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RESEARCH INTO MAXIMISING THE BENEFITS OF SMART METERING FOR CONSUMERS

Qualitative research with smart meter consumers

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Contents

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Executive summary

Smart meters are replacing traditional gas and electricity meters as part of a national infrastructure upgrade that will make our energy system more efficient and flexible, enabling us to use more renewable energy and achieve net zero greenhouse gas emissions by 2050.

Smart meters are bringing significant benefits to consumers by ending the need for manual meter reads and estimated bills, while enabling them to see how much energy they are using and what it is costing in near-real time via an In-Home Display (IHD). Smart meters are also benefitting prepayment consumers by enabling them to top-up remotely without leaving home and track their balance easily, so they do not unknowingly run out of credit. They also allow energy suppliers to see when customers have gone off supply and so offer timely support.

This research was commissioned by the Department for Business, Energy and Industrial Strategy (BEIS) to better understand the full range of benefits experienced by consumers who might experience barriers to realising benefits from smart metering (referred to as vulnerable consumers in this research) and help ensure these benefits can be maximised for a wide range of consumers. BEIS commissioned NatCen Social Research to carry out this qualitative research. It consisted of 80 in-depth interviews with consumers in vulnerable circumstances. Four deliberative workshops were then conducted to test broad policy ideas drawn up by BEIS in response to some of the opportunities for further realising the benefits of smart metering identified in the interviews.

About consumers who might experience barriers to realising benefits from smart metering

Four main barriers to realising benefits from smart metering were included in the research:

- Those experiencing financial barriers to paying for energy.
- Those with health conditions or disabilities that affect energy needs.
- Those lacking control or agency over energy use and costs.
- Those with comprehension or engagement barriers.

Getting and using smart meters

Getting a smart meter installed was not always an active choice, as some consumers inherited one when they moved to a new property. Where it was an active choice, motivations for getting a smart meter included wanting more awareness and control over energy consumption, the convenience of automated and accurate bill readings (for credit consumers) and remote top-ups (for prepayment consumers). The environmental benefits of conserving energy consumption at home were also cited. Participants' vulnerabilities sometimes informed their

decisions. For example, people in financial difficulties wanted more information and control over energy costs.

Guidance provided by energy suppliers and installers generally facilitated a better understanding of how to use smart meters among those who needed it. However, not everyone received this guidance and information, leading to a poor understanding of how to use their smart meter. For those with low digital literacy in particular, this resulted in unrealised benefits.

Participants had varying degrees of engagement with smart meters and IHDs. Levels of engagement were affected by vulnerabilities, including financial difficulties, low digital confidence, mobility issues and having dependants. For example, participants who were financially struggling tended to engage with their IHD in order to monitor their energy consumption and costs. However, other drivers such as prioritising comfort, habitual behaviours and wanting to reduce energy waste were also important in influencing smart meter use and levels of engagement with the IHD. In addition, participants sometimes moved between different levels of engagement, either over time or as their vulnerabilities shifted, particularly their financial situation or mental health. For example, participants whose incomes had dropped due to the COVID-19 pandemic began to monitor their energy consumption more.

Experiences of smart meter benefits

Five key groups of smart meter benefits were reported and are described below. These benefits reflected varying levels of use and engagement with smart meters and relied on different degrees of behaviour change. ‘Passive benefits’ required little or no changes in behaviour, while ‘active benefits’ required a greater degree of behaviour change, ranging from simply reading the IHD to acting on the information it provided.

Passive benefits included the **convenience** of credit consumers no longer needing to provide meter readings, which was particularly valued by those with health and mobility issues. Avoiding the need to interact with energy suppliers for meter readings or in relation to estimated bills was also seen as convenient. For prepayment consumers, smart meters offered the convenience of topping up remotely. **Peace of mind** came from accurate and predictable bills for credit consumers, with those on low incomes feeling less worried about getting into debt due to high bill estimates. Prepayment consumers reported not having to worry about running out of credit at inconvenient times because they knew they could top up quickly online or via their energy supplier’s app. This was particularly reassuring at the height of social distancing measures during the coronavirus (COVID-19) pandemic.

Active benefits that required more engagement included having a **better awareness of energy use and costs**. While for some participants the information gleaned helped them feel more informed without acting on it, others realised benefits by using the information to exercise **control over energy consumption and costs**. This included using less energy by turning off and unplugging appliances, buying more energy-efficient appliances and reducing energy waste. These behaviour changes were often driven by specific vulnerabilities, such as financial

difficulties and living in cold homes that participants said they struggled to keep warm due to draughts or ineffective heating systems. A final benefit of smart metering was **feeling able to contribute to environmental goals** by enabling energy conservation.

Key enablers to realising active benefits were having a smart meter operating in smart mode and an IHD, receiving an explanation of how to use the IHD or any associated smartphone app and having digital access in order to use online top-up options. Participants also needed to be motivated to change their energy use behaviours and have the capability to do so. This included understanding smart meter features and what they offer, as well as a basic level of digital literacy or confidence to engage in and act on the information provided.

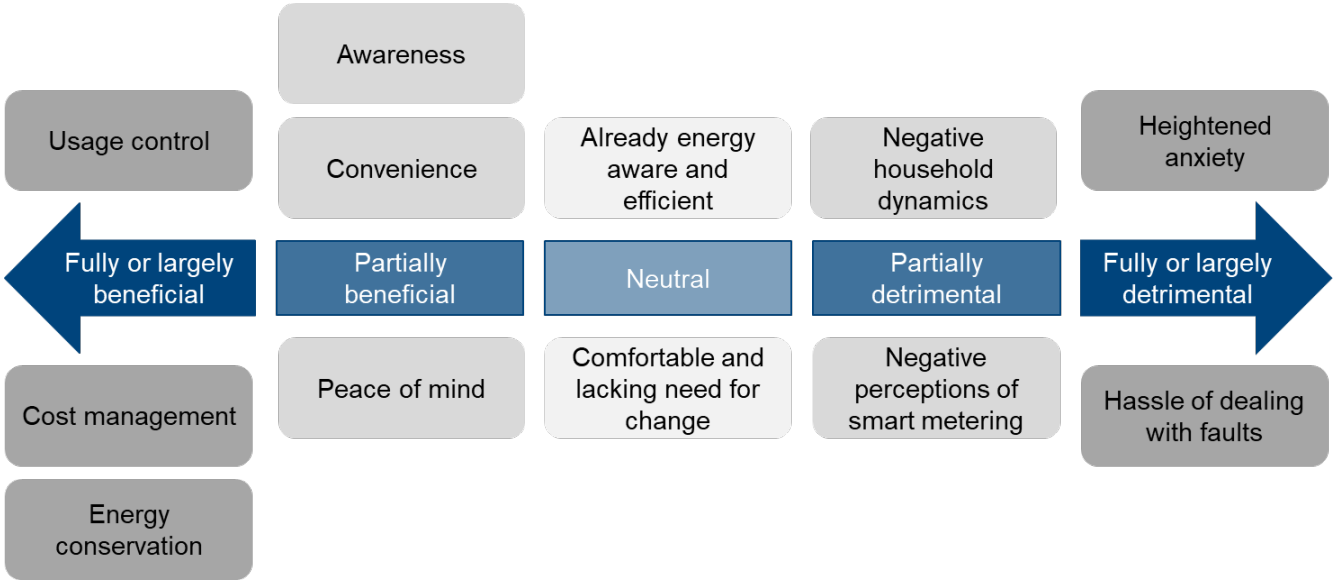
Detriments and barriers to experiencing smart meter benefits

Experiences of smart meters were wide-ranging and as well as the benefits discussed above, some participants described benefiting less than they wanted to or experiencing neutral or detrimental impacts. This is illustrated in the diagram below. Where neutral impacts were reported, this reflected that not all participants felt the need to actively engage with their smart meters and/or IHD or thought they could benefit from them. This was often because they were content with their energy use and expenditure or were prioritising other needs.

For participants in this research, any detriments of smart metering were more limited than the benefits. They were usually experienced alongside the benefits, which often outweighed negative experiences. Detriments included heightened anxiety due to greater awareness of energy costs; friction in the household due to disagreements over energy usage; frustration with faults; and a shift towards mistrust in smart metering driven by perceived differences in use and cost. Interestingly, no detriments were noted in relation to the coronavirus (COVID-19) pandemic by the participants of this research. Smart meters were reported to have helped participants to monitor usage more closely while social distancing measures required them to stay at home more. This was the case even where the pandemic brought about a loss of income.

Participants' vulnerabilities interacted with the experiences shown in the spectrum below in different ways. This could enhance positive experiences. For example, the benefits of convenience and peace of mind were particularly meaningful for consumers with mental and physical health conditions. Those who struggled to keep their homes warm also greatly valued increased awareness and control over their energy use and costs. This was not always experienced as a benefit. For example, in a small number of cases, existing mental health issues and experiences of financial difficulty could exacerbate reported detriments.

Figure 0.1: Spectrum of smart meter experiences



Suggestions for maximising smart meter benefits

The barriers and enablers to behaviour change discussed in this report highlight a range of areas where support could be targeted to facilitate a behavioural shift towards more active use of smart meters and the realisation of benefits by vulnerable consumers.

Participants' own suggestions for improvement largely focused on improving the functionality and accessibility of IHDs. It is important to note that some of these suggestions demonstrate a lack of awareness of existing products and features, such as setting budgets, or the availability of Accessible IHDs (AIHDs)[1] and suggest a need for greater promotion and education. Participants' suggestions also highlighted different preferences around the information provided by IHDs. Some participants, particularly those with low digital skills and confidence, wanted the functions and language of IHDs to be simpler to make the device more user-friendly and accessible. In contrast, there was appetite among those with higher levels of digital skills for IHDs to output more sophisticated analytics on energy consumption, extending beyond the current requirements for IHDs. Furthermore, the evidence suggests that myth-busting could help address negative perceptions consumers may develop around smart meters (for example that they add to energy costs) to encourage consumers in these circumstances to engage with their smart meters.

Participants emphasised the importance of more detailed and tailored information and support on how to use their IHDs for realising the benefits of smart meters. In order to explore these comments further, BEIS developed some broad potential policy ideas to act as stimulus for further discussion. The ideas focussed on delivering enhanced support before, during and after smart meter installations and had a particular focus on supporting effective engagement with

[1] Accessible IHDs are different models of In-Home Displays aimed to be more accessible to consumers with different accessibility needs. AIHDs are designed to enable the information displayed to be easily accessed and presented in a form that is clear and easy to understand including by consumers with impaired: sight; memory and learning ability; perception and attention; dexterity.

the IHD to help people manage their budgets and use energy to better meet their comfort needs.

These broad ideas were tested in four deliberative workshops. They were well-received by participants, who welcomed receiving demonstrations and guidance on their IHDs. While the idea of pre-installation advice was thought to have some merits, it was thought that on a practical level advice would be most helpful during and shortly after installation. Participants emphasised the need for the available support to be varied in format to accommodate different needs, for example, using written, visual and interactive in-home and/ or online resources. While there was support for receiving advice in-person, the idea of being signposted to a range of resources appealed to consumers due to the convenience of being able to access resources whenever they wanted.

1 Introduction

This report presents findings from a qualitative study carried out by NatCen Social Research on behalf of the Department for Business, Energy and Industrial Strategy (BEIS). Using 80 in-depth interviews and four deliberative workshops, the research sought to consider the specific uses and benefits of smart meters for consumers who might experience barriers to realising benefits from smart meters (referred to as vulnerable consumers in this research), together with any potential barriers faced by these consumers and opportunities to improve the consumer experience to further enable benefit realisation.

Context for the research

Smart meters are replacing traditional gas and electricity meters as part of a national infrastructure upgrade that will make our energy system more efficient and flexible, enabling us to use more renewable energy and reduce our reliance on fossil fuels.

Smart meters are also bringing significant benefits to consumers by ending the need for manual meter reads and estimated bills, while enabling them to see how much energy they are using and what it is costing in near-real time via an In-Home Display (IHD). Smart meters also bring significant benefits to prepayment consumers by enabling consumers to top-up remotely without leaving home and track their balance easily, so they do not unknowingly run out of credit. They also allow energy suppliers to see when customers have gone off supply and so offer timely support.

Energy suppliers are primarily responsible for engaging with their customers regarding smart metering and will offer and arrange installations. To ensure consumers receive a positive installation experience, a Smart Metering Installation Code of Practice (SMICoP) was established, which energy suppliers are required to adhere to[2]. After 1st September 2021 these obligations came under the Retail Energy Code (REC)[3]. This includes steps to identify and meet the needs of consumers who might experience barriers to realising benefits from smart meters, provide a demonstration of smart metering equipment and offer energy efficiency guidance.

In addition, energy suppliers are required to offer an IHD that meets accessibility needs, including for those with impaired sight, memory and learning ability, perception and attention, and dexterity. Recognising that these consumers may require additional support to realise the full benefits of smart metering, BEIS has also worked with consumer groups and energy suppliers to develop a framework for post-installation support, which includes signposting to

[2] In April 2022, SMICoP changed its name to the Smart Metering Implementation Schedule (SMIS). Information on SMIS can be accessed at https://recportal.co.uk/smis

[3] The Retail Energy Code can be accessed at https://www.retailenergycode.co.uk/

sources of support and, where further assistance is needed, providing a dedicated point of contact.

Previous research has focussed on the general consumer experience with limited scope to explore the experiences of consumers who might experience barriers to realising benefits from smart meters specifically. Against this backdrop, BEIS identified the need for more detailed research to explore the realisation of benefits among consumers who might experience barriers to realising benefits from smart meters, to help ensure all consumers benefit from their smart meters.

Research aims

The aims of this study were to:

- Identify and classify the range of smart meter benefits for consumers who might experience barriers to realising benefits from smart meters, including the ways in which smart meter technology is being used
- Understand if, how and why those benefits are experienced, for whom and in what circumstances
- Formulate strategies to enhance benefits realised by consumers who might experience barriers to realising benefits from smart meters

The findings from this research will be used by BEIS to monitor experiences, and if necessary develop policy, ensuring that the positive benefits of smart metering can be maximised and felt by all, and that any negative impacts are mitigated as far as possible.

Research methodology

The research adopted a qualitative approach to capture rich, detailed and contextualised insights into the views and experiences of consumers in vulnerable circumstances. It consisted of 80 in-depth interviews which took place by telephone or video-call, depending on participant preferences. Interviews took place between October 2020 and February 2021.

A purposive approach was used to design the sample of interviews, drawing on existing evidence and findings from a stakeholder workshop. The sample was intended to achieve a mix of consumers across four key vulnerability groupings and other socio-demographic and energy-related characteristics across Great Britain. A breakdown of the achieved sample is shown in Table 1.1, with further details in Appendix B.

Characteristics of consumers who might experience barriers to realising benefits from smart meters

The research focused on four main vulnerability groups as the primary criteria for selection, listed below. In addition, the selection criteria for consumers to take part in this research were guided by consumers:

- Being able to benefit from smart metering.
- Being unable to or experiencing difficulties benefitting.
- Being at risk of detriment from new smart meter features or innovations.

The four main groups of barriers were:

- Consumers with financial barriers to paying for energy including low-income groups and those struggling to pay for energy, including those on prepayment meters.
- Consumers with specific energy needs arising from health conditions or disabilities including three condition groupings (broken down in Table 1.1) identified by the National Institute for Health and Care Excellence (NICE) whose energy use, ability to take meter readings or ability to pay for energy are affected by a health condition or disability.
- Consumers who lack control or agency over their energy use or costs such as those who find it difficult to heat their home (due to costs or living in an inefficient home with a low energy efficiency rating), private renters and people living in large households.
- Those with comprehension or engagement barriers including people with fewer than five GCSEs or equivalent, low digital skills/ access, dexterity issues, and those with language barriers.

