

Smart prepayment & fuel poverty

A report for eaga charitable trust

Contributing authors:

Nicky Hodges
Simon Roberts
Karen Smith
Toby Bridgeman
Nick Banks
Molly Asher

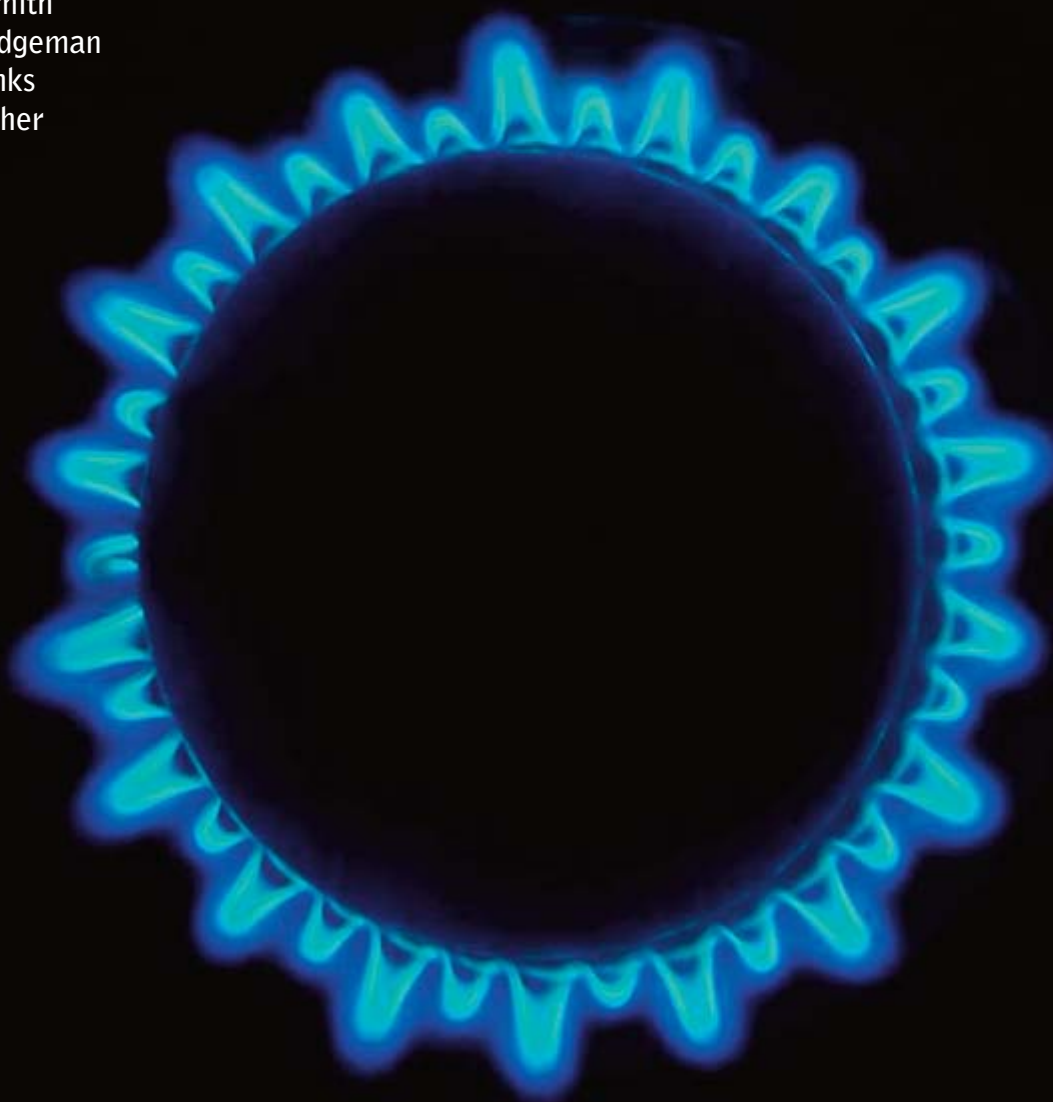


Photo: Eve Dias

October 2016

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Project steering group members: Simon Roberts, CSE (chair); Colin Griffiths, Citizens Advice; Dhara Vyas, Citizens Advice; Daniel Walker-Nolan, Citizens Advice; Stew Horne, Ofgem; Rosie McGlynn, Energy UK; Victoria Mason, BEIS; Daniel Alchin, Energy UK.

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3 St Peter's Court
Bedminster Parade, Bristol BS3 4AQ

0117 934 1400

info@cse.org.uk

www.cse.org.uk



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Executive Summary

Purpose and context

This research was designed to contribute towards a better understanding of the effects of the growing use of smart prepayment (PPM) meters on fuel poverty, particularly amongst households already using conventional PPMs, a group that has historically been poorly served by the energy market. As a part of this research, we also sought to gain insights into the views and experiences of householders who have switched to smart PPM, so as to identify what further policy, regulatory and practice measures might be appropriate to enable such households to maximise the benefits of smart PPMs, including tackling fuel poverty and its harmful effects.

The study was originally timed to fit with the then-programmed smart meter main rollout – from a then-timetabled DCC live date in September 2015. However, the rollout programme has been repeatedly delayed since then, with the DCC live date currently programmed for ‘pre-Christmas 2016’. The study period also coincided with the Competitions and Market Authority (CMA)’s Energy Market Investigation (EMI), which included consideration of detriment to prepay consumers; the CMA’s final decision on remedies was published on 24 June 2016. The implementation of CMA remedies for prepay consumers (assuming these are implemented) and the smart meter rollout will together shape the institutional context for PPM tariffs and smart PPM installations up to 2020. Supplier and consumer responses to these remedies can, in turn, be expected to influence fuel poverty amongst prepayment consumers.

