy options

- If hydraulic balancing became obligatory at installation, what impact, if any, would this have on your business? PROBE for both positive and negative impacts, including impacts on boiler manufacture and performance (if any), installation business (if they are involved) or new/increased business opportunities
- Do you think there are other ways to promote hydraulic balancing that would be equally effective, or more effective, than introducing a requirement in Building Regulations?
- What should be considered for future policies? What policy options could help to further drive boiler efficiency?

Background questions for manufacturers

Please answer these questions for the period from April 2018 (when the new regulations came into force) to mid March 2020 to now.

- Do you know how many of your combi boilers were sold to go into existing homes, rather than new build?
- Do you sell combis with FGHR built in?
    - If so, how many did you sell over that time period?
- Do you sell other compliant packages (e.g. boiler plus separate FGHRD, boiler plus control package)?
    - If so, do you have numbers?
- Do you know if your installers are otherwise fitting additional elements to meet the Boiler Plus regulations?
    - If so, do you have numbers of compliant installations, or can you otherwise provide an estimate?

Additional questions if the company has its own installer base in-house, or through a closely associated company

- Are you able to answer questions on behalf of your installers?
    - (if no, ask for relevant contact, if yes, ask the following)
- What upskilling did you have to undertake in 2018 to ensure your installers were ready for the new regulations?
- What is the level of consumer awareness when installers discuss Boiler Plus with their customers?
- Do installers have a preference for what additional measure they offer, or are all 4 options presented to customers?
- Were your installers already undertaking hydraulic balancing in all cases when fitting a new boiler?

Appendix D Installer Discussion Guide

Aims

- Understand the impact of Boiler Plus on installers.
- Understand installers views on hydraulic balancing, and mandating maximum flow temperatures.

Moderator introduction

Introduce self and Ipsos MORI – we are doing this research on behalf of the UK Government Department for Business, Energy and Industrial Strategy to understand the effects of the Boiler Plus Requirements on boiler installers, manufacturers and consumers

Consent and data protection

Check participant has received information sheet and signed the consent form.

Although you have already signed a consent form in advance of this interview, your participation in this research is entirely voluntary and you can change your mind at any time

Check key points: permission to record, MRS code of conduct, information will be treated as confidential and deleted 6 months after completion of the study unless you consent otherwise, your details will not be passed to BEIS, participation is voluntary, and you can choose to withdraw at any time and not provide a reason, if you prefer not to answer specific questions that is fine.

The discussion will last for up to 1 hour

No right or wrong answers, we are just keen to hear your views and experiences

Are you happy to proceed with the interview on this basis? IF NECESSARY: If you would like further information about how your data will be used I can email you a copy of our privacy notice

PERMISSION TO RECORD – START RECORDING

Participant introductions

- Firstly, can I check what is your role in your company? Are you the business owner? or part of a team carrying out installations employed by the business?
- How long have you worked a) at this company? b) in the industry?
- How does your business generate work? PROBE for direct enquiries from consumers; carrying out installations on behalf of online ‘one stop shops’ e.g. Boxt; sub-contracted by larger companies e.g. British Gas

Familiarity with Boiler Plus requirements

- How familiar would you say you are with the Boiler Plus requirements? How would you describe Boiler Plus to someone who has not heard of it before?
- Overview of Boiler Plus requirements provided here.
- What are your overall thoughts about the Boiler Plus requirements?

Moderator: please note that this is an open question intended to provide participants with opportunity to spontaneously give their views of Boiler Plus. Please note these down so they can be explored in more detail as relevant later within the discussion.

- And where have you received most of your information about the requirements?
    - Probe: your employer (if not sole trader); trade associations e.g. Gas Safe; BEIS; training?
- How useful was this information? What information do you think might be missing for installers like yourself?
- How have you adjusted to these new requirements?
- Have you taken part in any training?
- Has there been any cost to you/ the company in making adjustments? If so, what types of costs?

Impact of Boiler Plus

- Overall, what impacts, if any, have the Boiler Plus requirements had on your work since they were introduced, both positive and negative?

  Moderator note: this is intended to be an open question, allowing participants to spontaneously note what they consider to be the impacts of Boiler Plus requirements. The rest of this section then explores potential impacts in detail.