Due to social distancing and lockdown measures introduced in response to the coronavirus (COVID-19) pandemic, the intended recruitment approach, which was to use face-to-face free find recruitment, was not possible. Instead, a specialist recruitment agency was engaged and sought opt-ins from its databases of contacts and each interviewee received a £50 gift voucher as thanks for their participation. A key challenge of this recruitment approach was difficulty accessing participants with English language barriers, which were identified as a potential comprehension barrier for engaging with smart meters and IHDs. To widen the pool of people hearing about the research, it was promoted through a national advice organisation, however this approach did not deliver additional interviewees in the time available. Therefore, the smaller sample of people with English language barriers is a limitation of the findings from this research.

Table 1.1 Characteristics of the achieved sample

Meta-grouping	Sub-group	Achieved
Income/ finances	Low household income (£15,000 annual income)	26
	Struggles to pay bills/ keep house warm	39
	Prepayment meter	37
Health condition or disability	Respiratory conditions	13
	Cardiovascular conditions	14
	Depression/ anxiety conditions	15
Barriers to comprehension or engagement	Bill payer has fewer than 5 GCSEs, or equivalent	30
	Low English proficiency	2
	Low digital skills/ access	21
Housing/ control over energy usage	Private rental sector	20
	Living in a cold home	32
	Living in a large or shared household	44

In order to explore interview insights further, BEIS developed some broad potential policy ideas to act as stimulus for further discussion and development across four deliberative workshops. Each group represented consumers in specific vulnerable circumstances and consisted of up to six participants who had taken part in the interviews (a total of 20 across the groups, as shown in the sample breakdown in Appendix C)[4]. The 90-minute deliberative workshops took place between June and July 2021 and were delivered online due to social distancing measures as a result of the coronavirus (COVID-19) pandemic. Due to only being able to deliver the workshops online, there is a smaller sample for those with lower digital skills or access.

Topic guides, designed in collaboration with BEIS, were used to guide the interview discussions and the deliberative workshops. The themes covered for the interviews are presented below, with the workshop guides also focusing on the broad potential policy ideas developed by BEIS (discussed further in Chapter 6).

- Personal circumstances, how they affect energy usage and smart meter use

[4] The final workshop, which was with the "Barriers to comprehension or engagement" group, included only two participants due to non-attendance. The insights from this workshop are therefore more limited.

- Decision-making around having smart meters
- The range of benefits experienced and what has enabled them
- Unrealised benefits, detriments and the drivers for these
- Suggestions for enabling vulnerable consumers to get more out of smart meters

Both interviews and deliberative workshops were analysed using NatCen's Framework approach which allows in-depth exploration of the information by case and by theme.

Interpreting the findings

This research presents findings from a large and diverse qualitative sample, and provides in-depth insight into the range of experiences, views and suggestions of consumers in vulnerable circumstances. The report avoids giving numerical findings, since qualitative research does not support statistical analysis. Wider inference can be drawn on the range of issues discussed rather than on the basis of prevalence. This research has been carried out during the coronavirus (Covid-19) pandemic. As such, telephone and video interviews and workshops have been used in place of face-to-face data collection. This is not expected to have altered the findings, but may have affected the achieved sample specified in Appendices B and C.

Verbatim quotations and case illustrations are used to illuminate the findings. Interview quotes are labelled to indicate participants' energy payment method, age group and key 'vulnerability'. Workshop quotes give the workshop number and key 'vulnerability'. Further information is not given in order to protect the anonymity of research participants, and for this purpose case illustrations contain pseudonyms instead of participants' real names. Quotes and case illustrations are drawn from across the sample.

2 Getting a smart meter

This chapter explores how the participants of this research came to have smart meters, including their motivations for having them. It then discusses experiences of the installation process.

Key findings:

- Key motivations for getting a smart meter included gaining more awareness and control over energy consumption; wanting the convenience of automated meter readings for credit customers and remote top-up for prepayment customers; and helping the environment through energy conservation.
- Participants' vulnerabilities sometimes affected these motivations, with people in financial difficulty hoping to benefit from a better understanding of and control over their energy costs. Convenience was emphasised by people with health conditions and young children, who found it difficult to take meter readings or to top up at a shop.
- Guidance from energy suppliers generally helped participants to better understand how to use their smart meters and IHDs. Among participants who did not recall receiving any guidance, this impeded their understanding and sometimes led to unrealised benefits or detriments, particularly if they were less digitally confident.

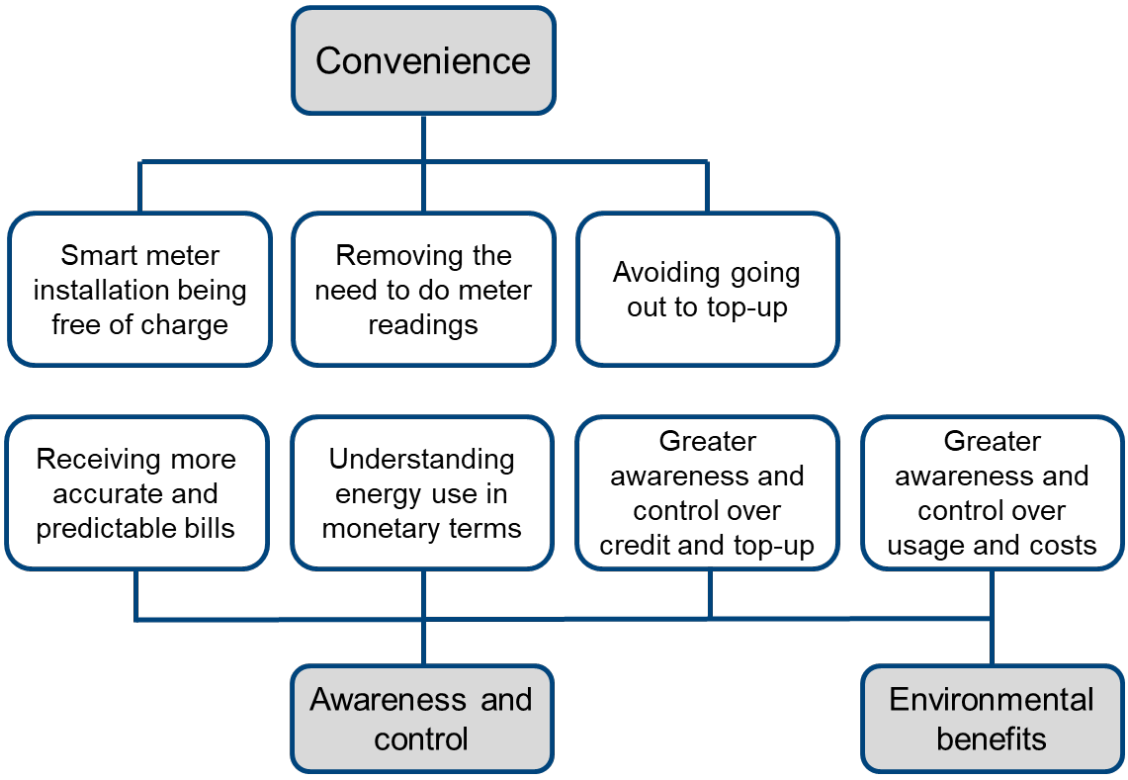
Motivations for getting a smart meter

This study included participants who had recently had smart meters installed (post-March 2020), as well as those who had smart meters installed pre-March 2020. Participants either moved into a property with pre-existing smart meters, proactively requested a smart meter from an energy supplier or accepted the offer of one from their energy supplier.

As illustrated in Figure 2.1, motivations for getting a smart meter amongst those who felt they had a choice, related to:

- Gaining more awareness and control over energy consumption
- Wanting the convenience of automated meter readings and remote top-up
- Helping the environment.

Figure 2.1 Motivations for getting a smart meter



Awareness and control

Gaining stronger understanding and control of energy consumption was a key motivation for getting a smart meter across the sample. Participants hoped to do this in the following ways:

- Understanding the monetary costs of energy use in simple terms.
- Greater awareness and control over energy consumption through near real-time information. For those who were financially struggling this was motivated by a desire or need to save money, while others were driven by environmental reasons, curiosity, or the wish to educate dependents on the importance of energy efficient behaviours.
- To have a reliable reference point for energy usage through the IHD, thereby offering greater bill predictability. This was particularly important for people who had experienced 'bill shock' in the past and people with variable incomes.
- Greater awareness and control over top-ups. Prepayment customers expected to benefit from being able to view near real-time information on their balance through their IHD rather than having to check their meter, which could sometimes be difficult to access. This was thought to be of particular benefit amongst those who had previously run out of credit, and subsequently self-disconnected[5], after failing to realise their balance was running low or due to difficulty accessing a top-up shop.

Convenience

For some participants, having a smart meter installed was convenient insofar as it was free of charge and they thought they "*might as well*", or were persuaded on this point by their energy

[5] "Self-disconnection" is when a Domestic Customer uses a Prepayment Meter and experiences an interruption to their electricity supply because the credit on the meter has been exhausted.

supplier. Others expected smart meters to bring convenience in other respects. Here, credit and prepayment customers expected to benefit in different ways.

- For credit consumers, avoiding the need to manually submit meter readings was expected to be convenient where existing meters were not easily accessible, either due to their location or due to participants' health conditions. Among those with mobility issues, accommodating engineers to take meter readings could also be challenging. In addition, convenience was a motivation for those wishing to avoid the burden of submitting meter readings and those who had previously received inaccurate estimated bills due to forgetting to take meter readings.
- Prepayment customers were motivated by being able to view their current balance and top-up remotely. This was expected to be more convenient than visiting a top-up shop which could be inconvenient. Respiratory problems or physical pain could also cause difficulty accessing meters or travelling to a top-up shop, especially in bad weather.

Environmental benefits

Environmental motivations for getting a smart meter were cited both by people who were motivated to conserve energy for financial reasons and those who were driven purely by environmental concerns. Some mentioned their awareness of this benefit being prompted by smart meter advertising. By closely monitoring their energy usage, these participants expected to identify any wasteful behaviours and adopt newer and more energy efficient habits, and to thereby "do their bit" for the environment.

Experiences of information and advice during the installation process

Energy suppliers and their installers are responsible for explaining the information available on the IHD to consumers. It is their responsibility to present information in an inclusive and accessible way to vulnerable and prepayment customers, and to offer an Accessible In-Home Display (AIHD) to those who might benefit from it. Participants who reported receiving guidance during the installation process did so through an installer and/ or in writing.

The guidance provided by installers was found to be helpful where they demonstrated IHD functions, for example emergency credit, a supplier smart meter smartphone app – where offered, and if they took the time to answer customers questions. However, some participants complained that their understanding was negatively affected where installers went through their explanations too quickly or did not demonstrate the IHD.

> *"They give me a booklet and said, 'Do this, this and this,' but they were so quick, in and out like Usain Bolt"*[6]
>
> Prepayment customer, age 35-44, social renter

Where written guidance was provided, this constituted a leaflet, email or webpages and was comprised of user instructions and money-saving advice. However, there were also participants across a range of energy suppliers who reported receiving no written guidance.

[6] This installation took place before the coronavirus (COVID-19) pandemic

This appeared to affect understanding among participants who had low confidence or motivation around smart meter use. Even where written guidance was provided, some participants (though not exclusively those with comprehension barriers) complained that it was not written in plain English or that they would have preferred video guidance.

> *"It wasn't light reading, and it was quite confusing because in some ways, I'm not technically minded [...] Press that for your gas, that for your electric, and that's all you need to do,' but it turns out it was a lot more complex than that [...] I've never had that explained to me."*
>
> Credit customer, age 35-44, low income

While receiving guidance from an installer could be beneficial, some participants found both smart meters and IHDs to be straightforward enough to understand without it. Similarly, among those who received less or no guidance, some described smart meters as "self-explanatory". Others preferred to ignore the guidance and figure it out themselves. Those without guidance and in need of help, drew on a friend, relative or search engine.

Poor or limited understanding persisted for one group of participants and a lack of guidance at installation was cited as a key reason. This was not restricted to those with low digital confidence or fewer qualifications, it affected participants across the sample. However, for those with low digital confidence the problem could be more pronounced. It should be noted that participants were not necessarily dissatisfied about this, despite not knowing everything their IHD could do, they either said it did everything they wanted or preferred not to engage with it further due to a dislike of electronics.

> *"I'm not good with devices [...] I just prefer to still go outside and check my box"*
>
> Prepayment customer, age 18-34, low digital inclusion

Others were less satisfied, as they wanted to get more out of their IHD but did not know how. This was a problem both for participants with low digital confidence and those who had moved into a property with a pre-existing smart meter and had thereby missed out on guidance provided at installation.

> *"No, they [the installer] just left. They literally came, put it on, left, and that was it […] I genuinely don't know how to use it. I wish I did […] I still don't know anything all these years later."*
>
> Credit customer, age 45-59, low digital inclusion
>
> *"The landlord should have maybe give us information that he initially received getting the meter in [...] Just more information about how it works, how you can save, and like you say, not everyone is on the internet. So if they had a little booklet or something like that."*
>
> Prepayment customer, age 35-44, low digital inclusion

3 Smart meter use

This chapter explains how participants of this research used their smart meters and IHDs, as well as the different levels of engagement exhibited.

Key findings

- The nature and extent to which participants engaged with their smart meter varied. Participants could be grouped into those who did not engage ('non-engagers') and those who did ('engagers') to varying degrees, as either 'readers' or 'glancers'.
- Levels of engagement with smart meters were affected to some extent by participants' vulnerabilities, including financial difficulties, low digital confidence, mobility issues, anxiety issues and having dependants. Other drivers such as prioritising comfort, habitual behaviours and wanting to reduce energy waste were also important.
- Participants sometimes moved between levels of engagement, either over time or as their vulnerabilities shifted, particularly their financial situation and mental health.

Levels of engagement with smart meters

This section explores levels of smart meter use among interview participants. It should be noted that rather than engaging with the meter itself, participants tended to interact with the more consumer-facing components of smart metering; the IHD (where it was provided and working[7]) or their supplier's smart phone app, where offered. This was by virtue of IHDs and supplier apps offering a range of everyday functionality, such as the ability to monitor and pay for energy. Interactions with the smart meter itself, were limited to checking the meter against the IHD or app to validate energy use and billing accuracy.

The nature and extent to which participants engaged with their IHD and supplier app varied and was affected to some extent by their vulnerabilities. These vulnerabilities included financial difficulties, low digital confidence, mobility issues, anxiety issues and having dependants. Other drivers such as prioritising comfort, habitual behaviours and wanting to reduce energy waste were also important in influencing engagement.

Based on the level and nature of interaction, participants could be grouped into those that did not engage with the smart meter or its components ('non-engagers') and two groups that did to varying degrees ('engagers'). This latter group included those who occasionally engaged with their IHD or app ('glancers') and those who engaged more fully with these components ('readers'). It is also important to note that participants sometimes moved between groups either over time or as their vulnerabilities shifted, particularly their financial situation and their mental health.

[7] Under their licence conditions, suppliers must make an unconditional offer of an IHD to domestic consumers

The sub-sections that follow describe the groups of non-engagers and engagers and what shaped their interaction with their smart meter. The benefits and barriers experienced by these different groups are discussed further in Chapters 4 and 5 respectively.

Engagers

Participants who engaged with the IHD and supplier app used them to monitor their energy usage, expenditure, and to pay for their gas and/ or electricity. They did this for three reasons:

- To understand their patterns of use and expenditure, such as monthly trends and whether their usage was in line with their direct debit payments
- Exploring the energy consumption of different appliances[8]
- Topping-up their prepayment meter.