The research drew on published evidence concerning the prepayment segment of the domestic energy market and sought insights from interviews with energy supplier representatives regarding the future smart prepayment market. Qualitative research investigated the views and experiences of households who have recently switched to smart PPM. Quantitative modelling was undertaken to predict the potential effects on fuel poverty rates of a number of scenarios regarding smart PPM uptake and changing prepayment tariffs. Using a small set of actual customer smart meter data, it explored analytical opportunities to generate useful understanding of customer’s changing energy usage patterns for future application with a larger sample covering a longer time period.

Findings

The emerging smart PPM market

Early smart PPM rollout is unevenly distributed across energy suppliers. Utilita, Ovo and British Gas are at the forefront, with E.ON and Utility Warehouse also understood to be installing growing numbers of smart PPMs. Marketing to date of smart prepay has almost exclusively focused on conventional PPM consumers. Suppliers’ future marketing strategies for smart PPM remain under wraps.

During early rollout, suppliers have installed SMETS 1 meters or ‘smart-type’ meters (which offer some, but not all, of the functionalities included in SMETS-compliant meters). Smart Meter Equipment Technical Specification (SMETS) is the minimum technical requirements of smart metering equipment installed if it is to count towards suppliers’ rollout obligations. SMETS 2 is the

specification for mass rollout, which works with the DCC technology.¹ As part of the rollout, all suppliers are required to provide an unconditional offer of an in-home display (IHD) (see below) when installing a smart meter system.

The CMA's interim price cap, if implemented, is likely to be highly influential on the pace and strategy for smart PPM marketing. It should see all PPM (conventional and smart) tariffs lowered from January 2017. The higher specification 'SMETS 2' meters, which will offer improved ability to switch suppliers or tariff type for PPM consumers, are exempt from the price cap. This is intended to encourage suppliers to advance the pace of the SMETS 2 rollout, given the greater potential customer benefits of PPMs meeting this specification.

Modelled effects on fuel poverty

Modelling undertaken for this study indicates that between 95,000 and 181,000 households would be brought out of fuel poverty as a result of switching to a cheaper smart PPM tariff. The biggest reduction would be achieved where 90% of existing conventional prepay consumers switch to smart PPMs tariffs equivalent to direct debit tariffs.

Despite a number of households remaining in fuel poverty after switching from conventional PPM to smart PPM, many households are predicted to experience a reduction in their fuel poverty gap, with the average fuel poverty gap (in the same scenario) reduced from £449 to £341.²

Assuming implementation of the CMA's PPM proposed price cap (2017 – 2020) on prepayment tariffs for conventional and smart (but not SMETS 2) meters, the cap would initially be more important as a driver of this tariff-reduction benefit for fuel poverty than the switch from conventional to smart PPMs.

With the rollout of SMETS 2, the comparative costs of prepay and credit tariffs and the improved ability to switch to more competitive tariffs will become more important in shaping the ability of consumers to move out of fuel poverty. The modelling did not factor in changes in customer behaviour affecting their ability to reduce consumption and so save money. Whilst some behavioural change may be expected as a result of smart meters being installed, many low income households already tightly restrict their energy consumption to manage fuel costs and may have little opportunity to reduce their energy consumption further. In the absence of any robust evidence of this impact, it was decided that attempting to account for associated changes in energy consumption would make the modelling more complex without necessarily bringing additional accuracy or insight.

Household experiences of smart PPM

The qualitative research explored householders' experiences of using smart PPMs, in-home displays (IHDs) and supplier-provided proprietary apps.

Smart PPM consumers predominantly used their IHD to monitor their credit balance and check messages rather than to check historic or real-time usage. Less than half the householders, prior to

¹ DECC (2015) Smart metering equipment technical specifications: second version

² Fuel poverty gap is defined as the amount by which the assessed energy needs of fuel poor households exceed the threshold for reasonable costs (the national median)

receiving a home visit, had explored other screens, such as screens showing historic usage. The number of householders reporting use of the history screen increased from six to eleven (out of fifteen) following a home visit. One reported this screen as particularly useful:

“Yeah, that’s [history screen] the function I use the most I reckon. I like to break it down over a week and see what my cost is and if I’m within my target.... I like to try and keep tabs of what I’m using and to budget really.”

Target setting, setting credit alerts and the visual display of live energy use were also notably under-used functions prior to the home visit. Following the visit, there was increased use of these functions, with some having set daily targets during or following the home visit.

A third of all householders (n=30) reported reduced electricity costs since switching to smart PPM, with reasons including a cheaper tariff and increased awareness of energy use, leading to efforts to reduce energy use. These efforts included more economical use of energy-hungry appliances, turning appliances off standby more frequently and changing their heating practices. Householders did not recall being provided with energy efficiency guidance on use of their IHD during its installation.

Householders reported reduced anxiety as a benefit of their smart PPM, including worrying less about running out of credit because they were able to top up online or over the phone at home or when they are away. The ability to use so called ‘friendly credit’ without being charged any extra was valued by those with children.

The supplier-provided proprietary apps used by case study householders did not offer real-time energy use, making them unsuitable for checking baseload or appliance costing. This is an additional reason in support of the Government requirement that any proprietary app should be additional to, not instead of, the offer of an IHD.³

Discussion and Recommendations

This research provides evidence in support of the government’s requirement that suppliers provide a genuine offer of an IHD with all smart meters and for any other proprietary device or app to be offered as additional, not as an alternative to the IHD. IHDs offer greater functionality than proprietary apps to help low income households identify energy saving opportunities in their home.