- What impact, if any, would you say that the requirements have had on the types of boilers you install? IF NEEDED: for now we are just asking about the boilers themselves, not any accompanying controls or energy efficiency measures
- Before Boiler Plus, did you install replacement combi boilers below 92% ErP? If yes, roughly what %?
- What impact, if any, would you say the requirements have had on the different types of measures you install? Have there been any changes in your work involving:
    - Flue gas heat recovery system
    - Load compensator
    - Weather compensator
    - Smart controls

Moderator note: for each PROBE:

- Is this something that you install? When installing new boilers or fitting to existing boilers?
- How frequently, if at all are you installing this measure?
- Has your offer to consumers changed at all? If so, how?
- What impact, if any, would you say that the requirements have had on how easy or difficult it is for you to carry out installations?
- How long installations take? Do they take longer? Does this vary by measure?
- Does installing the accompanying measures make the installation more disruptive/ more to clear up?
- Can the replacement boiler always be installed in the same place as the old one or do accompanying technologies affect this?
- How, if at all do these things impact on your business?
- Overall, what, if any, do you think have been the challenges for installers in adjusting to the new requirements?
- What, if any, challenges have you faced? How have you overcome these?
- And what benefits, if any, do you think the introduction of Boiler Plus has had for installers such as yourself?
- And have you taken part in any training about the requirements?
    - How was the training delivered? Online? in person?
    - Who provided the training? Delivered by your company (if relevant) or someone external? Who?
    - What did your training cover? was it to inform you about the requirements? to teach you how to install the technologies?
    - What can you remember about this training? was it useful, or not? why/ why not?
    - What kind of (additional) training, if any, would have been useful?

Impact on consumers

- And what impact, if any, have the requirements had on the discussions you have with consumers at the quotation stage? Allow for spontaneous responses then probe:
- Do you explain Boiler Plus to consumers?
    - if yes, what specifically do you tell them?
    - if not, what are the reasons for this?
        - Probe: Too complicated? They would not understand? They are not interested/ just want a boiler? Lack of time? Other reasons?

- Thinking about the four Boiler Plus measures discussed earlier, are consumers offered a choice of these four measures?
    - If yes:
        - Between all 4 measures or a subset? if a subset, how do you choose these? (if needed probe: ease of installation, suitability to the property in question, cost to you, cost to the consumer)
        - How would you say consumers typically respond to having this choice? Do they find it easy or difficult to choose? On what basis do you think they choose? (e.g. cost, disruption, timescales, energy savings, installer recommendation)
    - If no:
        - Do you offer the same measure universally? If yes, why this one? (ease of installation, cost to you, cost to the consumer). If it varies how is this chosen?
        - Do consumers themselves initiate conversations about Boiler Plus? What do they know about it? What sorts of questions do they ask you about it?
- What impact, if any, would you say that the requirements have had on the typical price a consumer pays for their boiler and installation?
    - Probe, if increased, to understand by how much
- How is any additional cost presented to consumers? As part of their overall bill, or itemised as a separate measure? Why?
- Overall, what benefits, if any, do you think the requirements have for consumers?
    - Probe: for warmer homes, reduced bills, more 'future proof' boiler/ heating system
- And what unintended consequences do you think the requirements could have for consumers?
    - Prompt: For example, higher cost of boiler/installation, householders being sold a system that is less efficient than an alternative option simply because it complies
- What should be taken into account if BEIS consider putting in place other requirements in the future?
- What should be taken into account from an installer point of view?
- What should be taken into account from a consumer point of view?

Extensions to Boiler Plus

BEIS are considering options for extending the Boiler Plus requirements. One option could be to look at mandating maximum flow temperatures to 55˚C to drive efficiency improvements.

- What are your views on this?
- What are the benefits of this?
    - Prompt: energy efficiency increases, carbon savings, other?
- How appealing do you think this would be to consumers?
- How could this be made attractive to consumers?
- How easy or difficult would it be to explain this to consumers?
- Do you currently set new boilers up in this way when installing them?
- Is this offered to consumers as part of other jobs e.g. when replacing radiators or servicing boilers? why/ why not?
- How easy or difficult has it been/ do you think it would be for you/ your business to put this in place? Why?
- What impacts, both positive and negative, do you think would have on your business?
    - Does it make installation more difficult? how?
    - Does it make installation more time consuming?
- Would you require training?
- Would it increase/ decrease revenues/ profits? Why?