Participants who engaged with the IHD liked how the information was presented on the device and how easy it was to track their energy usage and costs. They also valued being able to pay for their energy using an app. The features participants liked are summarised in Table 3.1.

[8] Though IHDs cannot directly state how much energy each appliance uses, participants reported experimenting with turning all but one appliance off to get a rough sense of this.

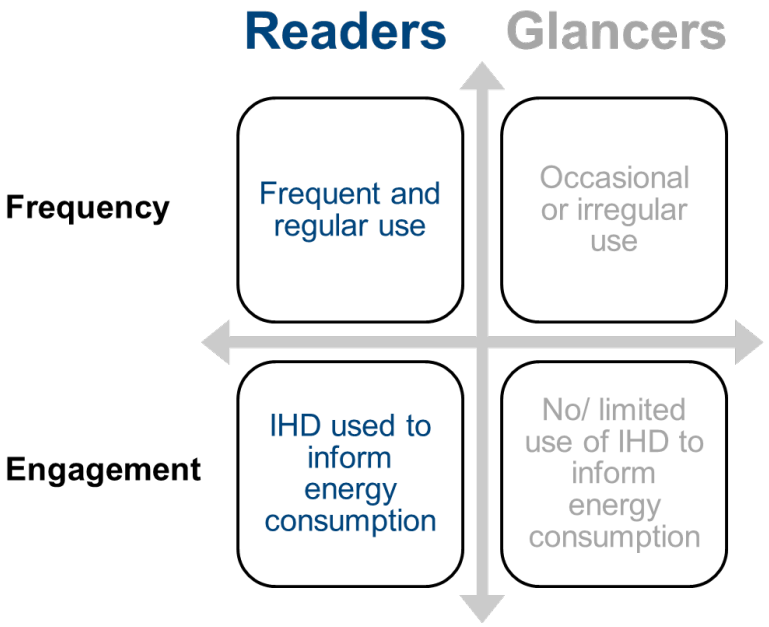
Table 3.1 Smart meter features participants liked

Feature	Aspects participants liked	How they helped
Presentation of information	Summary of energy consumption on the IHD using colourful graphs and icons	Made it easier to understand and more visually appealing
	Split screens for different energy sources (i.e. gas and electricity) on the IHD	Made it easier to distinguish energy sources
	Usage in pounds and pence, not just in energy units on the IHD and app	Made the data more relevant and relatable
Tracking functions	Ability to monitor use and costs daily, weekly or monthly through the IHD	Made it easier for credit consumers to track patterns of energy usage
	Daily energy use targets on the IHD	Helped credit consumers manage and plan their energy use and budget
	High usage alerts on the IHD	Helped credit consumers manage consumption
	Low credit alerts on the IHD	Meant prepayment customers were less likely to run out of credit at inconvenient times and enabled them to estimate how long they had before needing to top up
Help and payment	Ability to top-up through an app	Made it more convenient for prepayment consumers to top up
	'Help chat' function on an app	Made it quicker and easier to contact suppliers

Participants who engaged with the IHD fell into two further groups in terms of their levels of engagement; those with limited engagement ('glancers') and those who were more fully engaged ('readers'), with some participants moving between groups as their circumstances

changed, as discussed in more detail below. Figure 3.1 below illustrates the differences between 'glancers' and 'readers' by frequency of IHD use and type of engagement.

Figure 3.1 'Readers' and 'glancers'



For 'glancers', monitoring energy use was not important and so the IHD had limited impact on decision-making and behaviour around energy consumption. As with 'non-engagers', 'glancers' included people who were contented with their current energy awareness, use and expenditure (particularly those who were financially secure) and/ or unable to change their energy use behaviour. For example, those who needed to have the heating on all day for health issues. As such, 'glancers' tended to use the IHD less frequently, sometimes avoiding it altogether and instead using it at times when they were likely to use a lot of energy (e.g. the winter). As a result, their IHD was sometimes stored out of sight in cupboards, garages and spare bedrooms. Even when they did look at their IHD, it did not generally influence their energy use behaviours, as demonstrated in Case Illustration 3.1, although it sometimes led to small-scale energy efficiencies being adopted, such as how often the washing machine was used.

Case Illustration 3.1 A 'glancer' (Credit customer, age 75 +, cardiovascular condition)

Alison is in her mid-70s and lives with her husband in a house they own. Although her household income is relatively low, she considers herself financially comfortable because they have paid off the mortgage, they both get a pension and she can comfortably pay her energy bills. She has an IHD, which she keeps in her kitchen. However, she rarely makes a conscious decision to look at it because she is not struggling to pay her bills and says she is "*not a techy*". She does sometimes find herself looking at it when she is in the kitchen, but the information does not affect how she uses energy.

'Glancers' use of their energy suppliers' smartphone app was limited to just topping-up, particularly where they felt it was less accurate than their IHD; reported a time lag in the app registering their top-up; and/ or said it did not provide real-time information on energy use.

Even when 'glancers' did use it to top-up, the app tended not to be their primary way of doing this. For example, participants on low incomes mentioned that they would not use their app to top-up smaller values because their energy supplier required a minimum spend[9]. Other 'glancers' mentioned combining visits to the shops and use of the app to top-up for reasons to do with habit and routine noted earlier.

Case Illustration 3.2 A 'reader' (Prepayment customer, age 35-44, struggles to pay bills)

Rebecca is an owner occupier in her 40s and lives with her elderly mother. Since suffering a stroke a few years ago, Rebecca's mother is mostly confined to her bedroom and needs the heating on all day as her circulation is poor. Rebecca needs to ensure her mother is stimulated so she keeps the radio and the TV on all day. Even though Rebecca works, she struggles financially to pay for her energy bills and so looks to ways in which she can make savings where she can, without compromising her mother's health. She has found the IHD helpful as a cost saving tool.

'Non-engagers'

'Non-engagers' were participants who did not interact with their smart meters, IHDs or energy supplier apps because they felt either unwilling to or unable to do so. Those who felt unable lacked the confidence to use smart meters, particularly if they considered themselves to have low digital literacy, were aged 75 and over, or questioned the reliability of the IHD in providing accurate energy consumption information, as shown in Case Illustration 3.3.

Case Illustration 3.3 Participant who questions reliability of IHD (Prepayment customer, age 35-44, lives in a cold home)

Sanjay is in his late 30s, lives in a privately rented flat and has a prepayment meter. However, he does not feel particularly confident about using his smart meters. He does not recall receiving any verbal or written information about how to use his IHD when it was installed, and found limited information on this online. He knows it measures energy consumption but is not sure how he can access information about how much that consumption is costing him. He used to look at the IHD regularly when he first got it to find out which appliances were using the most energy but does not use it now as he does not think it is accurate. This is because he noticed over time that his IHD was registering high energy consumption even when he made an effort to reduce this,

"[I don't] trust it [IHD] - after all the efforts we were making, it wasn't making a difference."

In some cases, unwillingness to use the IHD stemmed from anxiety around knowing more about energy consumption and costs, often in combination with financial difficulties which made it overwhelming to engage with this information.

[9] Minimum top-up amounts vary amongst suppliers

> *"I kept looking at it [IHD] and kept freaking out that we were using so much electricity"*
>
> Credit customer, age 45-59, low digital inclusion

In contrast, there were participants who did not engage with the IHD because they were contented with their energy use and costs and so found the information presented by the IHD to be of limited value. This included participants who prioritised household comfort over costs, felt they were already aware of how they used energy and were as energy efficient as they could be, as well as those for whom paying for energy was not an issue. That is, they had the financial means to pay for energy costs or were comfortable with the level of their direct debit payments, that helped make these costs more manageable.

> *"It [IHD information] just doesn't do anything because you have the house heated to how you want it. You use the appliances in the house when you need to and that's the end of it. I'm not going to turn off the tumble drier because the little meter thing is telling me I'm using too much electricity."*
>
> Credit customer, age 75+, owner occupier

Another more exceptional reason given for not engaging with the IHD was preferring to view energy usage on an online dashboard provided by suppliers. This was perceived to output similar data to the IHD, such as graphs, but viewing it on a larger screen was felt to be easier.

Supplier prepayment apps offer different ways to prepay depending on the energy supplier. Those with limited digital access and confidence found it particularly difficult to engage with their apps, or had not attempted to use them at all. They reported not having a compatible phone or challenges downloading, setting up and using apps. For example, finding that it took too long to log on or not being able to remember their username and password was off-putting.

> *"Like I say, when it asks for the username and password and email and that, I get a bit flustered and think, oh my God! I'll just go to the shop."*
>
> Prepayment customer, age 35-44, low digital inclusion

In addition, participants also mentioned not engaging with the app because they preferred to top-up at the shops out of habit, sometimes because they valued the interactions with other shoppers, or it was something they did as part of their weekly routine anyway.

Changes in smart meter use

Although some participants' use of the IHD stayed stable, other participants moved between different levels of engagement over time. This in turn affected the benefits they experienced, as discussed in chapters 4 and 5. Use of the IHD generally tailed off over time particularly among those who were contented with their energy use. These participants either became 'non-engagers' or 'glancers'. There were four reasons for some participants reporting reduced engagement over time:

- No longer needing to look at the IHD because it had successfully raised awareness of energy use or because financial situations improved.

- Losing trust that the IHD was functioning properly, for example, if it was thought to be outdated or to be giving inaccurate readings.
- The novelty of having the IHD wearing off, with people becoming used to it and the information it offered.

  "There was a bit of a novelty about it [IHD], and then it just wore off, and now it's in the cupboard and only really gets touched if we need to alter something else, which I never do anyway."

  Credit customer, age 18-34, lives in a large or shared household

- Not wanting to look at the IHD due to worry about over-monitoring it or anxiety about costs accumulating.

  "I enjoyed it, it was fun, and it was interesting to see what used what, but then after a bit I thought, well, don't get manic about it."

  Credit customer, age 75+, depression or anxiety

Exceptions to this were when the coronavirus (COVID-19) pandemic affected people's financial situation and everyday routine so that they became more attentive to the IHD. This included looking at the IHD more often as participants were at home more and/ or needed to monitor costs more closely because of a pandemic-related income shock, for example, participants being furloughed, having their working hours reduced and being made redundant.

> *"[Use of IHD has increased…] Tenfold…. In the beginning, it was a bit of a novelty…Before [the pandemic], my bills were normal because we were…out of the house and working and doing whatever... Now, obviously, we're here most of the time and I'm just keeping an eye on the bill to find out some way of having to budget for it, to make sure that you can keep the house warm in the future."*
>
> Prepayment customer, age 45-59, struggles to pay bills

Regarding supplier and top up company prepayment apps, there were also participants who used their app more during the pandemic as they felt it was safer than going to the shops.

4 Benefits of smart metering

This chapter discusses the five main groups of reported smart meter benefits; convenience; peace of mind; awareness; control; and environmental benefits. It concludes by using the COM-B model of behaviour change to identify the personal, situational and environmental factors that enabled the behaviour change associated with smart meter benefits.

Key findings

- The benefits of having a smart meter exceeded participants' expectations, as described in Chapter 3. They included,
    - The convenience of automated meter readings and remote top-up
    - Peace of mind regarding bill accuracy, not running out of credit at inconvenient times and the ability to top up safely during the coronavirus (COVID-19) pandemic
    - Raised awareness of energy consumption and costs
    - The ability to control energy use and costs
    - The ability to contribute to environmental and energy conservation goals.
- These benefits relied on different degrees of behaviour change. Benefits relating to convenience and peace of mind were largely passive, requiring little or no behaviour change. They were enabled by automated meter readings for credit consumers or remote top-up for prepayment consumers. The other benefits required more active behaviour change, from simply glancing at the IHD to acting on the information provided.
- Having a smart meter operating in smart mode and an IHD, some explanation of how to use the IHD, remote top-up functionality and digital access were key opportunities needed to realise active benefits. To make the most of these opportunities, participants needed to have the capability to understand smart meter features and what they could offer, as well as a basic level of digital literacy and skill to be able to act on the information provided. They also needed to be motivated to do so because of financial need, a concern for the environment or waste, or just being curious around how they use their energy.

Convenience

Credit consumers reported smart meters saving them time and effort through automated meter readings while prepayment consumers said they allowed them to top up their prepayment meter anytime and anywhere, using mobile apps, by phone and by using supplier websites.

For credit consumers, the convenience of automated readings was a passive benefit because it did not require any change in behaviour. Participants found automated readings to be

convenient because they reduced the administrative burden on them to provide readings and meant having one less task to fit into their lives. This was a key benefit for participants with larger households, who previously struggled with finding the time to take meter readings, for example because they had young children.

> *"I think I like the convenience; I think is the main thing. So, the convenience of not having to do the meter readings and send those in."*
>
> Credit customer, age 35-44, living in a large or shared household

It also spared them the burden of going out in bad weather or accessing meters in hard to reach places, such as cluttered cupboards, to provide readings. This was particularly beneficial to older participants and those with mobility and respiratory health conditions, for whom going outside, bending down or reaching their meters to take a reading was challenging (see Case Illustration 4.1).

Case Illustration 4.1 Credit consumer with health issues (Age 60-74, financially struggling)

Janet is a credit consumer in her late 60s, who lives alone. She has severe asthma and Bronchiectasis, two respiratory conditions which are affected by the cold and rain. Her respiratory conditions mean that she has found it difficult to submit meter readings in the past because her meter is outdoors, exposing her to the cold weather during winter. As a result, she cites convenience due to automatic meter readings as a key benefit of having a smart meter because it saves her the trouble of going out to take readings.

Automatic meter readings were also viewed as convenient because they limited what participants perceived to be unnecessary interactions with their energy supplier. This meant avoiding the need to have difficult conversations with suppliers if participants did not agree with meter reading estimates and, more practically, the inconvenience of accommodating visits from energy suppliers for meter readings. Participants reported not wanting a stranger to come into their home, for reasons to do with privacy and safety, (particularly during the coronavirus (COVID-19) pandemic), as well as challenges around taking time off work to facilitate visits.

> *"…because otherwise you've got to be here for the guy when he comes to read the meter, and it's not always convenient, or they come when you're not here, then put cards through the door…. For us, it's not really necessary now [because of automatic meter readings]."*
>
> Credit customer, age 75+, cardiovascular condition

For prepayment consumers, benefitting from the convenience offered by online top-up options required slightly more action insofar as they needed to make use of supplier prepayment apps or online accounts to pay for their energy. Where participants used online top-up options, they reported avoiding the following challenges:

- Finding local top-up shops, including during public holidays
- Having to go out in bad weather to top-up

- Having to make unplanned visits to shops after running out of credit[10]
- Visiting shops and other public spaces during the pandemic.

Being able to top up remotely was particularly helpful for parents, who found it challenging to take children to the shops, and those with specific health issues. This included those with mobility issues, who found it difficult to walk to the shops, and those with anxieties, who reported challenges interacting with others and often forgetting their top-up card/ keys because of their condition.

> *"That's one of the biggest benefits I've noticed. I can just do it on my phone now. I don't need to go over to the shop…Just because if you're in with the kids and stuff, if it was at night or whatever it went out [energy credit ran out], you would need to get the kids, because they were obviously young, and take them over to the shop, but now you don't have to. You can just stay in your house and do it."*
>
> Prepayment customer, age 35-44, living in a large or shared household
>
> *"Absolutely hated having to go out and top up and remember everything. That's another thing: with my depression I forget, whereas now if I forget I can just think, oh, and just press the button and do it. I haven't got to go back out and do it… I could forget to take my card with me or the key for the electricity."*
>
> Prepayment customer, age 45-59, depression or anxiety

Peace of mind

For credit consumers, automated rather than estimated meter readings, as well as being convenient, helped to make bills more accurate and predictable. Participants reflected on estimated meter readings leading to fluctuating energy bills prior to having smart meters and sometimes being overcharged (due to estimated usage being higher than actual usage) by suppliers, leading to difficult conversations with them. Although participants across the sample felt it was unfair to be charged for energy they had not used due to poor estimates, bill accuracy was particularly important to participants with specific health issues that meant they were unable to submit meter readings and those on low incomes. Low income groups were anxious about getting into debt due to high estimates.