It also provides evidence in support of the importance of the smart meter installation code of practice (SMICoP) minimum standards, particularly the sections on ‘Demonstrating the System to the Customer’ and ‘Provision of Energy Efficiency Guidance’ for prepayment consumers. The installation process is a key opportunity for delivery of information and advice to help vulnerable and fuel poor PPM consumers get the most from smart metering and their IHD as a helpful tool to reduce energy waste and manage their fuel bills. Recommendations are focused around this process.

³ A range of other reasons were put forward in responses to consultation DECC (2016) In-Home Display Licence Conditions: consultation response <https://www.gov.uk/government/consultations/smart-meter-in-home-display-licence-conditions> including, amongst others, that an app on a person’s phone won’t be useable by all members of a household, and does not provide a traffic light system for at a glance use.

OFGEM

- Request and review material evidence of compliance with SMICoP minimum standards, in particular on 'Demonstrating the System to the Customer' and 'Provision of Energy Efficiency Guidance'. OFGEM should satisfy itself that for prepayment consumers, energy efficiency guidance is not being skipped over to fit in time for demonstration of the prepayment functions, particularly where installers are under pressure to achieve high target numbers of installations so that suppliers can meet the 2020 deadline.
- Request suppliers to review and report on prepayment customer feedback regarding energy efficiency advice and prepayment functions.
- Encourage supplier-led trials of 'beyond the minimum standards' energy efficiency advice to smart PPM consumers.

Department for Business, Energy and Industrial Strategy (BEIS)

- Work with OFGEM to identify where suppliers need to be pushed harder and held to account as part of the smart meter rollout towards reducing fuel poverty.

Smart Energy GB

- Develop campaign materials aimed at smart PPM consumers that promote awareness of the use of IHDs as helpful tools to reduce and manage energy use as well as more convenient top up and credit-checking.

Energy UK

- Support and co-ordinate efforts by suppliers to fulfil SMICoP minimum standards, particularly 'Demonstrating the System to the Customer' and 'Provision of Energy Efficiency Guidance' for their prepayment consumers.
- Encourage suppliers in their development of a smart PPM 'pre-installation to post-installation' customer engagement strategy to enable vulnerable and fuel poor PPM consumers to realise the benefits of smart metering as fully as possible.

Energy Suppliers

- Develop a smart PPM 'pre-installation to post-installation' customer engagement strategy.

Pre installation

- Produce videos to communicate how consumers can use their IHD to achieve energy demand reduction and budgeting activities as well as prepayment functions.

During installation

- Installers carry tablet-type devices for consumers to view videos or tutorials which:
 - prepare consumers (including all energy users in home) for their use of different functions on the IHD;
 - help consumers to think about their energy practices and where they could reduce energy waste; and
 - encourage consumers to ask the installer questions and play with the display themselves.

Post-install

- Design and implement an annual programme of post-install energy efficiency messages delivered via the messaging function on their displays.
- Frame energy advice to PPM consumers as helping to encourage healthy and less wasteful energy choices.
- Provide energy reports to households which present the cumulative effects of their energy efficiency actions on their fuel use/bill.
- Offer a phone top-up registration service for consumers who want to top up by phone but don't have internet access.
- Resource and support community-based advice, such as local trained energy champions.

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1 Introduction

This research was designed to contribute towards a better understanding of the effects of the growing use of smart prepayment (PPM) meters on fuel poverty, particularly amongst households using PPMs. This is in recognition that this group continues to be poorly served by the energy market, paying higher tariff rates for their energy, facing barriers to switching energy supplier and/or payment method (particularly consumers carrying debt⁴) and being more likely to self-disconnect when facing short term choices about budgeting (e.g. eating or heating)⁵.

As a part of that wider aim, it also sought to gain insights into the views and experiences of householders who have switched to smart PPM, towards identifying what further policy, regulatory and practice measures might be appropriate to enable such households to achieve benefits from smart PPMs, including tackling fuel poverty and its harmful effects.

1.1 Smart metering and fuel poverty evidence

The smart metering roll-out has been presented as a potentially enabling technology change in the strategy to tackle fuel poverty, although it is recognised that there will be limits in how far smart metering alone will be able to make a difference to consumption by households in fuel poverty, Smart metering is expected to help enable consumer behavioural changes to reduce their energy consumption and to switch to cheaper tariffs more easily and so save money on their energy bills, though vulnerable customers are likely to require greater support.⁶ A variety of trials have been undertaken to understand the potential for energy and cost savings associated with smart metering. Evidence on the extent to which fuel poor households will have scope to achieve savings behavioural changes has been challenged.^{7, 8}

The use of smart metering-enabled real live data for accurate identification of fuel poor households and so better targeting of investment and activities is identified as another way in which smart metering can contribute to tackling fuel poverty. However, as noted in the Smart Metering Early Learning Project Synthesis Report, this requires customers to share their data and institutional support to respond appropriately. So far, the potential significance of smart metering on fuel poverty remains uncertain and contested.

⁴ Reforming the switching process for indebted prepayment meter customers, Ofgem September 2014 <https://www.ofgem.gov.uk/ofgem-publications/90376/openletter.pdf>

⁵ Topping up or dropping out: self-disconnection amongst prepayment meter users. Dhara Vyas, Citizens Advice & Citizens Advice Scotland, October 2014. www.citizensadvice.org.uk/Global/Migrated_Documents/corporate/topping-up-or-dropping-out.pdf

⁶ Smart meter roll-out for the domestic and small and medium non-domestic sectors (GB) Impact Assessment. <http://bit.ly/1AZMCPJ>

⁷ See 'Securing the benefits of the programme for consumers' in Public Accounts Committee Update on Preparations for Smart Metering 2014/15 <http://bit.ly/2dBgr2O>

⁸ Darby, S., Liddell, C., Hills, D. & Drabble, D. (2015) Smart metering early learning project: synthesis report. DECC.