Hydraulic balancing is a practice that can drive energy efficiencies and may have an impact on bills and emissions

- What are your views on this?
- What are the benefits of hydraulic balancing?
    - Prompt: energy efficiency increases, carbon savings, even heat distribution, other?
- How appealing do you think this would be to consumers?
- How could this be made attractive to consumers?
- How easy or difficult would it be to explain this to consumers?
- Does your business offer hydraulic balancing when installing new boilers?
- Is it required for installing products from particular manufacturers? If yes: which products, what do you think about this?
- Is it offered to consumers as part of other jobs e.g. when replacing radiators or servicing boilers? why/ why not?
- How easy or difficult do you think it would be for you/ your business to put this in place? Why?
- What positive impacts do you think obligatory hydraulic balancing at installation would have on your business?

- What negative impacts do you think obligatory hydraulic balancing at installation would have on your business.
    - Does it make installation more difficult? how?
    - Does it make installation more time consuming?
    - Would you require training?
    - Could it increase/ decrease revenues/ profits?
- Do you think there are other ways to promote hydraulic balancing that would be equally effective, or more effective, than introducing a requirement in Building Regulations?

Wrap Up

Thinking about all we have discussed, are there any other suggestions for how the Boiler Plus requirements could be extended or improved?

Are there any other things you would like to mention about Boiler Plus requirements and potential future measures that we have not covered

Thank you for taking part. Your feedback will be shared anonymously with the Government and will be very helpful in improving their understanding of how Boiler Plus is impacting on installers and for their future policies in this area

Appendix E Consumer Interviews

Moderator introduction

Thank you for taking part.

Introduce self and Ipsos MORI

Research is being carried out on behalf of the Department for Business, Energy and Industrial Strategy who are interested to understand people's experiences of having a new boiler installed. Today I'd like to talk about your experience of having a boiler installed.

Check participant has received information sheet and signed the consent form.

Check key points: permission to record, MRS code of conduct, information will be treated as confidential and deleted 6 months after completion of the study, participation is voluntary, and you can choose to withdraw at any time and not provide a reason, if you prefer not to answer specific questions that is fine.

The discussion will last for up to 1 hour.

No right or wrong answers.

Are you happy to proceed with the interview on this basis? IF NECESSARY: If you would like further information about how your data will be used I can email you a copy of our privacy notice

PERMISSION TO RECORD – START RECORDING

Participant introductions

- First name
- Do you live in a house or flat? Approximately when was it built? How long have you lived there?

Moderator: please be aware that participants may be keen to discuss their experience of an installation during the COVID-19 pandemic. Please allow participants to express their views but ensure that the discussion stays on track. However, please look out for examples of where the pandemic is cited as a reason that something may have happened differently to expectations e.g. a face-to-face discussion with the installer was not possible/ had to be done via telephone instead. Please probe on what difference participants felt this made to the process.

Boiler Installation

- Please can you talk me through the process that led up to having a new boiler installed.
- When did you decide to change it?
- Did you want an upgrade, or notice that something was wrong with your boiler?

TIMELINE MAP. Moderator: encourage participant to talk through what happened step by step. Make a written note of the timeline on paper (for telephone interviews) or on-screen to share with participant.

Choice of installer

- How did you choose which installer to use? did you get multiple quotes?
- What was important to you when finding an installer?
- Did you approach any companies/ installers that had carried out work for you previously (e.g. boiler service)?
- IF NOT CONFIRMED AT RECRUITMENT: What sort of company did you choose? was it a small or sole trader or larger company?
- How did you find/ contact an installer?
- Moderator: if online sources mentioned, please explore what type of website was used e.g. online one-stop shop, gas safe register, particular company website etc.