Automated meter readings also helped to reassure credit consumers that they did not need to provide meter readings, which was particularly important for people with health issues and childcare responsibilities.

For prepayment consumers, being able to top up using an app, online or over the phone gave them the peace of mind that they would be able to top up quickly if their credit ran out at inconvenient times. This was particularly reassuring at the height of social distancing measures

[10] Emergency and friendly credit features mean consumers should not lose energy supply overnight. Energy suppliers may have different hours for friendly credit.

during the coronavirus (COVID-19) pandemic because it meant being able to top up from the safety of home.

Awareness of energy use and costs

Participants described benefitting from being more aware of how they use energy and the associated costs. Raised awareness is described as an active benefit since it involves interaction with smart meters. The IHD, in particular, spotlighted energy use behaviours for participants by providing near real-time information on energy consumption and expenditure in an accessible way. This was enabled through a dual screen for gas and electricity consumption, where relevant; having a display with easy to read icons (sometimes including the use of colour); and presenting the information in monetary terms, rather than abstract energy usage units such as Kilowatt Hours (kWh).

This monitoring raised participants' awareness of one or more of the following three types of energy use behaviours,

- Energy consumption patterns, including variation in energy use over different periods of the day and, more broadly, during different seasons.
- Inefficient energy consumption behaviours, such as leaving lights and charging cables turned on when not in use and leaving appliances such as televisions on standby.
- Energy consumption of specific appliances and devices, including everyday items, such as white goods and appliances participants did not realise were operating in the background, such as immersion heaters, see Case Illustration 4.2.

Participants also mentioned the value of the IHD and smartphone apps (where offered by energy suppliers) in helping to raise awareness of energy use and costs both for themselves and their wider household, including dependants such as elderly parents and teenage children.

> *"I just think it's generally made everyone in the house a bit more aware of what we use and how much we use."*
>
> Prepayment customer, age 35-44, living in a large or shared household

Greater awareness of energy use was a benefit mentioned by participants from across the sample. It was nevertheless particularly helpful for those who perceived themselves to be digitally literate enough to engage with the IHD and/ or mobile apps, and who were motivated to do so, for example due to being on a low income. In some cases, this raised awareness led to a change in consumption patterns, as discussed in the next section.

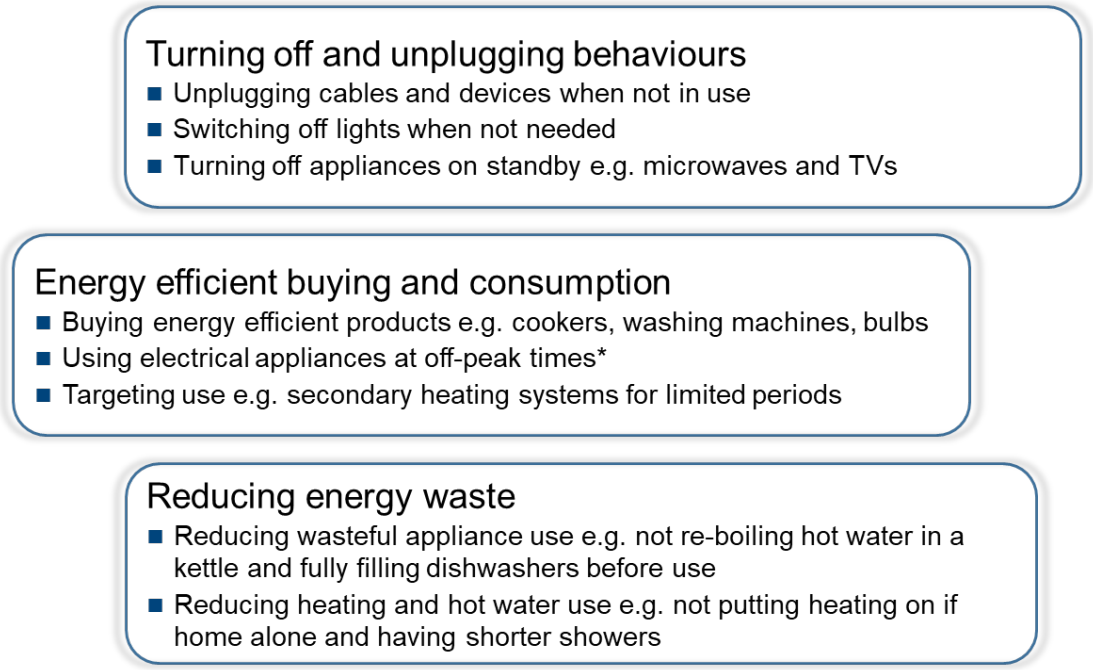
Controlling use and costs

As discussed in Chapter 3, not all participants were willing or able to translate increased awareness of energy use to changes in behaviour, for example, those who were already content with their energy use or for whom change was difficult on health grounds. Where participants were motivated and able to make changes, the greater awareness afforded by

smart meters translated into changes in energy consumption and related to this, the management of energy costs, as discussed in this section.

Participants altered their behaviour in response to the information provided by their smart meter in one or more of three ways, as illustrated in Figure 4.1 below. This included using less energy by turning off and unplugging appliances; buying more energy-efficient appliances and consuming energy more efficiently; and reducing energy waste. These changes in behaviour tended to be motivated by the need or desire to cut costs and were often underpinned by specific vulnerabilities such as financial difficulties and living in homes that participants struggled to keep warm. Environmental concerns were the other key driver for managing energy consumption, and this is discussed in the next section.

Figure 4.1 Changes in energy use behaviours



*This practice was rarer in the sample, reflecting current lower levels of take up of time-of-use tariffs (similar to traditional Economy 7 and Economy 10 tariffs) that charge different rates for electricity at different times.

A key reported benefit of having a smart meter, was the ability to use the information provided to better manage energy use and reduce energy costs.

> *"The power is in my hands now to control my budget, so it is useful in that way. Best thing about the smart meter is that it demystifies the energy I'm using. I've tried to calculate how much energy I'm using by doing meter readings in the past and things like that, and you just press a button and it [IHD] tells you straight away in pounds and pence. It's transparent in that regard and it gives you the power."*
>
> Prepayment customer, age 45-59, low income

A key vulnerability driving this behaviour change was the need to reduce energy costs due to financial difficulties, sometimes as a result of income loss due to the coronavirus (COVID-19)

pandemic (see Case Illustration 4.2). This was compounded if energy costs were unpredictable; for example, where customers are not paying by fixed direct debit.

> *"[Checking IHD] To see if anything in my flat is using too much, because like I said, I'm on a low wage, so every penny counts."*
>
> Prepayment customer, 35-44, low income

Case Illustration 4.2 Energy use cut due to fall in income and to conserve energy (Credit customer, age 35-44, struggles to pay bills)

Shilpa is a credit consumer who lives with her husband and four children in a newly bought property. Although she has savings from selling a previous property, the pandemic has affected her business and income, so she has been keen to monitor her energy use and minimise her costs. She also wants to conserve energy for future generations. Shilpa and her husband look at their IHD regularly. This has enabled her to identify appliances that consume energy even when they are not in use, such as immersion heaters. She says she is now saving around £3 a day by unplugging these appliances.

Participants who found it difficult to heat their homes were another group who benefitted from the ability to exert greater control over their energy use (see Case Illustration 4.3). For this group, the smart meter helped to inform decisions on when and how long they could afford to use their secondary heating systems, such as electric fires, to supplement primary heating systems.

Case Illustration 4.3 IHD used to inform use of secondary heating system (Prepayment customer, age 35-44, low income)

Jack is a prepayment customer who lives in a privately rented house. He has central heating but struggles to keep the house warm. This is due to a combination of air vents that do not close and only having three radiators. He feels that this is,

"not enough to sufficiently heat the property, especially when you consider…the place is open plan".

He therefore uses an electric heater to supplement the central heating, especially when the weather is very cold. Before getting a smart meter, he was not sure how long he should keep the electric heater on. The IHD helped him gauge the cost of running the heater, as a result of which he feels he can afford to have it on for a maximum of a couple of hours a day.

Credit consumers who pay on receipt of bills reported that this information was helpful because it took the guesswork out of what their bill would be. This helped to make bills more predictable and so participants were able to budget better to accommodate their energy outgoings. This was reported to help reduce anxiety around having an unexpectedly high bill among those on a low income or who were otherwise financially struggling. Similarly, for those who paid by fixed direct debit, the IHD helped keep track of their consumption and helped them avoid building up excess credit or debt with their energy supplier.

For prepayment consumers, the IHD helped budgeting decisions by raising their awareness of their top-up patterns. This allowed them to have clearer insights into how much they needed to top up and how often. Although this awareness sometimes heightened anxieties (as discussed in Chapter 5), it also helped reassure prepayment consumers that they had enough credit because of having a better understanding of how they use energy (see Case Illustration 4.4).

Case Illustration 4.4 Prepayment customer who regularly looks at IHD (Age 18-34, depression or anxiety)

Carol lives on her own in a private rented flat. She has depression and now spends quite a lot of time at home because she has been furloughed. This has also meant that her income has fallen over the last year, and she struggles to top-up her gas and electricity. She now often borrows money from family or draws on her savings. She feels anxious about running out of electricity and gas because of being on a low income and feels this anxiety is heightened by her depression. However, having an IHD in her kitchen helps her manage her energy anxiety because she can check it often to see whether she needs to top-up and to act if she does. This makes her feel in control.

Prepayment consumers also reported that they went into emergency credit less. This was because they had a clearer picture of what their use and costs were and so were better able to predict when they needed to top up. They reported having developed more routine top-up behaviours as time went on. Secondly, they benefitted from the IHD/ app providing visible or audible reminders when they were low on credit, which helped them to top up at short notice. Having these reminders, as well as near real-time information on their energy use, also helped them make more informed decisions about how to make their credit last longer. For example, choosing not to use high-energy appliances (such as a washing machine) when they knew their credit was low or to limit their overall energy usage in such situations. One prepayment customer said they requested to switch to a prepayment meter when they got their smart meters, so that they could avoid paying bills and to have more ‘hands-on control’ over their energy use, via the app.

> *“It's [IHD] just sitting there, I can see how much credit I've got and therefore if I'm on emergency and the emergency is on a low, then I can try my best to cut down on unnecessary things.”*
>
> Prepayment customer, age 45-59, struggles to pay bills

Contributing to environmental and energy conservation goals

Some participants used their smart meters to manage energy consumption for environmental reasons, sometimes in combination with financial reasons. They benefitted from feeling they were contributing to environmental and national energy conservation goals. These participants were spread across the sample and included those who were able to afford their energy costs and were motivated to think about their energy use in broader social terms.

These participants explained that having a smart meter enabled them to reduce their carbon footprint and their impact on the environment. They saw this as “doing their bit” for the

environment, but there was also an intergenerational element to this as they sometimes wanted to model good energy use behaviours to their children (see Case Illustration 4.5).

> *"Oh! Well, everybody's conscious of saving the planet […] well, I am! I don't know about everybody, but I am. Try and do their little bits to reserve what we can, so the less power you use, the less water you waste, the better for everybody in the future, so again, that's why you do it."*
>
> Prepayment customer, age 35-44, lives in a cold home

There were also participants who felt that reducing domestic energy consumption using smart meters was helping to conserve energy for future generations. These participants were concerned by the possibility of energy shortages in the future and the impact of these on meeting consumer demands.

Case Illustration 4.5 Participant who wants to contribute to the environment (Credit customer, age 18-34, respiratory condition)

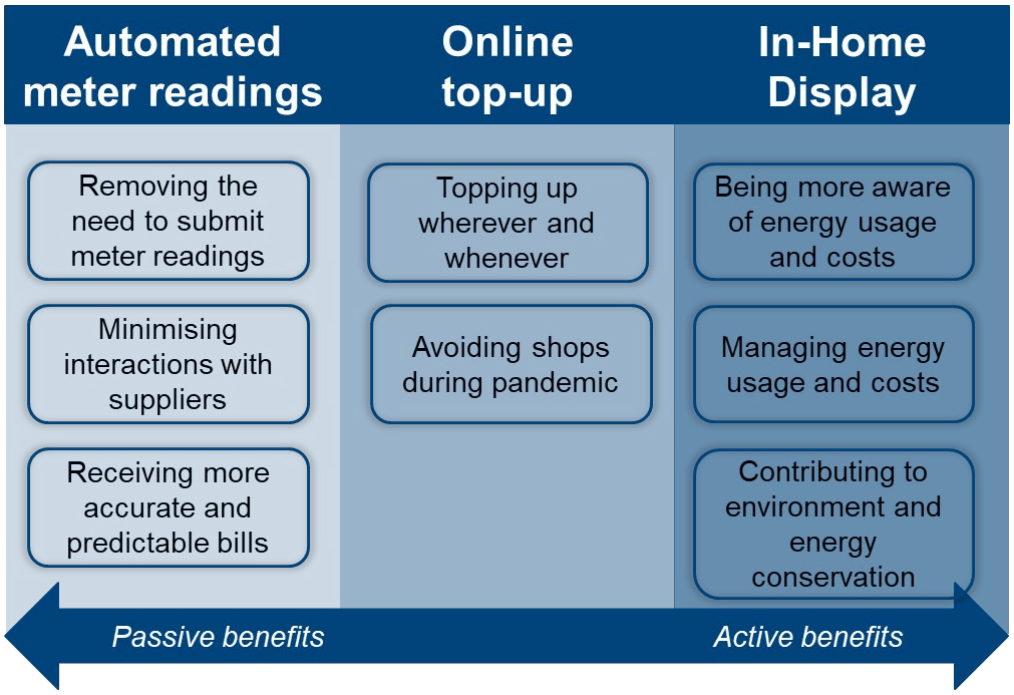
Sandra is a credit consumer who lives with her husband and three young children. Before the pandemic, she was just managing to get by financially but now feels more comfortable and can put more money aside because she does not go out as much. Sandra currently feels comfortable paying for her energy, but she is still motivated to reduce her energy consumption as she is mindful of the impact this has on the environment. She also wants to model good energy use behaviours for her young children, to encourage them to do the same,

"I'm trying to encourage them [her children] to look after the environment, I guess as well, because this is their world, they've got to live in for the next 70, 80 years."