1.2 Background on prepayment energy, smart metering and energy market investigation

This section explains some of the technical terms used in the report which may be unfamiliar to some readers of the report.

1.2.1 Prepayment and conventional PPMs

Prepayment is one method of paying for electricity or gas used in the home – it is paid for upfront, before the energy is consumed. In addition to covering the standing charge and per unit charge, the meter can be set up to pay off arrears on an energy debt. For this reason, prepayment meters (PPMs) have frequently been installed in the properties of households with energy debt. Some households request a PPM as an aid to budgeting whilst some rented properties also have PPMs installed to avoid fuel debts being ‘left behind’ by ex-tenants. The number of consumers paying by prepayment doubled from 7% in 1996 to 16% in 2015 (CMA, 2016). With a PPM, the supply of energy can be interrupted when credit on the meter runs out. Self-disconnection happens when all credit is exhausted, including emergency credit (a fixed value) or so called ‘friendly credit’ (periods of the day when suppliers do not disconnect whatever the consumer’s usage or credit status).

Conventional PPMs are topped up with credit using a card or key – usually at local shops or Post Offices with a PayPoint or Payzone facility.

1.2.2 Smart meters and the smart meter rollout

Smart meters are new gas and electricity meters that track energy use regularly through the day and provide information about the energy used by a household directly to the householder and to their energy supplier. This removes the need for manual meter readings and for estimated bills.

The smart meter rollout programme in Great Britain is being managed by the Department for Business, Energy and Industrial Strategy (BEIS).⁹ The rollout requires energy suppliers to install smart meters for their consumers as standard by the end of 2020. But there is no legal obligation on individuals to have one. The smart meter roll out includes an early rollout stage (since 2012/2013) and a mass rollout stage (from late 2016).

A new Data Communications Company (DCC) is responsible for linking smart meters in homes with the systems of energy suppliers, network operators and energy service companies. DCC Live is the date when this system will go live, after which the main rollout can commence. The DCC live date has been repeatedly delayed and is currently understood to be ‘before Christmas 2016’. At the time this project was designed the DCC live date had been timetabled for autumn 2015.¹⁰

Smart Meter Equipment Technical Specification (SMETS) is the minimum technical requirements of smart metering equipment installed if it is to count towards suppliers’ rollout obligations. During early rollout, suppliers have installed SMETS 1 meters or ‘smart-type’ meters (which offer some, but

⁹ Since this report was drafted, the former Department for Energy and Climate Change (DECC) has been merged into the new Department for Business, Energy and Industrial Strategy (BEIS). All relevant DECC responsibilities have been transferred to BEIS.

¹⁰ Utility Week (2015), “Government expects a 4 month delay to DCC’s smart meter plans”

not all, of the functionalities included in SMETS-compliant meters). SMETS 2 is the specification for mass rollout, which works with the DCC technology.¹¹

As part of the rollout, all suppliers are required to provide an unconditional offer of an in-home display (IHD) (see below) when installing a smart meter system.

The Smart Meter Installation Code of Practice (SMICoP) sets out consumer protection standards during the installation process, including making sure the customer 'knows how to use, and benefit from, the smart metering equipment to improve the energy efficiency of their home'.¹² The SMICoP aim includes achievement of smart meter programme long term behavioural changes.

1.2.3 Smart PPMs

Smart meters can be set to operate in prepayment mode or in credit payment mode. For smart meters operating in prepayment mode, the IHD provides additional functionality, to show information on remaining credit, debt balance, emergency credit balance, and low credit alerts. Smart meters also enable users to set target usage and limits on usage - functions which are likely to be particularly useful for PPM users, who like the budgeting features of prepay. New smart PPMs allow for prepayment online, by text or on the phone. For meters set in prepayment mode, the SMICoP requires a demonstration of prepayment functions at the point of installation.

Unlike SMETS 1 and 'smart-type meters', the SMETS 2 technology will allow consumers to switch suppliers without needing to get a new meter. Early adopter smart prepay consumers with SMETS 1 or 'advanced' meters will lose 'smart' functionality on switching supplier. Consumers would then either have to revert to non-smart metering or request a new SMETS 2 meter.

1.2.4 In-home display

An in-home display (IHD) is a handheld electronic device kept in the home. It takes information from the smart meter and shows a household's energy consumption, including near real time energy use, and energy usage in the last hour, week, month or year. It allows all energy users in the home to view this information. Information on energy usage can be displayed in pounds and pence or in kWh or carbon emissions. A visual display also shows whether current usage is high or low. The government requires that every household is made a genuine offer of an IHD.¹³

During the early rollout, some energy suppliers have offered proprietary apps for smart phones either as an alternative to, or in addition to the offer of an IHD. The government has since clarified its requirement that suppliers are obliged to make an unconditional free offer of an IHD. In addition to the IHD, suppliers may choose to offer other means of engaging with energy consumption, such as via the internet or via proprietary apps, for use on smart phones or tablets.¹⁴ A grace period was set for suppliers to come into compliance with this clarified requirement.