Discussions with installer

- What discussions did you have with the installer about your boiler replacement?
- What types of things did you discuss?
- When during the process did you have these discussions?
- Who did you have the discussions with - installer or someone else at the company?
- What were your priorities for your new boiler?
- Probe: cost (of boiler/ installation/ ongoing bills), energy efficiency, look, fit for space, availability/ able to have it installed quickly, types of controls/ settings offered
- Did you discuss these with your installer? Why/ why not?
- Boiler options - were you given any options or different choices to consider?
    - If yes: what options were you given? How did you decide which to option to take? How did you feel about being given these options? Did you feel you were given enough information about the options to be able to make a decision?
    - If no: did you expect to be given any options? What types of things, if any, might you have liked options for? How would you have felt if you had been given options?
- Thinking about discussions you had, did you discuss any of the following:
- Energy efficiency

- Systems to make your boiler more energy efficient.
- Using sensors and monitors to work out how much energy is needed to heat the home. For example, using room sensors or weather sensors so the boiler only uses the energy required to heat the home to a set temperature.

IF YES TO EITHER: what did you discuss? Did the installer provide a quote for this? What did you decide to do? Why did you reach that decision?

- Smart controls to make energy use in the home more efficient. For example:
- Automatically scheduling your heating to turn itself on only when you are at home
- Calculating how long it takes for the house to heat up and timing the heating so that it does as little work as possible.

IF YES TO EITHER: what did you discuss? Did the installer provide a quote for this? What did you decide to do? Why did you reach that decision?

- Cost (of boiler/ installation/ ongoing bills)
- Meeting boiler/ government regulations.
- Was there any mention of Boiler Plus requirements?
- Please can I check, have you heard of Boiler Plus before?

Explanation of Boiler Plus read out to consumers.

Moderator: please be aware that participants may be keen to discuss their experience of an installation during the COVID-19 pandemic. Please allow participants to express their views but ensure that the discussion stays on track. However, please look out for examples of where the pandemic is cited as a reason that something may have happened differently to expectations e.g. a face-to-face discussion with the installer was not possible/ had to be done via telephone instead. Please probe on what difference participants felt this made to the process.

- Where did you hear about this? What do you know about it? Was it mentioned by the installer? When did they mention this? What was discussed in relation to this? What options were discussed? What were the options and choices? What decisions were made and how?

Information sought/ provided

- What information, if any, did you use during the process? e.g. information about different types of boilers, the type of boiler best for you, the best set up for your property, what things cost?
- Did you look for any information yourself?

    - If yes: what type of information, what were you looking for, when during the process, where did you look, how useful was the information you found? Were there any sources that you found particularly useful (which?)?
    - If no: why not?
- Did you come across any information that mentioned Boiler Plus regulations?
    - If yes: where was this information, what did it say, how useful was the information, what did you do after seeing this information - did you talk to your installer about it? Why/ why not?
- Did the installer/ company provide you with any information?
    - If yes: what type of information, about what, in what format?
- Are you able to share any information that you were provided by the installer/ company during the process?
- Moderator: ask participants to look at any information they have to hand. If they are happy to send copies e.g. email copies/ photos please provide email address
- To what extent did you look at/ use this information? How useful was this information?
- What type of information did it include?
- Did it include any mention of Boiler Plus requirements?
    - If yes: where was this information, what did it say, how useful was the information, what did you do after seeing this information - did you talk to your installer about it? Why/ why not?
- Did it provide any different options for you to consider?
    - If yes: what were the options?
- To what extent did the information help you make any decisions about your installation?

New boiler installed

- What can you remember about the boiler you had installed? e.g. what make/ model is it? anything else?
- Overall, how much choice do you feel you had about your new boiler?
- How much choice would you like to have had?
- How did you make a final choice about which boiler/ options to have installed?

Thinking about your boiler installation, how does the process compare to other purchases and installations you might have? For example, thinking about purchasing and having a new washing machine/ fridge/ cooker installed, or buying a new car/ computer (moderator: ask participant to think of a large purchase/ installation they have recently made)…

How is it different or similar in terms of:

- Deciding which type of <item> to have installed and how you make this decision.
- How much choice you prefer to have over which <item> you have installed.
- The type of information you find useful when making a decision.
- Why do you think there are these differences?
- Is there anything about the way in which you choose a <item> that you think would be useful when choosing a boiler? Why/ why not?
- There are a number of measures that can be put in place to improve the energy efficiency of boilers and giving people more control over how to use energy efficiently in their home. Including these measures can add to the cost of the boiler package. I'd like to get your views on some of these.
- Lists information regarding FGHRS, Weather Compensator, Load Compensator and Smart Controls.