Enablers to experiencing smart meter benefits

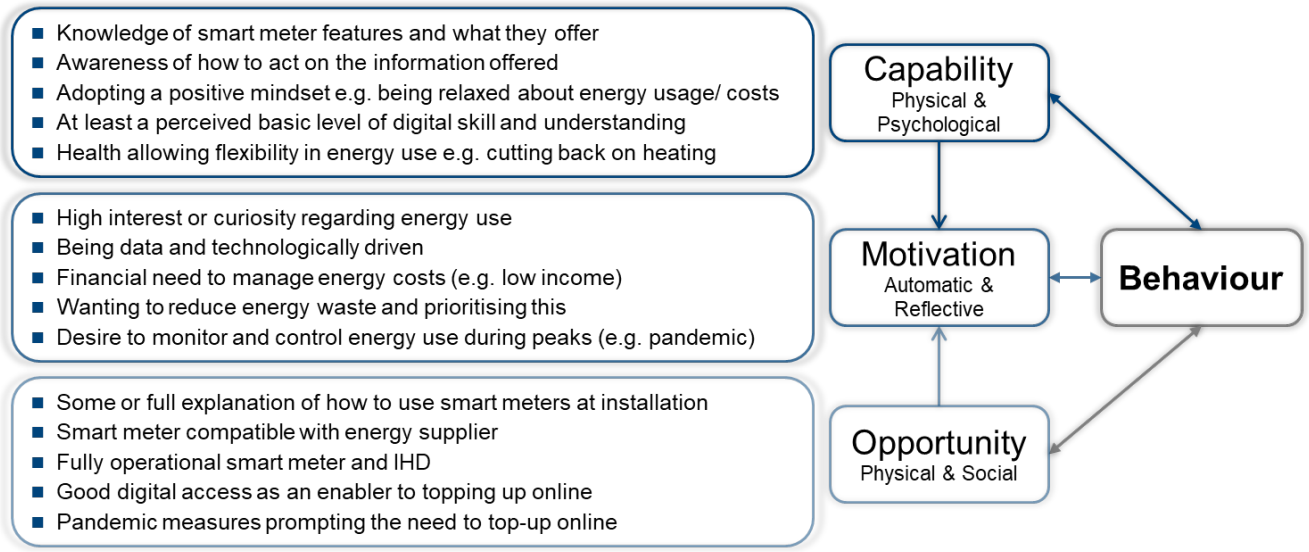
This chapter has explored both passive and active benefits of smart meters. Passive benefits, convenience and peace of mind, were possible if credit consumers had an operating smart meter and prepayment customers made use of remote top-up options. In contrast, active benefits required a greater degree of behaviour change among consumers, in terms of using the information offered by smart meters to enhance their understanding of their energy use and to manage energy use and costs.

Figure 4.2 Passive and active smart meter benefits



The COM-B model of behaviour change is used here to identify the different personal, situational and environmental factors that combine to enable or inhibit the behaviour change associated with active benefits. The three main factors are capability, motivation and opportunity, as outlined in Figure 4.3.

Figure 4.3 COM-B model – enablers to behaviour change



As the model illustrates, participants who experienced the benefits discussed in this chapter reported a number of enablers to behaviour change relating to capability, whether physical or psychological. In terms of physical capabilities, these participants or other household members did not have health needs that could not accommodate changes to energy use, or if they did, they found ways to change their energy use in a way that would not interact with their health needs. Regarding mental or psychological capability, participants who experienced active

benefits comprehended what smart meters could offer and how to act on the information provided, using at least a basic level of digital skills and confidence. Psychology, or mindset, was also important in another way, as a positive attitude towards receiving information about energy consumption and costs. This was important to enable the ability to embrace and act on the information provided by smart meters as opposed to experiencing anxiety and rejecting the information offered. This will be explored further in the next chapter.

Motivation, whether unconscious (or automatic) or more conscious (or reflective), was a key enabler for active benefit realisation and drove interaction with the IHD or app, for a diverse set of reasons. These included curiosity around energy usage, wanting decisions to be informed by energy use and consumption data provided by the smart meter, needing to manage consumption because of financial circumstances and more broadly, wanting to contribute to environmental and energy conservation goals. Interestingly, the coronavirus (COVID-19) pandemic served to nudge people towards greater interaction with their smart meters. For example, as noted in Chapter 3, participants' interaction with their IHD sometimes increased during the pandemic because they were at home more and felt more of a need to monitor or manage their energy consumption.

Regarding, situational and environmental factors (opportunity) that facilitated active benefits, a key prerequisite was an operating smart meter and IHD. Having some explanation of how to use the IHD or app during installation was an enabler, particularly for those with low digital skills or confidence. Digital access (e.g. internet access or having a phone compatible with supplier apps) was important in enabling particularly prepayment customers to use online features. Use of remote top-up, whether using suppliers' websites or apps, was prompted by the coronavirus (COVID-19) pandemic and social distancing measures which for periods prohibited leaving home unless necessary.

5 Barriers to experiencing the benefits of smart meters

This chapter explores the barriers experienced in realising the benefits offered by smart meters. The chapter focuses on consumers who said their smart meters had either not made a difference to them, had affected them negatively or who wanted to get more out of their smart meters. It covers any detriments reported by participants and then examines the barriers to realising benefits, using the COM-B model of behaviour change to understand the range of inhibitors at play.

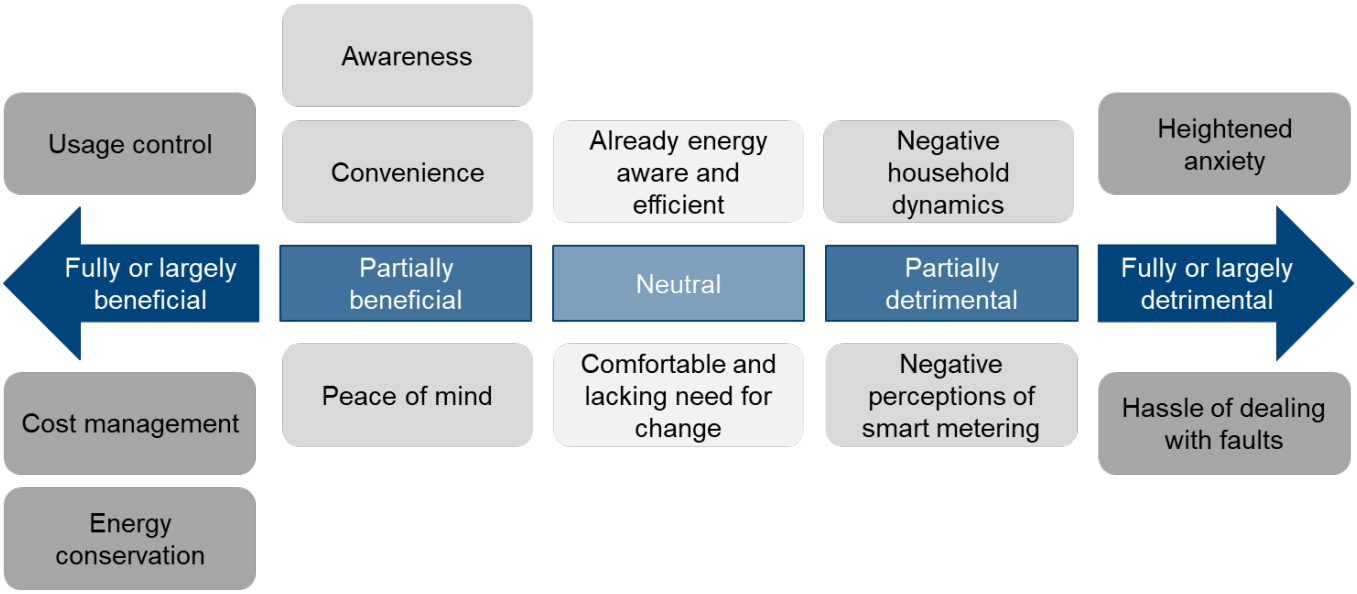
Key findings

- Participants who reported partial, neutral or detrimental impacts described a range of ways in which they wanted to get more from their smart meters. These unmet needs were driven by the desire for greater functionality and better awareness of what smart meters can offer.
- Any detriments experienced in relation to smart metering were not as wide-ranging as the benefits experienced by the participants of this research. Where detriments were reported they were often experienced alongside benefits, with benefits generally outweighing detriments.
- Detriments centred on anxiety from seeing energy costs accumulate; minor instances of friction at home due to ‘nagging’ about energy usage; a shift towards negative perceptions about smart metering such as mistrust and cynicism; and frustration caused by faults and functionality.
- Interestingly, no detriments were noted in relation to the coronavirus (COVID-19) pandemic. Smart meters were only reported to have had positive impacts, with IHDs helping participants to monitor usage more closely while energy use increased as a result of lockdown and social distancing measures requiring people to stay at home more.
- The barriers to realising or maximising smart meter benefits included one or more of the following factors. In this chapter, these barriers are interpreted using the COM-B model of behaviour change:
    - A lack of understanding and awareness of smart meters and how to use them (capability).
    - Constraints associated with smart meter functionality and the service offered by energy suppliers (opportunity).
    - The importance placed on other priorities such as maintaining harmony at home, comfort, habit, and for those who found the IHD visually displeasing, aesthetics (motivation).

Unmet needs

As discussed in Chapter 4, the sample of interview participants included those who described benefiting from smart meters in a range of ways. The sample also included participants who reported no substantial change (neutral experiences) and those who experienced detriments. Figure 5.1 illustrates the spectrum of experiences found in this research.

Figure 5.1 Spectrum of smart meter experiences



Participants who reported partial, neutral or detrimental impacts described a range of ways in which they wanted to get more from their smart meters. These unmet needs were driven by the desire for greater functionality and for better awareness of what smart meters can offer. Participants' suggestions for improvements and solutions in relation to these points are discussed further in Chapter 6.

Detriments

The detriments experienced in relation to smart metering centred on anxiety; negative impacts on household dynamics; negative perceptions of energy and smart metering; and issues with faults. These detriments are described in more detail below. It is important to note that any experiences of detriments were not as wide-ranging as the benefits experienced by the participants of this research. Where detriments were reported they were often experienced alongside benefits, with benefits generally outweighing detriments. Situations in which detriments appeared to outweigh benefits were limited and are discussed later in this section.

Anxiety

Increased anxiety was a recurring theme raised both by participants who had experienced it directly and those who had not, but who nonetheless saw potential for people to become anxious over monitoring usage and costs. For some participants with their IHD always on display, being more aware of their energy use and of the associated costs was the main cause of anxiety. Feelings of panic, worry and even depression were reported from seeing costs rise

or exceed a certain limit; from prepayment customers seeing a low balance; and from participants approaching the budget they had set for themselves. This could lead participants to feel that instead of helping them, the smart meter caused them to start worrying about their energy use,

> *"It kind of had the opposite effect of what I wanted it to have, rather than it being a way for me to be more ecological and monitor my energy consumption, that's the main reason I got it, but it's turned into a thing of watching it and thinking God, I've used that much today, I'd better turn everything off and put another jumper on."*
>
> Credit customer, age 35-44, low income

These feelings manifested in participants either making a conscious decision to take a relaxed approach and to prioritise their energy needs without becoming stressed, or participants adopting counterproductive thoughts or behaviours such as,

- Greater or 'obsessive' monitoring of usage
- Worrying about their energy consumption and finances
- Cutting energy use below a level that they were comfortable with (self-rationing)[11]
- Paranoia about energy cutting off due to a low balance
- Avoiding the IHD completely by turning it off or moving it out of sight

Negative responses to the information provided by smart metering were reported by participants in a range of financial and other circumstances but were exacerbated by certain situations (sometimes in combination) such as financial difficulties, existing mental health issues and past experiences of bill shock. In contrast to this, some consumers had the opposite experience, with IHD monitoring reducing anxiety over energy costs, as discussed in case study 4.4.

Relatedly, there were instances of anxiety waning among participants whose circumstances or mindset changed over time. For example, participants reported experiencing anxiety during past periods of hardship which then allayed when their finances improved. For others, reducing energy use in response to seeing costs rise had felt too austere and therefore unsustainable, and led to doubts about whether the financial gains were worthwhile,

> *"I found it was taking up too much of my energy looking at it"*
>
> Prepayment customer, age 18-34, low income

In another example, developing a better understanding of how smart meters worked helped to dispel anxiety. For instance, a participant came to realise that their energy provider had set an arbitrary daily spending budget alert and that they could in fact afford to spend more on energy.

[11] Self-rationing of energy refers to customers deliberately limiting their energy use to spend money on other goods or services. Self-rationing affects both prepayment meter and credit meter customers.

Interestingly, no detriments were noted in relation to the coronavirus (COVID-19) pandemic by participants of this research. Smart meters were only reported to have had positive impacts, by enabling closer monitoring of usage while energy use increased as a result of lockdown and social distancing measures requiring people to stay at home more. This was the case even where the pandemic brought about a deterioration in participants' financial situations due to job or income loss alongside greater expenditure.

Negative impacts on household dynamics

Some participants reported experiencing minor instances of friction at home as a result of finding themselves "nagging" and "annoying" their partners or children about their energy use and behaviours, sometimes as a result of anxiety that they themselves were experiencing. As with experiences of anxiety discussed above, this detrimental impact also tailed off over time as participants started to relax due to developing a better understanding of the peaks and ebbs of their energy use or made a conscious decision to change their mindset due to the impact on household relationships,

> *"You're constantly going round turning things off and telling people [off]... I just, I can't live like that."*
>
> Credit customer, age 45-59, living in a large or shared household

Negative perceptions of energy and smart metering

The experience of having a smart meter had for some participants prompted mistrust, cynicism and negative perceptions of energy costs and smart metering. Participants questioned the accuracy and reliability of smart meter readings, either due to a lack of understanding or trust in smart meter technology or due to their costs remaining high even after concerted efforts to reduce usage. In addition, a heightened awareness of energy costs, had for some led to negative attitudes towards energy costs, with participants now perceiving energy to be more costly.

> *"But it does honestly feel a lot more expensive than not having it [a smart meter/IHD], but I don't know if that's just because I can see it being used, if you know what I mean, because it's a visual thing"*
>
> Prepayment customer, age 35-44, struggles to pay bills

There was also suspicion of smart meters resulting in higher energy bills as a way of energy companies recouping the costs of installing smart meters[12]. Similar concerns were raised about the energy costs of running smart meters, though participants acknowledged that these costs were likely to be marginal[13]. A related view was that energy suppliers could not be trusted to educate customers on how to reduce their energy usage because of the assumption that their primary objective is profit.

[12] Consumers are not charged separately for a smart meter or for the In-Home Display. Under current arrangements consumers pay for the cost of their meter and its maintenance through their energy bills. This is the same for smart meters, and traditional meters.

[13] The smart meter itself does not use consumers energy supply, and so does not cost the consumer to run, while, the running costs of the IHD are marginal.

Faults and functionality issues

Some participants reported frustration regarding perceived faults and said the process of resolving issues caused hassle and inconvenience. They experienced issues such as:

- SMETS1 (First-generation smart meters) meters losing smart functionality, resulting in estimated billing for some consumers[14]
- IHDs not working
- IHDs being slow to re-connect to the smart meter after being moved
- Glitches with prepayment apps causing a loss of synchronicity with the smart meter
- Prepayment apps being slow to update top-up information
- In exceptional cases, being unable to top up during scheduled maintenance (sometimes lasting a day)

Some participants with a first-generation smart meter incorrectly believed upgrading to the newer model was a pre-requisite to changing energy suppliers. Here, the “hassle” of upgrading was also a barrier and was perceived by participants to prevent them from switching to a cheaper deal. Difficulty resolving faults with smart meters also led participants to feel trapped on estimated bills.

It is possible that some detrimental impacts were prompted by a lack of understanding of how smart meters work, rather than being caused by faults or functionality issues. For example, a participant complained about her IHD sounding an alarm and causing disruption to her baby, however this more likely reflects a lack of familiarity with IHD settings which should allow alarms to be changed or turned off. As discussed above, a participant also explained that he experienced anxiety about his IHD saying he had exceeded his budget until learning that the limit had been set arbitrarily.

Detriments outweighing benefits

As mentioned earlier, detriments were not as wide-ranging as benefits. Where negative experiences were reported they were often accompanied by positive experiences, with the positives generally outweighing the negatives. Situations in which detriments outweighed benefits were limited and concerned the issues discussed in the sections above.