¹¹ DECC (2015) Smart metering equipment technical specifications: second version

¹² Smart Meter Installation Code of Practice (SMICoP) <http://www.smicop.co.uk/SitePages/Home.aspx>

¹³ Smart Energy GB 'FAQs: What are smart meters?' <https://www.smartenergygb.org/en/faqs?category=what-are-smart-meters>

¹⁴ DECC (2016) In-Home Display Licence Conditions: consultation response <https://www.gov.uk/government/consultations/smart-meter-in-home-display-licence-conditions>

1.2.5 CMA Energy Market Investigation

The Competition and Markets Authority (CMA)¹⁵ opened its energy markets investigation (EMI) in June 2014, following a referral by Ofgem. It concluded the investigation in June 2016. Its final report sets out a range of reforms, with the stated aims of driving down costs by increasing competition between suppliers, whilst protecting those less able to benefit from competition. The measures also include technical and regulatory changes intended to modernise the energy market and make sure it works in consumers' interests.¹⁶ In the press release accompanying publication of the final report, it is stated:

*'The options to switch are far more limited for the 4 million households on prepayment meters. For these customers, a transitional price cap will be introduced which will reduce bills by around £300 million a year. The cheapest tariffs for such customers are currently £260 to £320 a year more expensive than those available for direct debit customers. The price cap will remain in place until the introduction of smart meters removes the limitations on such customers accessing better deals.'*¹⁷

It proposes that the interim price cap be in place from 2017 to 2020, by which time the smart meter rollout is due to be completed. Interoperable SMETS 2 smart meters will not be subject to the cap.

¹⁵ The CMA is the UK's primary competition and consumer authority, with responsibility for carrying out investigations into mergers, markets and the regulated industries and enforcing competition and consumer law.

¹⁶ <https://www.gov.uk/cma-cases/energy-market-investigation>

¹⁷ CMA (2016) Press release: CMA publishes final energy market reforms.
<https://www.gov.uk/government/news/cma-publishes-final-energy-market-reforms>

1.3 Original research design and questions

The original research identified the following stated research questions:

- Can smart PPMs provide an effective tool and solution to help address fuel poverty (by helping consumers control and manage their energy use)?
- Are low income consumers realising the benefits promised from smart PPM and to what extent?
- What additional benefits and opportunities could be realised with policy and practical intervention?
- Will the smart meter roll out result in more low income households paying more than they need to for energy as a result of them switching to smart PPM tariffs?
- What advice and help do low income/fuel poor households need to ensure they get the full benefits from smart PPM when and if they are installed (i.e. to ensure smart PPM has a positive impact in reducing vulnerability to fuel poverty)?

The original research design was devised to enable these questions to be answered using a mixed methods approach, comprising: a published data review; quantitative analysis of datasets of smart PPM customer's energy consumption patterns; and quasi-experimental qualitative research concerning the experiences of householders with smart PPM: firstly, with householders who had switched from conventional PPM; secondly, with households who had switched from credit forms of paying for their energy. Both qualitative research elements were intended to include a test 'with home visit advice' group and a control 'no advice received' group, to enable consideration of how attitudes and experiences varied according to the advice given.

In practice, the actual approach followed varied from this design, with the focus of investigation revised, in the light of: external factors affecting the research assumptions and data availability; insights gained in undertaking the research; and from the advice of the project steering group.

1.3.1 Effects of smart meter rollout delay on research assumptions and data availability

This research was intended to coincide with the planned start of the main smart meter rollout, to generate early insights which could inform practice, particularly for the PPM segment as the rollout proceeded. The main rollout has been repeatedly pushed back, first to April 2016, then to September or October 2016, with remaining uncertainty regarding actual timing.¹⁸ The slippage of the smart metering implementation programme has meant that just a handful of suppliers proceeded with installation of smart (or smart-type) PPMs in customer households during the period of the study. Installations were mainly by new entrant suppliers (notably Ovo Energy and Utilita) or in trials by Big Six suppliers (notably, British Gas and E.On). Although numbers installed are understood to be in the thousands, it proved more difficult than expected to secure a suitably-sized sample of smart PPM customer energy consumption data for analysis using the intended approach. Utilita collaborated to supply half hourly energy consumption data for thirty consumers who participated in qualitative research and consented to their consumption data being shared for the purpose of the research. By itself, however, this dataset was too small and covered too short a time period to be suitable for answering questions of whether smart PPMs are helping consumers control

¹⁸ Utility Week (2015), "Government expects a 4 month delay to DCC's smart meter plans"

and manage their energy use. Nevertheless, it did prove useful as an experimental dataset, with which to test the suitability of techniques for analysis of customer consumption data.

The difficulties in securing relevant customer datasets led us to instead adopt a modelling approach, making use of suitable national representative household survey data. However, this necessarily required a change in the focus of research questions investigated. The revised design and approach is described further below.

The delay to the main smart meter rollout also affected our ability to undertake one strand of the envisaged qualitative research. An underlying assumption of the research design was that the smart meter rollout would lead to an expansion of the prepay market through the marketing of new pay-as-you-go tariffs, with tech-savvy consumers switching from credit tariffs to smart PPM tariffs. The research design had included 'credit to smart PPM' switchers as a target population of interest, as part of the second qualitative research. But during the research, it proved impossible to identify households who have voluntarily switched from credit forms of payment to smart-enabled prepayment. We surmise that this is partly due to the delayed rollout and the focus of early marketing approaches taken by suppliers on households with conventional PPMs installed or existing credit consumers in arrears.

1.3.2 Research team and project steering group led changes to the design

The research team and project steering group agreed on a number of changes to the research design in response to constraints encountered, new intelligence gained and our own developing appreciation of the context. The most noteworthy of these changes to be aware of are:

- A methodological change to use of modelling-based approaches to understand the effects of smart PPM on fuel poverty rates, in response to insurmountable difficulties in gaining timely access to suitable customer consumption data for use in analysis;
- The inclusion of informational interviews with supplier representatives as a source of insights on the future direction of the smart PPM market, partly in response to limited access to suitable published statistics and other evidence; and
- The presentation of findings from one set of qualitative interviews as case studies, with limited further analysis, to reflect recognised limitations in the suitability of the data to generate generalizable findings. This arose from difficulties in identifying individuals who fitted the intended profile of participants - consumers who had switched directly from a credit-type tariff to a smart prepay tariff.