For each explore:

- Is this something that you have heard of before?
    - If yes: where did you hear about this? What do you know about it? Was it mentioned during your installation?
- Moderator: if mentioned explore when, by whom and the role this played in boiler options and choice.
- What do you think about this? Is it something that would interest you? Why/ why not?
- To what extent is this something that you would want choice over when having a boiler installed? Why/ why not?
- How would you have felt if you'd been given this as an option when you had your boiler installed?
- Where relevant: this could be something that is included as part of the boiler 'straight out of the box'. This would mean that people would not have not decide whether to have it added or not - it would already be included as part of the boiler.
    - What do you think about this?
    - If it was already part of a boiler would you want to know that it is included? Why/ why not?
- Finally, thinking about everything that we have discussed and talked about what would you tell a friend/ family member if they were looking at getting a new boiler installed?
- Is there anything else that you'd like to mention?

Thank and close

Appendix F Consumer Focus Group

Introductions

- *Thank you for taking part.*
- *Introduce self and Ipsos MORI*
- *Research is being carried out on behalf of the Department for Business, Energy and Industrial Strategy who are interested to understand people's experiences of having a new boiler installed. Today I'd like to talk about your experience of having a boiler installed as well as gather your views towards ideas for how to help boilers operate at their maximum efficiency.*
- *Check key points: permission to record, MRS code of conduct, information will be treated as confidential and deleted 6 months after completion of the study, participation is voluntary, and you can choose to withdraw at any time and not provide a reason, if you prefer not to answer specific questions that is fine, and to remind you that if you prefer not to be seen by others, you can turn your camera off.*
- *The discussion will last for up to 1.5 hours.*
- *No right or wrong answers.*

PERMISSION TO RECORD – START RECORDING

Participant introduction

- First name, where you live, property type, age of property, when you had your boiler installed

Recent boiler installation

- Thinking about your recent boiler installation, what words use to describe your experience? Why these words?
- How did you find an installer?
- When arranging your new boiler installation, what were the key priorities for you? Why were these important
- IF NOT MENTIONED BY ANYONE: What about the Cost? Energy efficiency? Space it takes up? Look? Brand? Availability for immediate installation? Size (this is normally presented in kW and ranges from around 24 to 40 kW and based on the size of your property)?
- How did you find your installer? did you get multiple quotes?

Discussions with installer/sources of information

- What sorts of discussions did you have with the installer?
- Did you discuss your priorities (cost, space etc.)

- Were you offered a choice of boilers?
- Did they explain the technical aspects of the boiler or boilers they recommended?
- Is this something you were interested in? Why/ why not?
- Why might some people be more or less interested in discussing this type of information?
- Did the installer mention the following? If yes: what did they say, how interested were you in this. If no: would you have been interested in this type of information?
- Boiler efficiency. What do you understand boiler efficiency to mean?
    - Impact on environment
    - Impact on finances/ running costs
- Were you offered/ did you discuss any other type of boiler or heating system other than a combi boiler?
    - If yes: what, and what was discussed?
    - If no: would you have been interested in hearing about alternatives? why/ why not?
- Other than the installer, did you get any more advice or information about your boiler installation? Where from?
    - Prompt: online sites, forums or blogs, installers, family/ friends/ neighbours

Awareness of Boiler Plus

- Does anyone recall Boiler Plus being mentioned by your installer or in any paperwork you received?
    - If yes, what was mentioned?

STIMULUS: explanation of Boiler Plus and technologies.

- Were any of these discussed?
    - If yes, what was discussed?
- Is this the type of information that you would have been interested in knowing about or discussing at installation? Why/ why not?
- To what extent would you like to know which technology is put in place? Why/ why not? Would you want to discuss this with the installer?
- How much information would you like about the technology that's installed?
- Were there any discussions about the energy efficiency of the boiler?
    - If yes, what was discussed?