Where faults or functionality issues were reported, the stress and aggravation of trying to resolve these issues, together with the loss of benefits associated with automated meter readings combined to outweigh reported benefits such as lasting energy saving behaviours. In cases where participants stopped using the IHD due to the anxiety and panic it induced, this detrimental impact stopped them from experiencing more active smart meter benefits, such as exerting more control over their energy usage and costs. These participants were left with the passive benefits of automated meter readings, and associated the information offered by IHDs

[14] The issues related to first generation (SMETS1) meters operating in traditional mode following switching supplier are being resolved. First-generation (SMETS1) meters are being enrolled into the Data Communications Company (DCC), which will prevent this, and will end this for consumers that have been affected by it in the past.

with negative feelings. Similarly, participants who developed negative attitudes towards smart metering and subsequently ignored the information offered by IHDs, also had the advantage of passive benefits but could not experience a wider range of benefits or realise the full potential offered by smart meters.

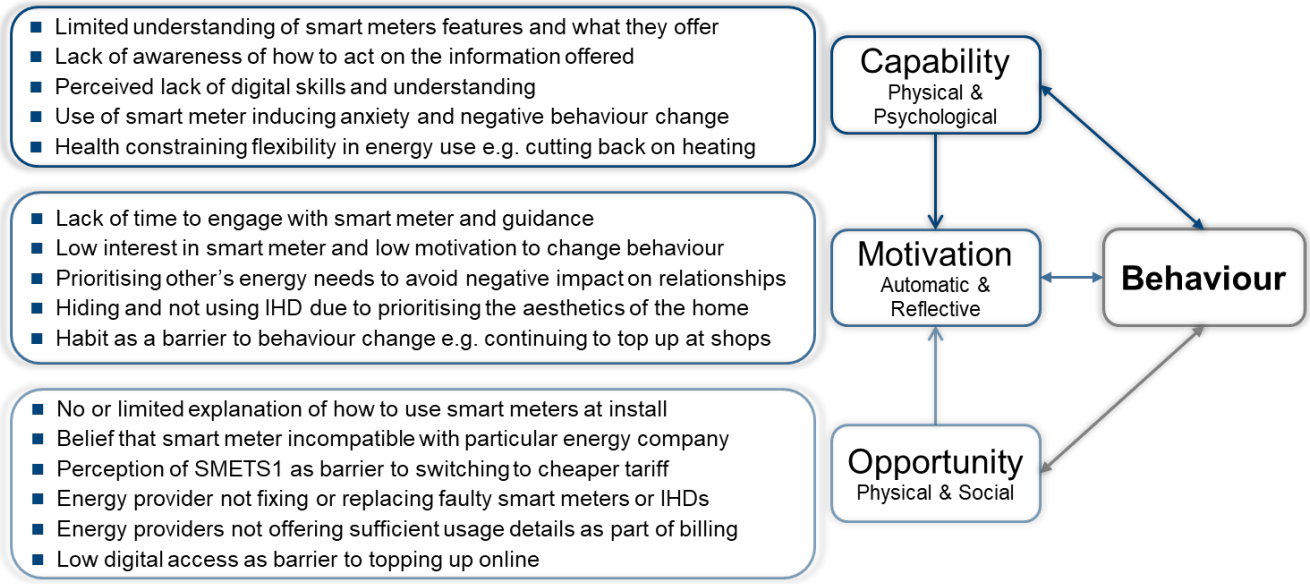
Barriers to realising or maximising benefits

Participants that were not experiencing the full range of benefits reported facing several barriers to realising or maximising the benefits offered by smart meters. The factors preventing participants from realising or maximising the benefits of smart meters included one or more of the following,

- A lack of understanding and awareness of smart meters and how to use them
- Constraints from smart meter faults and the service offered by energy suppliers
- The importance placed on other priorities.

These barriers sometimes stemmed from the detriments some participants experienced, which resulted in a lack of engagement with smart metering. This section groups these barriers using the COM-B model of behaviour change, as illustrated in Figure 5.2.

Figure 5.2 COM-B - barriers to behaviour change



Capability

Barriers relating to participants' physical and psychological capability were underpinned by a lack of awareness and understanding among participants about what smart metering can offer and how to use the IHD to their benefit. This barrier was pronounced among participants with comprehension barriers who perceived themselves as not being sufficiently digitally skilled to use smart meters, who could not understand how to interpret the information on their IHD, who found that the IHD was not straightforward or user-friendly and who could not understand what the different features of the IHD did or how to make them work. This barrier was compounded

by a lack of effective explanation of how to use smart meters and IHDs at install, alongside low interest in finding out proactively.

> *"They don't show you. Nobody's getting the best out of the meter unless they are what I would class as a gadget person or a tech kid"*
>
> Deliberative workshop 4, low digital inclusion

A second capability barrier, for some participants, was the inducement of negative feelings, such as anxiety, panic, depression and paranoia from being more aware of energy consumption, and which for some intensified existing mental health issues. In addition, where participants' or family members' health issues were affected by the cold, participants were more constrained in adapting their energy consumption to meet other needs such as saving money or conserving energy for environmental purposes.

Opportunity

Opportunity barriers appeared to relate largely to the constraints associated with smart meter functionality and the service offered by energy providers. This included issues with some energy companies failing to fix faults. In one such case an energy company reportedly said that not replacing a broken IHD would not impede the participants' ability to benefit from a smart meter, despite them feeling they could not develop their understanding of their energy consumption costs without one.

> *"I asked them if it affected the usefulness of having one. They said, 'Absolutely not. That's just for your own personal knowledge'."*
>
> Credit consumer, age 18-34, low digital inclusion

A lack of information provided by energy suppliers both at installation but also as part of some companies' billing information was described as a barrier to benefiting from smart meters. These participants wanted a better breakdown of usage to understand their usage patterns and to help them use energy in a more informed way.

Limited internet access was a further opportunity barrier, both to making use of online top-up facilities and also to finding out more about how smart meters work and how to benefit.

Motivation

Some participants lacked the motivation to use their smart meter to manage their energy consumption and costs. For some, this was because they became less motivated as they got more used to their smart meter while others lacked interest in energy use. Participants with very busy lives described being interested but faced time barriers and preferred to focus on other priorities. Parents said that, due to the additional family, work and financial pressures the COVID-19 pandemic introduced, it had been especially difficult to prioritise engagement with their IHD or to change their energy use behaviours. There were also participants who would have liked to have made changes but decided against this due to prioritising harmony at home. These participants wished to avoid negative impacts on household relationships from "nagging" family members to cut their energy use. Some parents felt they needed to prioritise

their children's comfort and happiness by keeping a warm house and allowing them to use energy freely. Aesthetics were another priority inhibiting the use of IHDs among participants who felt the IHD was visually displeasing and therefore hid it away. There were also participants with first generation meters who felt that this represented a barrier to switching, or accessing better tariffs. Finally, some participants expressed unwillingness to change, preferring to stick to habit or routine in terms of their energy consumption, monitoring and top-up behaviours,

> *"Just more convenient [to go to shops than use app], because by the time you jump online, it's just time really…Instead of going on the phone, because… it can take longer; five or ten minutes, and then you probably have to make an account and stuff like that. I'm not interested in that; I just go to the shop, pay it over the counter and I'm more than happy with that."*
>
> Prepayment customer, age 18-34, low income

6 Suggestions for maximising smart meter benefits

This chapter focuses on suggestions for enabling consumers to get more from their smart meters. The chapter explores participants' own suggestions as well as their views on broad potential policy ideas developed by BEIS, focusing on information and guidance on using IHDs.

Key findings

- Participants' own suggestions focused primarily on IHDs. They included calls for improving the functionality and accessibility of IHDs through additional information, alerts and alterations to the design. It was evident from their suggestions that some consumers lacked awareness of existing support options and features, suggesting a need for greater information and awareness raising.
- Those with low perceived digital skills wanted greater simplicity and additional support to interpret features and information on IHDs. Consumers with vulnerabilities such as health conditions or financial worries, felt these changes would help them to better manage energy usage and costs.
- Prepayment app users felt their energy supplier's app could integrate additional energy consumption information (like the IHD) and do more to allow consumers to monitor their energy usage and spending away from home. Credit consumers also thought they could benefit from these features, where not currently offered.
- Some participants thought that energy suppliers could offer more relevant and tailored information and support both during and post-installation in the form of demonstrations on using the smart meter and IHD, tips on IHD features or cost-saving and faster support with fixing faults. There was appetite for sources of information and guidance to be varied in format to accommodate different learning styles.

Suggested solutions

This section focuses on potential solutions and improvements for helping consumers to get more from their smart meters. It should be noted that not every participant requested changes or improvements, particularly those who were content and had no unmet needs. Where changes were requested and solutions raised, this was in relation to the smart meter, IHD and energy suppliers' smartphone apps, as well as changes to the information and support provided by energy suppliers to aid understanding and use of smart meters. In addition, it was evident from participants' suggestions that some consumers lacked awareness of existing support options and features, suggesting a need for more information and awareness raising.

Improvements to the smart meter

Changes suggested in relation to the smart meter itself focused on wanting what consumers perceived as "updated" models. As discussed in Chapter 5, there was a perception among some participants with a first generation smart meter that they could not easily switch energy providers or move to a cheaper tariff, and that first generation models had more limited functionality. These participants suggested that smart meter manufacturing should be kept consistent across all suppliers to ease the process of switching[15]. Participants with meters not currently operating in smart mode felt that action could have been taken at the point of installation to avoid these issues, though in practice this was unlikely to be the case.

Improvements to the IHD

In relation to IHDs, some participants reported not being given the option of having one despite all energy suppliers being obligated to offer an IHD to all domestic customers. It was felt that to meet this obligation, this was something everyone should be clearly offered. Other participants who benefitted from and engaged with their IHD wanted multiple devices to use in additional rooms.

Improved functionality and accessibility of the IHD were recurring themes. The four main changes suggested by participants are described in turn below. It should be noted that some of these suggestions, particularly those relating to accessibility, already exist. This suggests that these consumers weren't made aware of this functionality or had not been able to engage with information provided by their energy supplier which covered these areas. In addition, requests for more sophisticated information and functionality, though more novel suggestions, extend beyond the current requirements for IHDs. Taken together, these suggestions demonstrate the demand for both more and less complex information and highlight opportunities for improving the current offer through the provision of information that can be tailored to meet these diverse needs.

Accessibility

As part of the smart meter rollout, and in line with the Equality Act 2010 and other relevant obligations, energy suppliers must ensure they have processes in place to identify customers with specific needs, including those with impaired sight, memory and learning ability, perception and attention, and dexterity. Accessible In-Home Displays (AIHD)[16] have been designed to support these customers and are now being installed by energy suppliers, where required. Without being aware of the AIHD, some interview participants thought that the IHD could be made more accessible for users with sight loss and learning difficulties by offering bigger screens or large-text functions. Furthermore, participants who took part in deliberative

[15] There are two generations of smart meters. A number of energy suppliers have installed first generation smart (SMETS1) meters, which use their own communications systems and are sometimes enrolled into the Data Communications Company (DCC). All second-generation smart meters (SMETS2) are enrolled into the DCC and can be switched between any energy company. Many first-generation smart meters are in the process of being enrolled into the national communications network run by the Data Communications Company (DCC). This will increase compatibility with different energy suppliers.

[16] Energy UK, the trade association for the GB energy industry, the Royal National Institute of Blind People (RNIB) and GEO, a leading energy technology business, developed an inclusively designed 'Accessible In-Home Display'. Further information is available here.

workshop thought AIHDs were a good idea in principle for those with visual or dexterity impairments but were unaware of AIHDs prior to the discussion.

Simplified functions

For some participants, the IHD appeared overly technical and was seen to display information that is not always clear or necessary. For example, there was confusion around translating kw/h into expenditure in pounds and pence and around interpreting the colour display of dials. These participants typically had limited engagement with the IHD or used the front screen and basic features only.

> *"The normal person isn't able to understand all these figures and things that it gives you… it could be dumbed down a bit for the average person to use. It is good having a lot of information - but then sometimes too much information can be overwhelming."*
>
> Prepayment customer, age 35-44, low income

It was suggested that simplifying IHD functions and using 'lay terms' would make the device more user-friendly and accessible, especially for those with low digital literacy/ skills. It was thought that this would help increase engagement, awareness and control of energy use.

Information breakdown by appliance and room

A suggestion from both participants who engaged regularly with their IHD and non-engagers was that the IHD should offer a breakdown of energy use by appliance and/ or room. It was thought that this information would help them monitor energy costs and consumption, identify areas where cuts were needed and improve energy efficiency. This was particularly important for participants who were struggling financially or who had hard-to-heat homes.

> *"... then I would know where to kind of make the cuts, maybe, to save a bit of money; know what is - what appliances are actually draining it [energy]."*
>
> Credit customer, age 35-44, lives in a cold home

Some participants used the IHD to manually calculate energy costs of specific appliances and/ or rooms by turning appliances on and off to estimate energy consumption. They felt that if this information was offered by the IHD automatically, it would save them the time and effort of making manual calculations. In addition, it was felt that this breakdown would allow larger households to monitor behaviour by different family members, identify unintended wastage and help educate children on how to reduce their energy usage.

Additional alerts

Another suggestion for improving the functionality of IHDs was for them to offer additional alerts or notifications. As was the case in relation to the provision of AIHDs, some of the suggestions made by participants reflected functionality that was already available. For example, credit consumers suggested flags for higher-than-usual energy usage or alerts when approaching a pre-set budget. Participants felt this would help them economise energy consumption and better manage their finances. Where participants suggested functionality that is already available this indicates low levels of awareness of the full range of IHD capability,

suggesting that information was either not provided to these consumers or was not offered in a way that appeared relevant or encouraged engagement. Other participants demonstrated an appetite for further energy consumption feedback.

> *"… just maybe a little alarms or notifications saying, 'You're using loads more energy than you usually do. Have you left something on?'... Just making you alert of it, so you can think, oh, have I left something on?.. That would be really helpful to save money"*
>
> Prepayment customer, age 35-44, lives in a cold home

Changes to alerts were also suggested to better support consumers with specific vulnerabilities. For example, it was thought that the ability to adjust the volume and tone of alerts could help people with hearing loss.

Design improvements

Improving the look of the IHD was a suggestion made by both high- and low-engagers of the device. These participants felt that their IHD was visually displeasing and improvements to the design, such as a thinner device or options for different colours and styles, would increase their willingness to keep the IHD out on display and to engage with it. Other suggestions focused on making the device wireless and rechargeable to improve the look and portability.

Finally, there was a view that IHDs could be synchronised with other smart household devices and systems such as smart thermostats and smart phones. Participants felt that this would help improve the control and convenience smart meters bring and increase overall system synchronicity. People who typically suggested this had high digital capabilities, were younger (aged 44 or under), and both engaged regularly with their IHD or did not engage at all.

Improvements to energy supplier's apps

Not all prepayment customers were aware of or had access to a prepayment app. These participants wanted this as an option to help them benefit further from having a smart meter; including making topping-up more convenient and their energy management more accessible.

> *"I actually expected to just be able to top-up without phoning up, to be honest. I thought there would be an app: I thought the whole point of it being smart was so it's on your smart phone as well"*
>
> Prepayment customer, age 18-34, struggles to pay bills

Prepayment customers who were aware of and had access to a prepayment app had mixed views on its features and the information it provided. Those with low digital skills felt their app should be made less technical and that the top-up process should be more straightforward to complete. This would increase the likelihood of them interacting with an app.

In contrast, a desire for their app to do more to demonstrate usage trends and credit was reported by participants with high digital capabilities. It was felt that this would allow users to have greater control of spending, usage behaviours and higher overall interaction with their smart meter. Participants suggested that their app could integrate more IHD features, such as the date/ time of last top-up, greater breakdown of usage/ spending and alerts for higher-than-

usual usage (not just when credit is low). In addition, there were calls for improved app responsiveness from those who reported delays in updated credit information following top-up.