1.4 Revised design and research questions

1.4.1 Revised design

In light of the effects of external factors and the decisions of the research team and steering group, the revised design comprised:

- Contextual analysis of the existing and developing smart PPM sector, drawn from desk analysis of published evidence and a set of three telephone interviews to gather the perspectives from energy supplier representatives. This understanding served to frame the revised design of other research elements as well as to inform interpretation of the primary research findings.

- Quantitative modelling, using nationally representative household survey datasets, to predict how the smart meter rollout would potentially affect rates of fuel poverty (and associated fuel bill savings for consumers), based on three scenarios.
- Qualitative research with former conventional prepay consumers (n=30) who have had a smart PPM installed, including a quasi- experimental comparison of the experiences of householders who received a home visit advice session in use of their IHD and those who did not.
- Qualitative case study home visit and semi-structured interviews with smart prepay consumers (n=3), including exploration of their use of apps instead of IHDs.
- Experimental analysis of a small set of actual customer PPM energy consumption data (n=30).

1.4.2 Revised research questions

The research questions explored using this revised design and reported here include:

Smart PPM market and supplier approaches to smart prepay

- What has been the scale and nature of smart PPM installations as part of the early smart meter rollout?
- How will the move to smart prepay affect supplier's communication with and support to vulnerable prepay consumers?
- What are supplier's longer-term marketing strategies for smart PPM - and what is the place of vulnerable and low income households within that?

Fuel poverty and household energy bill effects of smart PPM rollout

- What is the likely quantitative effect of smart PPM rollout to 2020 for fuel poverty levels?

Consumer experiences of smart PPM; informed by contextual analysis and qualitative research

- What has been the experience of consumers moving from conventional PPM to smart PPM?
- How has the switch to smart PPM affected energy consumption in fuel-poor households?
- How are households using their IHDs? With what effects for their energy behaviours, lifestyles and finances?
- What health effects are associated with the shift to smart prepayment?
- What messages or actions merit further attention as possible means of enabling consumers to more fully realise the benefits of smart PPM?

Analysis opportunities of using smart PPM consumer data in fuel poverty research; informed by experimental analysis

- What opportunities does analysis of actual customer consumption data offer to understand the effects of smart PPM installation and experimental interventions on energy consumption patterns and fuel poverty?
- What methodological and data requirements are important in the design of future research using such modelling analysis?

In the following chapters, the findings from each of the research activities are reported, leading on to discussion of the findings and conclusions.

2 Approach and Methodology

The research used a mixed methodology to investigate the relevance of smart PPM rollout for fuel poverty, with quantitative investigation of the effects for fuel poverty at a national and a household level and qualitative investigation of the experiences of smart PPM consumers. A steering group met at two points during the research, contributing towards revisions to the research approach and, in the latter meeting, to reflect on draft findings and their potential application to inform future research and policy.

The evidence sources, method of data collection and analysis methods used in each of research component are described below. This includes outlining limitations specific to particular components of the research.

2.1 Desk analysis and energy supplier key informant semi-structured interviews

Desk analysis of published reports and statistics on trends affecting prepay consumers provided a contextual understanding of the emergent smart PPM market. It drew on attitudinal and tracker surveys and reporting data published by BEIS and Ofgem, evidence produced as part of the CMA EMI and Citizens Advice published research on PPM households.

A small number of semi-structured telephone informational interviews were conducted with senior customer engagement executives representing energy suppliers active in the early smart PPM rollout to draw out some industry insider insights on the developing smart PPM sector. The interviews were guided by a pre-provided set of questions, asking about current and future marketing approaches as well as communication with consumers, including vulnerable consumers. This contextual research informed the design of research tools used in the qualitative research and assumptions used in the modelling.

2.2 Quantitative modelling of the effects of smart meter rollout on fuel poverty in England

The quantitative analysis element was significantly modified from the originally proposed approach to undertake analysis of a large anonymised set of actual PPM customer energy consumption. It proved impossible within the research timeframe to secure access to a large set of customer data from energy suppliers.

From project inception, CSE contacted a number of energy suppliers to request they release a set of anonymised customer smart PPM energy consumption data, ideally to include some 'pre-smart' consumption data to compare against. However, despite persistent efforts over a period of six months, we were unable to negotiate the release of data. Particular barriers encountered included: relatively frequent changes of contact person at suppliers without handover, requiring recommencement of negotiations or non-response from suppliers; concerns about data disclosure and data security arrangements; and prioritisation of in-house data analysis demands by suppliers. Where reasons were given for not releasing data, reasons cited were:

- That the smart prepay market is too underdeveloped as yet to be able to discern trends;
- That in-house teams are doing analysis of the customer data and hence there is a reluctance to make it available to others, and;

- That they have insufficient numbers of smart prepay consumers to make available a dataset to us (the supplier in question actually had several thousand).

Conversations continued with Ovo energy for longer than with the other energy companies approached, but eventually they too were not able to provide data in the extended timescale offered and we made the decision to stop pursuing that opportunity in April 2016.

Lessons learned for future projects include: pre-engagement with suppliers at research design stage; setting out a clear strategy for negotiating and securing access, with suitable resource allocation; production of a project brief for suppliers, to minimise duplication of effort and ensure consistency of message; use of face-to-face meetings where possible; keeping an audit-trail style record of contact with suppliers; and using steering group and internal review processes as opportunities to review the effect of external or previously unknown factors on the timeliness and deliverability in line with the proposed approach.