Heating Systems

- If you had a query about your central heating where would you get information or advice from?
    - Prompt: online sites, forums or blogs, installers, family/ friends/ neighbours
- When were the radiators in your house installed or last upgraded?
    - Were you involved in this?
    - If involved, was this part of a wider project installing or upgrading central heating throughout the house, or on an individual basis with a single radiator being replace?
- If not upgraded since you moved in, have you considered upgrading them? what have you explored? what has stopped you going ahead?
- Does your heating system radiators, pipes and underfloor heating) get regular DIY care or service?
    - Prompt: yearly professional service, DIY bleeding to remove air gaps in radiators, professional flushing pipes.
- How efficiently do you think your radiators work?
- Do all of your radiators heat up at the same time or is there a long delay between them all getting hot? Do some not get hot at all?
- Can you remember if your installer asked you any questions about this or checked this themselves when your boiler was installed?
- Has anyone else looked at this, e.g. when servicing your boiler?
- Did your installer mention balancing/ powerflushing? Would you expect them to have done this when your boiler was replaced? why/ why not? would you have been interested in discussing this? why/ why not?
- Do you bleed your radiators? how often? why/ why not?
- Where would you go if you wanted to find more information about this?
- Do you have valves or any other controls that let you control how much heat goes to each radiator?
- Can you remember if your installer asked you any questions about this or checked this themselves when your boiler was installed?
- Has anyone else looked at this, e.g. when servicing your boiler?
- Would you expect them to have done this when your boiler was replaced? why/ why not? would you have been interested in discussing this? why/ why not?
- Do you use these controls? in what ways/ when?
- Where would you go if you wanted to find more information about this?

Finally, I'd like to revisit something that we touched upon earlier - smart controls.

- As far as you can remember, were smart controls mentioned by your installer? What kinds of things did they say about smart controls?
- As far as you know, does anyone have smart controls on their boiler? here are some pictures of some examples, but there are lots on the market.

STIMULUS: smart controls including pictures

- When did you get smart controls? (with before the new boiler, with it, or installed since?
- If you have one, what kinds of features do you use/ not use? why/ why not?
- Why might some people not want to use them? PROBE: Technical confidence, Wi-Fi issues, potential to break, don't have a smart phone or computer, happy with a traditional thermostat.

Wrap up

- What one thing we've spoken about tonight would you tell someone else about?
- Anything else you'd like to mention that we haven't covered?
- Any questions?

Thank you for taking part.

Appendix G Consumer Focus Group Stimulus

Boiler Plus

Boiler Plus is a standard which was introduced by the UK Government's Department for Business, Energy, and Industrial Strategy (BEIS) in 2018.

The aim of the policy is to raise the minimum standards for boilers installed in existing dwellings in England. It introduced a new minimum performance standard for all domestic gas boilers of 92% ErP. It also requires all boilers to be fitted with a timer function, and a thermostat to control the temperature of the heating.

For gas combination boilers an additional energy efficiency measure is required.

These energy efficiency measures are sometimes already built into the boiler or are devices which can be installed alongside a new boiler.

The previse measure to be installed will vary from property to property based on the boiler set up, and type of property.

Examples of Smart Controls

Consumers are shown a number of publicly sourced pictures (Google Search) of smart controls. Different brands, shapes and sizes are shown to support recognition.

Making radiators run more efficiently

Hydraulic Balancing: Balancing ensures the distribution of water is the same in all radiators so all the room heat up evenly. This reduces the risk of over or under heating rooms by ensuring each room meets the set point temperature at the same time,

Power Flushing: Over time, rust and dirt can gather in radiators, which can form sludge. The areas of radiator blocked by sludge do not heat up properly, so the home is not as warm, and the heating is less efficient. A power flush uses chemicals to clear this sludge.

Bleeding: air can be trapped in the radiators. This means hot water cannot fill the radiator completely, due to pockets of trapped air. The trapped air rises to the top, so the top of the radiators will be cooler than the bottom. Bleeding is the process of releasing the trapped air so the radiators heat up evenly. It is a normally a DIY job for homeowners, rathe than an installer led job.

Controlling the temperature of the radiator.

The consumers are shown a range of TRV (Thermostatic Radiator Valves) in various shapes and sizes.

Individual radiator controls: These allow you to change how much hot water flows into each radiators. For example this means you can send more heat to a room which is naturally colder, or send less heat to a room which is not used as much. Thermostatic controls let you set the precise temperature in each room.

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