Credit consumers reported interest in monitoring energy usage more frequently and conveniently, for example when away from home. Where participants did not have access to or use an app, or where their app did not offer this functionality, they felt that this information would be a useful addition. Reflecting the suggestions expressed by prepayment customers, these credit consumers suggested the app could contain IHD information and provide credit or budgetary notifications.

Improvements from energy suppliers, the Government, and other organisations

Participants' ideas for how energy suppliers and government could better support consumers to get more out of their smart meters focused on the installation process and aftercare.

Improvements during installation

Participants called for better guidance on using smart meters and the IHD at the point of installation. This was particularly important for those lacking confidence in technology, for example due to their age or educational attainment. It was suggested that this guidance could come in the form of practical training or demonstrations from engineers during installation, alongside an easy-read brochure left behind with simplified information, and step-by-step instructions on IHD usage.

> *"…maybe a walkthrough, rather than just a leaflet, because it was quite a hefty leaflet and it wasn't light reading, and it was quite confusing because in some ways, I'm not technically minded, I didn't know what half the things were. He [the engineer] just said, 'Oh, you don't need to worry about anything else. Just look on there [the IHD] and it'll tell you… but it was a lot more complex than that"*
>
> Credit customer, age 35-44, cardiovascular condition

In order to explore participants' comments on the importance of greater information and support on how to use their smart meters and IHDs further, BEIS developed some broad potential policy ideas to act as stimulus for discussion in four deliberative workshops. Participants who had taken part in the interviews were invited to reflect on and further refine these initial ideas. Their thoughts are summarised in the boxes below.

Pre-installation guidance

The broad idea: consumers receive information on how they can use their IHD to help budget and use energy to meet their energy comfort needs, as well as supporting energy reduction.

Those who welcomed this advice said they would value an explanation of how their IHD works in general, rather than specifically around meeting budgeting and comfort needs. They felt it would help them become more familiar with how an IHD works prior to installation, allowing them to prepare questions for the installer in advance on what they were not clear about.

- **Timescales:** they wanted the information to be sent close to the installation date, either a week or a few days before, to allow them to familiarise with and retain the information before the visit.

- **Content:** to avoid being overwhelmed, participants said they would benefit from just basic information on how to use the IHD and some key benefits explained in simple terms.

Not everyone agreed that pre-installation advice would be helpful. Participants across the groups expressed concerns about the relevance of receiving information before having an opportunity to see and interact with their IHD for several reasons. These included not having the time to review the information prior to installation, not being able to understand it prior to engaging with their IHD and needing a physical demonstration rather than written information.

At-installation guidance

The broad idea: at installation, the installer would provide a demonstration of not only how to use and understand their IHD, but how to use it as a tool to help both budget and meet their energy comfort needs. This includes how to see energy usage in monetary terms, set a budget on it and change a budget.

Again, participants focused on the importance of how an IHD works and its features, rather than on meeting budgeting and comfort needs. This guidance was particularly welcomed by participants who felt they had a limited understanding of their IHD and said they had not received advice or a demonstration at installation. Participants also reflected on four other groups that may also benefit from this follow-up advice: (1) those that were practical/ visual learners; (2) those who accepted their IHD with the motivation to reduce costs; and two groups that may be less capable of engaging with IHDs on their own: (3) older consumers; and (4) those with low digital literacy.

Reflecting the discussion in Chapter 3, views on the appropriateness of this support also hinged on how participants engaged with their IHD. Those who interacted with their IHD often enough to be familiar with the features, as well as those who did not engage with it at all considered follow-up support to be unnecessary or unhelpful.

As with pre-installation guidance, participants also commented on how they would like this post-installation advice to be delivered:

- **Duration** – there were mixed views on the length of the session. On one hand, there was the view that the length should reflect consumer need, including their level of IHD understanding. On the other, participants felt they did not want installers in their homes any longer than needed, particularly after potentially lengthy installations.

- **Content** – as noted, participants wanted the information and demonstration tailored to their needs, rather than narrowly focusing on using the IHD as a tool for budgeting and meeting comfort needs. For example, highlighting features that may be particularly applicable to prepayment or credit consumers.

- **Format** – participants felt that demonstrations should also be accompanied by a range of other resources that they could consult after installation. They emphasised that these resources should be more tailored and accessible than what was felt to be the usual lengthy instruction booklet that accompanies IHDs. Examples included concise,

easy-to-read booklets; tips on how to get the most out of their IHD on a laminated A4 sheet; as well as the use of case illustrations and personas of people using IHDs in similar circumstances to aid understanding and interest. Participants also wanted to be signposted to additional online information and support to consult if they had further queries (discussed in next section).

- **Who should deliver the advice** – participants preferred the information and demonstration to come directly from energy suppliers or an IHD/ energy expert at the time of installation or shortly afterwards. This was because participants questioned whether installers would have the time, patience and the ability to address specific energy related questions whilst conducting multiple installations.

Improvements to installation aftercare

Following installation, participants suggested additional resources would be helpful such as online video tutorials and instruction leaflets on how to use the IHD. Others suggested a 'how to use' feature could be implemented into the device itself. It was mentioned that these resources would be particularly helpful for people who had moved into a property where a smart meter was already installed, for example by their landlord or previous tenants, as illustrated in Case Illustration 6.1.

Even participants who were confident within their digital capabilities wanted more information on the benefits and features smart meters offer. They suggested reminder leaflets providing information about using the IHD as well as tips for using energy efficiently. In addition, participants experiencing financial difficulties said they would benefit from receiving cost-cutting tips, such as which appliances cost more to run and how to cost-effectively heat a home.

As well as wanting additional information, participants reported that more could be done by energy suppliers to provide follow-up support to help them get the most out of their devices. They suggested this support could come in three forms:

- Better and faster support with broken/ malfunctioning IHDs through a direct number for smart meter experts/ technicians. Participants felt that replacing IHDs should be cost-neutral for consumers, given that they were paying for their energy through the supplier.
- Post-installation follow-up calls to check on device awareness and competency, in particular for those who felt information or engineer support was lacking at the time of installation.
- More information on any updates/ changes available to the IHD or smart meter and for it to be easier to have old models updated.

Case Illustration 6.1 Social renter who wants more guidance on using the IHD (Prepayment customer, age 18-34, struggles to pay bills)

Isabel is a social renter on a low income who lives with her two-year-old daughter. She has recently moved into her new property where there was a smart meter already installed. She did not know anything about smart meters before moving in and while there was a guide left in the house, she still does not know how to use all the features and all

the options available to her, such as remote top-up facilities. She thinks a short video tutorial would best help her to understand how to use her smart meter.

"No, it was the situation that, when I moved in, it was already in the new address, so I just went along... I still don't think I do know a whole load about them, to be honest. I feel there's a lot more I need to learn. […] I definitely would love a short video, just because for me now I can watch a video for three, four minutes and know exactly how to use my smart meter"

Based on these interview insights, BEIS developed two further broad potential ideas for providing tailored post-installation support which were discussed at the workshops. These initial ideas were (1) one-to-one support, delivered either in-home or over the phone, and (2) signposting to online support. Participants' views on these ideas are summarised below.

Across both options, participants welcomed follow-up advice and support and felt that it should be delivered either by their energy supplier or, where trust was low in these, government, independent bodies and regulators (such as Ofgem) or national organisations. They expected to be contacted within the first month of installation and there was appetite for signposting of resources periodically after that, for example every six months. Participants were happy to proactively contact suppliers if they needed additional support with their IHD, but also felt that suppliers should reach out and provide wider support to those in specific circumstances. These included people with health issues and people who find it challenging managing their energy use at home.

One-to-one tailored support

The broad idea: consumers are invited to contact their energy supplier to book a one-to-one session with a smart meter expert. The expert can come to their home and talk through how to use and get the most out of their IHD in person or can do this over the phone.

Those who welcomed in-home contact recognised its importance in providing participants with the opportunity to learn in person how to use and resolve IHD issues that may be difficult to do online or over the phone. This approach particularly suited those who reported learning better in person and through demonstrations. However, participants felt that this should not be the default provision, and that video or phone calls should also be offered to offset some of the challenges associated with in-home contact. These included needing to set aside time to accommodate a visit, concerns around social contact because of the coronavirus (COVID-19) pandemic, the costs of visits to energy suppliers which may then be passed on to consumers, and the carbon footprint impact to the environment of home visits.

They also commented on the delivery of one-to-one support, whether it was in-home or through video or phone calls:

- **Duration** – participants felt that one-to-one support need not be lengthy, suggesting around 10-15 minutes to be convenient and efficient. However, participants acknowledged that duration may vary based on individual needs, for example those with low digital literacy may require longer with an expert than someone who is confident with

technology. Similarly, those receiving a good level of support at installation may require less support after installation.

- **Staged approach to support provision** – there was the view that suppliers should nudge consumers in stages, getting a sense of their support needs and encouraging take-up of support at each stage. One suggested approach was that suppliers should text participants shortly after installation to see if they need support and, if so, the supplier should arrange for a follow-up call to discuss further. In-home support or a video call could then be arranged to provide further support if needed.

Signposting to resources

The broad idea: As an alternative to in-home support, the energy company signposts participants to a website where they can access smart meter information and resources. This includes online tutorials, training sessions and step-by-step IHD guides.

Participants who felt confident and able to access resources online said they would find the signposting of resources helpful. They mentioned the potential benefits of this in terms of the convenience of being able to access resources whenever they wanted and stressed that resources need to be clear, non-technical and cover a spectrum of information to be useful. This ranged from Frequently Asked Questions and basic guidance to advanced tips on how to make the most of their IHD. As with in-home support, participants suggested that there may need to be an additional step involving suppliers contacting consumers to understand their needs so they could signpost them to appropriate resources.

In terms of accessing online support, participants mentioned that it could be signposted via email links, over the phone or in person. Alternatively, a Quick Response (QR) code could be provided on the IHD or accompanying information leaflet which participants can scan to quickly access a trusted resource website.

They also had specific suggestions for how these online resources could look. For online tutorials and videos, participants felt these could be delivered via You Tube or PowerPoint and should be at a comfortable pace for participants to follow easily. For step-by-step guides, they mentioned the importance of having visuals and pictures to aid understanding and demonstrate IHD functionality.

Participants suggested other ways in which this online offer could be expanded:

- **Dedicated television slots** – similar to TV shopping channels, there could be demonstrations on how to use and optimise the benefits of IHDs that can be viewed live on television or on ‘catch-up’ television channels.

- **Online group sessions** – to allow them to not only question experts, but also to learn from other IHD users. These could be done, for example, on online conferencing software such as Zoom.

- **Information on social media** – they mentioned information and demonstrations using a range of social media platforms would make the information “fun” and accessible to the younger generation. These included ‘TikTok’, Instagram and Facebook.

As the deliberative workshop findings illustrate, there was not a ‘one size fits all’ preference for the level and type of follow-up support. Rather, participants’ preferences hinged on their availability to accommodate face-to-face visits, whether people learned better independently through signposted resources or needed an expert present, and how confident they felt in being able to access online resources.

7 Conclusions

Using 80 in-depth interviews and four deliberative workshops with consumers, this qualitative study explored the benefits of smart meters for consumers who might experience barriers to realising benefits from smart meters, together with barriers to realising benefits and opportunities to improve the consumer experience. This chapter presents conclusions from the research.

Uses and benefits of smart meters among consumers who might experience barriers to realising benefits from smart meters

The four main vulnerability groupings that were identified and used to select participants for the research worked well to identify consumers who were able to and did benefit from smart metering in a range of ways, and for whom there are opportunities to remove barriers and any detrimental impacts to ensure the benefits of smart meters are maximised and felt by all. The groupings related to a) financial barriers to paying for energy; b) health conditions or disabilities causing specific energy needs; c) lacking control or agency over energy use or costs; and d) comprehension or engagement barriers affecting understanding or interest in smart metering.

Participants exhibited varying levels of use and engagement with smart meters. While interest often waned as understanding of energy use grew, key vulnerabilities exerted an influence over use and engagement, and in different directions. Finances were pivotal here, in that engagement often diminished as finances improved, and intensified when they deteriorated to enable tighter control over spending.

Reflecting this variation in use and engagement, the research identified a broad range of types and levels of smart meter benefits. Smart meters offered greater convenience and peace of mind through automated meter readings and remote top-up. Smart meters helped people to feel more informed about their energy use and spending and better able to manage their consumption, thereby gaining more control over costs as well as contributing to environmental goals. In addition, the findings demonstrated clear links between participants' vulnerabilities and the benefits offered by smart meters, particularly vulnerabilities relating to health issues and financial difficulties.

Detriments and barriers to realising benefits

For participants of this research, any detriments of smart metering were more limited than the benefits. They were usually experienced alongside the benefits, which often outweighed negative experiences. Detriments included heightened anxiety due to greater awareness of energy costs, especially for those in financial difficulty and with existing mental health issues; friction in the household due to disagreements over energy usage; frustration with faults; and a shift towards mistrust in smart metering. These findings echo existing concerns around the

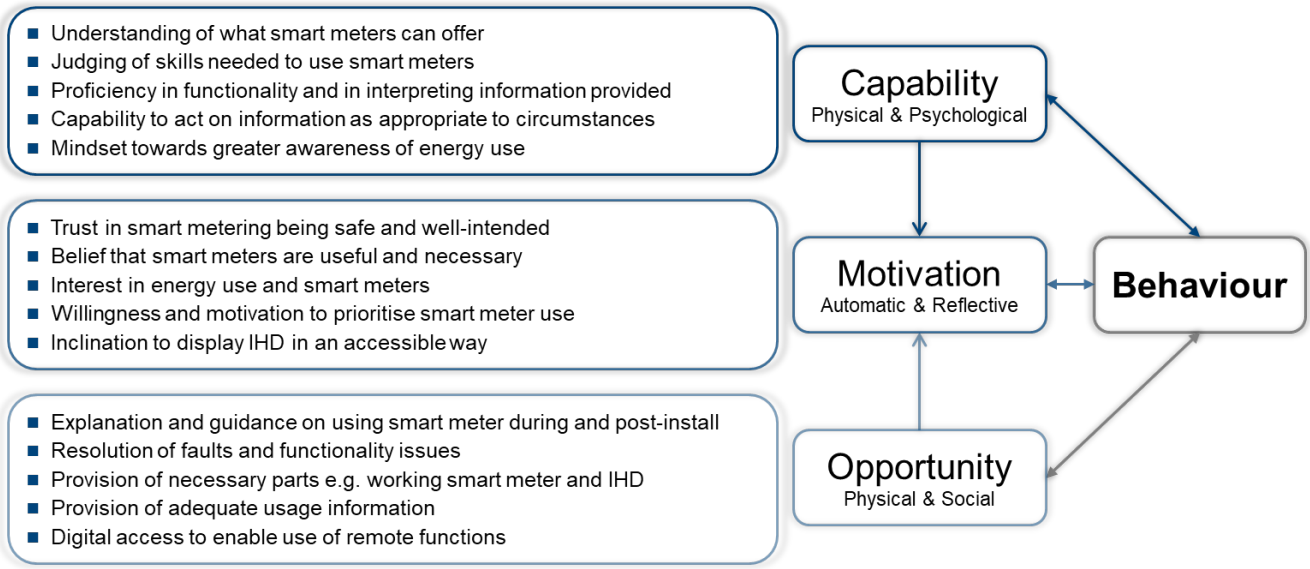
potential of smart meters to allay or heighten anxiety, particularly among consumers who might experience barriers to realising benefits from smart meters, and highlight the importance of support for those at risk of negative impacts.