It was decided instead to undertake modelling to forecast the impact of smart PPM on fuel poverty. The modelling applied an analytic model to socio-demographically representative samples of households, according to a set of stated assumptions. The methodology used, including the assumptions applied, is described in greater detail in 6.2 below. The analysis identified estimates of the number of households in England estimated to be brought out of fuel poverty and the effects on household fuel bills.

2.3 Qualitative research with prepay consumers who have moved to smart PPM

The research included a test group of 15 Utilita customers with smart PPMs, who had previously had 'conventional' PPMs as customers of a different supplier. Home visits were made to each household, with a short follow-up telephone interview conducted approximately four to six weeks following their home visit. The home visit consisted of a half hour interview which gathered information on the property, occupancy, fuel payments, household energy-using practices and any energy-related issues. This was followed by an interactive session in which energy advisers from the Centre for Sustainable Energy (CSE) guided householders through all of the screens of their Utilita IHD and explored with them how to use the display to manage and reduce energy use, tailored to their home situation. In follow-up interviews, householders were asked questions about their use of their smart meter display since the home visit, as well as on their views of the advice given. A control group of 15 Utilita smart prepay consumers participated in a short telephone interview about their experiences in using their smart meter display only.

Householders were mainly recruited through telephone invitations, using contact details provided by the energy supplier Utilita, with some householders recruited through CSE advice line calls and workshops. Householders had their smart meter and display installed predominantly in the 3 months prior to the research (June-August 2015) with only 5 of the 30 interviewees having installations before then. Interviews took place late August-December 2015. It was not possible to explore space heating costs with every household as the heating was either not yet on, or had only be used for a relatively short period. However, householders were able to discuss electricity costs.

All interviews were audio recorded and transcribed, and then qualitatively analysed using thematic analysis.¹⁹

This research component was separately funded by the Chesshire Lehmann Fund and the USmartConsumer project. The findings, with write-ups of individual case studies, are reported in full in Simpson et al (2016).²⁰ Key findings relevant to this research are reproduced in this report.

Customer energy consumption data for gas and electricity over a period of 7 months for all participating households was supplied to CSE by Utilita, with the permission of householders. Analysis of this data was undertaken as part of the quantitative analysis component of this research (see Chapter 7 below).

2.4 Qualitative research with consumers of different suppliers who have a smart PPM

This research component varied importantly from its originally intended scope. The proposed design was to compare a test group and a control group of former credit payment consumers who have switched to smart PPM. However, this proved unachievable. The limited rollout of smart PPM over the relevant time period, with initial targeting by suppliers mainly of households with conventional PPMs, meant that the research was unable to identify households fitting the profile of the intended population of interest, namely former credit payment consumers who have switched to smart PPM. The recruitment strategy was limited on practical grounds to within a reasonable travel distance of Bristol. The reluctance of energy suppliers to provide access to existing consumers as a sampling frame further impeded the ability to secure suitable participants.

Alternative recruitment strategies were pursued, including using CSE's own social media channels and customer database to recruit suitable participants and engagement of a research participant recruitment agency, guided by an agreed screening process and with a more generous incentive payment. The research was also promoted via a partner debt advice agency's social media channels. In recognition of the additional effort required per participant to recruit, a reduced target of 6-8 participants in each group was defined. However, in practice, just four participants from over 300 contacts were screened as meeting the criteria. Most of the contacts screened out as unsuitable had a conventional PPM or used credit payment and had a smart meter. Furthermore, at the time of the home visit, it transpired that every participant who was selected via the screening process had in fact most recently switched from a conventional PPM to a smart PPM, rather than from credit payment, which they had indicated in their answers to the screening questions. The study's failure to identify any suitable candidates suggests that to date a very limited number of households have switched from a credit form of payment to use of a smart PPM.

As only a handful of participants were positively identified to participate, the research approach was modified to conduct a home visit and follow-up phone call for each participant, to gather as rich as possible data as a set of qualitative case studies. This was instead of the proposed quasi-experimental design, which would have required larger numbers to have a meaningful test and

¹⁹ Thematic analysis is a method used in qualitative research which involves identifying, analysing and reporting patterns in data

²⁰ Simpson, K., Smith, K. & Thomas, K. 2016 Smart Prepayment meters: householder experiences. Centre for Sustainable Energy <https://www.cse.org.uk/smart-prepay-hh-experiences.pdf>

control group. Three case study household interviews were conducted, two of which were followed up by a short phone calls concerning the advice provided on use of their IHD (the third participant did not have an IHD so such advice could not be provided during the visit). One eligible participant dropped out before the home visit was conducted.

The home visits consisted of an interview which lasted around 30 minutes, followed by an interactive session in which the energy advisers from CSE guided the participants through all of the screens of their IHD and/or smartphone app. In follow-up interviews, participants were asked questions about their use of their smart meter display use since the home visit, as well as on their views of the advice given. Screen shots of IHD screens and/or app views were taken as a record of customer's energy consumption history. All interviews were audio recorded and transcribed, and then qualitatively analysed using thematic analysis. They were each written up as an individual case study in order to provide a rich picture, with limited further analysis of findings from the small number of cases.