The research established that while some benefits could be achieved simply by owning a working smart meter (passive benefits), others required a degree of behaviour change (active benefits). It was apparent that not all consumers felt the need to actively use their smart meter or thought they could benefit. This was often because they were content with their energy use and expenditure or were prioritising other needs. However, the findings suggest that participants with vulnerabilities, such as financial difficulties or ineffective heating systems, could have benefitted if they were willing or able to change their behaviour and if wider constraints such as poor internet access or limited guidance at installation were removed.

Opportunities to improve the consumer experience

The barriers and enablers to behaviour change discussed in this report highlight a range of areas where support could be targeted to help consumers get the most from their smart meters. The COM-B model of behaviour change is used in this report to explain the factors enabling and inhibiting behaviour change and smart meter benefit realisation. Figure 7.1 summarises the factors underpinning these barriers and enablers, in relation to three main aspects of behaviour change: capability, opportunity and motivation.

Figure 7.1 COM-B model of behaviour change for smart meter benefit realisation



The findings highlight areas where additional information and guidance could help support a behavioural shift towards more active use of smart meters and the realisation of benefits by vulnerable consumers. The research suggests a need to increase consumer awareness of existing products and features, such as AIHDs. It also highlights the need for myth-busting and the promotion of smart meter benefits both to individuals and the environment, as well as the need to tackle the perception that smart meters require more than a basic level of digital literacy.

Furthermore, the interviews revealed an appetite among consumers for both simpler information and more sophisticated breakdowns of energy use through the IHD. This suggests that offering the ability to dial the complexity of information up or down may be useful in catering to varying consumer needs and interests, and in increasing engagement with smart metering.

In relation to support and guidance provided in and around the time of installation, the findings point to a role for improving the consistency, quality and variety of support provided by suppliers before, during and after installation and to resolve faults and issues quickly. This is reflected in deliberative workshop participants welcoming BEIS's broad potential policy ideas around offering tailored and flexible support, particularly during and after installation.

Appendix A Glossary

Term	Definition
Credit customer	A customer who pays for their energy following bills set by their energy supplier.
Emergency credit	A fixed amount of credit, set by the supplier, provided to a customer when their prepayment meter credit is exhausted.
Energy regulator/ Ofgem	The Office of Gas and Electricity Markets (Ofgem) is the Government regulator for the electricity and downstream natural gas markets in Great Britain. Their role is to protect consumers by working to deliver a greener, fairer energy system.
Estimated readings	A figure used to project a customer's monthly or quarterly energy consumption for the purposes of producing a bill.
First generation smart meter (SMETS1)	Smart Metering Equipment Technical Specification version 1 (SMETS1) - the first version of the Smart Metering Equipment Technical Specification which was designated by the Secretary of State
Fixed tariff	A tariff for consumers where the cost of each unit of energy is fixed over a specified duration. This is usually twelve months but can last up to three years.
Friendly credit	'Friendly Credit' provides a continuity of supply at set times (e.g. overnight) if Emergency Credit runs out to ensure that supply is not lost at an inappropriate time and to give consumers time to top up when appropriate. Suppliers set their own friendly credit hours, and any friendly credit used needs to be repaid in full at the end of these hours.
In-Home Display (IHD)	An electronic device paired to the Smart Metering System, which provides near real-time information on a consumer's energy consumption.
kWh	Kilowatt hours, a unit used to measure energy consumption.
Meter reading	Data collected about energy consumption, for the purpose of informing energy suppliers how much gas and electricity a customer is using. Traditionally, customers would be required to read this information from their meter and communicate it to their supplier, or a supplier would arrange a visit from a meter reader. Smart meters transmit this data automatically.
Prepayment card/ key	A payment card or key onto which credit is preloaded and then slotted into a traditional prepayment meter, allowing it to be topped up. Without doing so,

	consumers would go into emergency credit, or the energy supply will cut off. Smart prepayment meters avoid the need for inserting a card/key, as credit is loaded onto the meter automatically after topping up.
Prepayment customer	A customer who pays for their energy in advance, on a pay-as-you-go basis, by topping-up their meter with credit.
Primary heating system	The main heating system which customers use for in-home heating, for example central heating radiators.
Second generation smart meter (SMETS2)	Second generation smart meter or Smart Metering Equipment Technical Specification version 2 (SMETS2) are the second version of the Smart Metering Equipment Technical Specification which was designated by the Secretary of State.
Secondary heating system	An additional heating system used for specific purposes such as heating individual rooms. Examples could include plug-in heaters, gas fires, oil radiators etc.
Smart meter	Metering systems that are compliant with the Smart Meter Equipment Technical Specification (SMETS) and have functionality such as being able to transmit meter readings to energy suppliers and receive data remotely.
Standard Variable Tariff (SVT)	A supply contract with an indefinite length that does not have a fixed-term applying to the terms and conditions. It is an energy supplier's basic offer. If a customer does not choose a specific energy plan, for example after their fixed tariff ends, they are moved to an SVT until they choose a new one. A customer can also make an active choice to select an SVT.
Topping up	The process by which prepayment customers pay for their energy. This can be done at a top-up shop (traditional or smart prepayment customers), online, via an app or by phone (smart prepayment customers only).
Top-up shop	A shop at which prepayment customers can top-up their prepayment meter e.g. PayPoint, Payzone or Post Office store.

Appendix B Interview sample details

The research focused on four main vulnerability groups as the primary criteria for selection, described in turn below. In addition, the selection criteria for consumers to take part in this research were guided by consumers a) being able to benefit from smart metering; b) being unable to or experiencing difficulties benefitting; or c) being at risk of detriment from new smart meter features or innovations.

Income-related and financial barriers to paying for energy

The sample for the study included people with a range of household incomes. It sought out a purposive sub-sample of people with a household income of less than £15,000 and people who said they were struggling to pay their energy bills. Three groups, discussed in turn below, emerged based on participants' reported household and financial circumstances and their ability to pay their energy bills. These were 'struggling', 'getting by' or 'comfortable'. Factors that affected which group participants and their households fell into were:

- Level of household income relative to expenditure, including impact of the coronavirus (COVID-19) pandemic
- Number of earners and dependents in the household
- Whether they owned their own home
- Energy efficiency of their home
- Whether they regularly managed their outgoings
- Level of pre-existing debt or arrears

Struggling

This group described themselves as living pay-cheque-to-pay-cheque. They had to make decisions about what bills to pay in what order, sometimes having to ration energy use, for example by only using heating for set periods. Credit customers described getting further into debt as monthly payments were revised upwards by energy suppliers. This group included households on annual incomes of less than £15K, between £15K to £35K, and in excess of £35K including earnings as well as pensions, benefits and other income streams. They were characterised by being in receipt of work-related, or health condition or disability related benefits, single earner households, pensioners, or having lost employment because of injury or ill-health. Single-parent households, those with dependent children, and those experiencing relationship breakdown were also prominent in this group.

Low income and/ or poorly insulated, draughty homes combined to create fuel poverty and contributed to wider financial difficulties. While they tried hard to live within their means, some had considerable levels of debt. These included: energy and rent arrears, overdrafts, credit card debts, loans for home improvements, and large and expensive mortgages. Paying debts and ongoing bills compounded the level of debt and sometimes led to anxiety, depression and

a sense of being overwhelmed that meant they felt unable to engage in energy or bill management. The coronavirus (COVID-19) pandemic also meant some previously more financially comfortable households were tipped into the struggling group due to having one or more earner furloughed or losing work or income.

Getting by

This group described themselves as: "not exactly destitute, but not great" or "doing all right but with few treats and no money for holidays". Households with children or other dependents for whom they cared were prominent in this group. Some single parent households managed two jobs to give them the income that they and their children needed. The group contained owner occupiers still paying a mortgage, private renters and social renters with disabilities or ill-health. Those on less than £15K or £15K to £35K sometimes said they had to prioritise bills and be resourceful to get by.

They tended to use prepayment or fixed tariffs to help them plan, sometimes actively managing or rationing their energy use to keep fuel bills down. They often talked in terms of keeping a close eye on all of their bills, including their energy bills. Without the winter fuel allowance for older people, in-work benefits such as Universal Credit, or free school meals, some explicitly said they would not be able to make ends meet.

The coronavirus (COVID-19) pandemic tipped the balance for some households from comfortable to getting by as a result of income loss in the various forms described above. This was particularly where the sole or main earner in the household was affected and/ or there were dependent children.

Comfortable

This group often described themselves as 'fortunate' or 'lucky'. While they did not always consider themselves wealthy, they saw themselves as comfortable and not having to worry too much about energy bills. Household income was in the £15K to £35K or in excess of £35K groups, with this being largely unaffected by the coronavirus (COVID-19) pandemic. The winter fuel allowance for older people often meant people were in this group who otherwise would have seen themselves as struggling or getting by.

The group included single earners with well-paid jobs or good pensions, or with dual or multiple household incomes. There also tended to be no or few dependents in the household. Some had inherited their home or had bought it outright. They lived in properties that they did not struggle to keep warm or managed their energy bills with regular payments. Other than mortgages they had few or no debts, and none were in energy arrears.

Health, disabilities and energy needs

The research sought to include people who themselves had health conditions or disabilities that affected their energy needs or who lived with someone who did. Participants mentioned a variety of health conditions or disabilities. Health conditions and disabilities fell into the following main groups: respiratory, cardiovascular, rheumatic and depression/ anxiety, with some reporting multiple health conditions.

- Respiratory conditions – these included asthma (including Eosinophilic asthma), bronchiectasis, bronchitis, emphysema, COPD and tracheobronchomalacia. These conditions could fluctuate based on weather and environmental circumstances and ranged from having minor effects on people's lives to being chronic and debilitating. Cold temperatures and rainy weather increased the risk of breathlessness, asthma attacks or chest infections. Breathing difficulties could also be conducive to mobility restrictions. Participants therefore spent more time at home and used more energy, especially heating. They also mentioned the use of specific heating devices such as electric blankets.

- Cardiovascular conditions – including angina, cardiomyopathy, Raynaud's, and peripheral neuropathy. Participants with these conditions felt cold more quickly which led to discomfort, especially in their extremities (such as hands and feet); or they experienced pain and breathlessness when moving about. They therefore used more heating to keep themselves warm. In some cases, participants were constantly at home and worked from home due to the severity of their condition. This also led to greater use of energy.

- Depressive illnesses and anxiety – participants often discussed the effects of depression and anxiety on their relationship to energy use and engagement with their smart meters. For some people the effects of the conditions were mild or fluctuated, but for others they were chronic or profound. They often spent more time at home and mentioned using more heat and electricity for electronic devices to entertain themselves and distract from concerns.

- Rheumatic conditions - arthritis (including osteoarthritis and rheumatoid arthritis), fibromyalgia, spondylitis, and Marfan syndrome. Participant's joints, or nerves, in their legs, arms and hands would become painful and/ or stiff if they did not keep warm by having the heating on during cold spells. In some cases, their heating was needed all day and/ or night. Some participants with these conditions said they took baths more often than they otherwise would to ease their pain. Rheumatic diseases also limited mobility, making it difficult to bend down and check a meter or get out and access a prepayment top-up shop.

Other health conditions and disabilities were discussed by participants during the study, although not specifically recruited for. These conditions and their effects were:

- Cancer (e.g. leukaemia) – this meant spending more time at home with the heating on during cold periods or needing ways to cool as a result of some treatments that made them feel hot.

- Skin conditions such as eczema, psoriasis and urticaria – these could be irritated by heat and participants sometimes spent more time at home when the conditions flared up, making them self-conscious.

Control and agency over energy use and costs

The effects of living in a cold home which participants struggled to keep warm, for example due to draughts or ineffective heating systems, are discussed in the sections above. The effect of a sense of control and autonomy was explored in the study in relation to private renters and people living in larger households.

For private renters a range of factors limited their control or agency in relation to energy consumption and smart metering. This included the perception of not having a choice about owning a smart meter or being on a prepayment tariff. Some private renters lacked control due to not having access to the IHD which was in another part of the building. There was also evidence of landlords receiving information about how to use the IHD at the point of the smart meter installation, which was then not passed on to new tenants. For larger households, the sense of a lack of control came from living in a busy household where it was considered difficult to reduce energy consumption. They tended to prioritise the health and warmth of their family and said the opportunity to make savings was limited. There was some evidence of minor relationship difficulties arising from arguments about power usage.

Comprehension and engagement barriers

Level of educational qualifications, access to the internet and energy provider apps (as means used to access energy bill information), and the level of perceived confidence in using technology were used as indicators of comprehension and engagement with smart meters. Although the study set out to include people with English language barriers, the circumstances of recruitment during the coronavirus (COVID-19) pandemic meant that it was not possible to access this group within the timeframe for this research. Comprehension and engagement barriers were found among participants in terms of:

- Their level of understanding about the purpose and potential benefits of smart metering
- Perceptions that benefitting from smart meters requires complex and technical knowledge, which put them off
- Gaps in knowledge about how to use the information made available through smart meters
- Specific circumstances to do with time, opportunity and levels of anxiety that affected motivation to engage with smart metering.

For the participants of this research there appeared to be less of a link between educational qualifications (having more or fewer than five GCSEs or equivalent) and level of comprehension and/ or engagement with energy use information and smart meter technology. At the same time, access to the Internet and perceived levels of digital confidence did not always translate into the ability to engage with or interpret the information offered by smart metering.

The table below shows the other sampling criteria used to select participants and the numbers achieved against each characteristic.

Sampling criteria	Sub-group	Achieved
Meter type	Prepayment	37
	Credit	43
Geographic	Birmingham	9

location	East of England	5
	London	15
	Manchester	6
	North East	15
	West Midlands	10
	Scotland	10
	Wales	10
Area type	Rural	21
	Semi-rural	1
	Suburban	9
	Urban	49
Age	18-34	19
	35-44	27
	45-59	20
	60-74	9
	75+	5
Tenure	Owner	31
	Private renter	20
	Social renter	29
Dependents in household	Yes	43
	No	37
Household composition	Single	20
	Small (4 or less)	50
	Large (more than 4)	10
	Smart meter affected behaviour	54

Smart meter engagement/ use	Smart meter did not affect behaviour	26
Smart prepayment top-up method	Shop	14
	Online or via phone	13
	Both	10
Energy type	Gas & electricity	62
	Electricity only (off-gas)	18

Appendix C Deliberative workshops sample details

The sample breakdown for the four deliberative workshops is shown below.

Sampling criteria	Sub-group	Achieved
Participants with financial barriers to paying for energy		
Meter type	Prepayment	6
	Credit	1
Household income	Less than £15K	5
	£15K to £35K	2
	In excess of £35K	0
Financial assessment	Struggling	7
	Not struggling	0
Age	18-34	2
	35-44	2
	45-59	3
	60-74	0
	75+	0
Gender	Female	4
	Male	3

Participants with health conditions or disabilities that affect energy needs		
Health condition	Depression or anxiety	0
	Respiratory	4
	Heart or blood vessels	2
	Other	0
Meter type	Prepayment	2
	Credit	4
Age	18-34	1
	35-44	1
	45-59	2
	60-74	2
	75+	0
Gender	Female	3
	Male	3
Participants lacking control or agency over energy use and costs		
Household composition	Alone	1
	Couple	1
	4 or less people	4
	More than 4 people	0
Tenure	Owner	2

	Private renter	3
	Social renter	1
Cold home	Yes	4
	No	2
Meter type	Prepayment	3
	Credit	3
Age	18-34	2
	35-44	3
	45-59	1
	60-74	0
	75+	0
Gender	Female	3
	Male	3
Participants with comprehension or engagement barriers		
Education	Less than 5 GCSEs	2
	5 or more GCSEs	0
Digital literacy	Low	0
	High	2
Meter type	Prepayment	1

	Credit	1
Age	18-34	0
	35-44	1
	45-59	0
	60-74	1
	75+	0
Gender	Female	1
	Male	1

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