2.5 'Proof of concept' analysis of smart PPM customer energy consumption data

Analysis of patterns of actual smart PPM customer energy consumption data were conducted for 28 of the sample of 30 smart PPM Utilita consumers who participated in the qualitative quasi-experimental research. Utilita provided CSE with energy consumption data for electricity and gas for 28 of the 30 households covering several months either side of the intervention. The data was provided under a specific contract and data sharing agreement; CSE received permission to analyse the data for the purposes of this project. This analysis compared the energy consumption patterns by the test group and the control group using half-hourly energy consumption data. Supplementary data, including the date and type of the intervention, was also used in the analysis.

The core set of data contains the meter number, fuel type, meter type and half hourly intervals of energy consumption in kWh. In addition, some supplementary data, which included the date and type of the intervention was used in the analysis.

Interventions occurred from the end of August to the end of October; before or in the early part of the heating season. Pre-intervention data covering predominantly the spring and summer months, although three consumers have data that starts in last week of January 2015 or early February. However, the majority of customer data starts in May, June or July. Data collection continued after the interventions until the end of December. This means that drawing any detailed conclusions on the impact of the interventions is difficult; there is not sufficient data to establish baseline levels of consumptions, nor account for seasonal influences. This was anticipated, with the principal purpose of this element of the study being to test the efficacy of our analytical approach and reveal its potential value if applied to a larger dataset, with more complete pre- and post- installation data.

Data for a four week period around the intervention for each household was interrogated – covering the two weeks before and after the intervention (or the date of the telephone interview, for control case).

3 Smart PPM market and regulatory context

3.1 Introduction

This section seeks to arrive at a clearer picture of the number and profile of smart prepay energy consumers, the shape of the emerging smart PPM sector and the situation of vulnerable and fuel households within that sector. It draws on published evidence and statistics on the smart PPM market, including: Ofgem's supplier performance on social obligations annual reporting; Citizens Advice and Ofgem attitudes tracker and consumer surveys; and data captured by the CMA investigation. It also incorporates insights from informational interviews with senior staff from three energy suppliers, including two 'Big Six' suppliers and one independent supplier – all three have had some early engagement in the roll out of smart PPMs.

3.1.1 Trends in numbers of prepay consumers

The number of consumers paying for their energy with a PPM has been increasing in recent years. In 2014 17% of all electricity accounts and 15% of all gas accounts were paid for through a PPM. This was 2% more for electricity and 4% more for gas than at the end of 2013.²¹

PPMs are often used by suppliers to recover debt from consumers. This is particularly the case where the consumer can only afford small repayments that would necessitate more than a year to clear the debt. Prepay is often the only repayment method that suppliers will accept in these circumstances. Once a PPM is installed then a supplier can gradually recover debt from the customer as part of their meter top-ups. Additionally, many consumers find it is easier to budget for energy with a PPM. With this payment method it is impossible to spend more than you have on your meter and so impossible to build up a debt. This does mean, however, that if a customer gets their budget wrong they will be left with no energy, which, particularly for vulnerable consumers, carries a significant risk.²² Citizens Advice, in analysis exploring self-disconnection and self-rationing of energy by prepay energy consumers, finds that a majority are not using their PPM to repay debt and tend to refer this form of payment as a budgeting/lifestyle tool²³.

3.1.2 Demographic characteristics of prepay energy consumers

An appendix to the CMA final report included analysis of the demographic characteristics of prepay consumers²⁴. It identified that:

- compared with both direct debit and standard credit consumers, prepay consumers are significantly: less likely to have a degree as their highest qualification; and more likely to have a GCSE as their highest qualification. Compared with direct debit consumers, prepay consumers are significantly more likely to have no qualifications.

²¹ Ofgem (2015), Domestic Suppliers' Social Obligations: 2014 annual report

²² CSE is undertaking advice and advocacy work to support prepay consumers in the West of England including to change supplier, tariff or payment method. Our direct practical experience is that if a customer wishes to move to direct debit there are typically 3 to 4 key steps in the process with numerous interactions between themselves and their suppliers.

²³ Citizens Advice (2014), Topping-up or dropping-out: self-disconnection among prepayment meter users

²⁴ CMA (2016) Energy Market Investigation: final report. Appendix 9.6: Prepayment.

- compared with both direct debit and standard credit consumers, prepay consumers are significantly less likely to have an income of over £36,000 and more likely to have an income below £18,000;
- compared with direct debit consumers, prepay consumers are significantly less likely to be aged over 65 and more likely to be aged between 18 and 35. Further, when compared with standard credit consumers, prepay consumers are significantly less likely to be aged over 65 and more likely to be aged between 35 and 44 or 45 and 54.
- compared with both direct debit and standard credit consumers, prepay consumers are significantly more likely to be disabled, be a single parent, or have more than one of the following markers of vulnerability status: disabled, single parent and carer.
- compared with direct debit consumers, prepay consumers are significantly less likely to live in a property they own and more likely to live in rented housing, both social and private, and other. In addition when compared with standard credit consumers, prepay consumers are significantly less likely to live in a property they own outright and are more likely to live in rented social housing and other housing.

This is consistent with research conducted by Ofgem in 2010, which found that prepay consumers were more likely than the average customer to have a low income and be in receipt of a means-tested benefit or disability benefit.²⁵ Research by Ofgem also found that, whilst 36% of the lowest two social grades (DE) use a PPM, usage of PPMs amongst the top two social grades (AB) is just 3%. The same research found that 36% of tenants in rented property had a PPM compared to 9% of those in other properties.²⁶ Amongst respondents who report having a physical or mental impairment, 25% report PPM as their payment method, whereas amongst respondents who do not report having an impairment, 15% report PPM as their payment method.²⁷

At present, there is insufficient data available on smart prepay consumers to know if there are any significant differences in demographic characteristics when compared with conventional prepay consumers. Given the reported focus to date on installation in homes of those with conventional PPMs, it seems reasonable to conclude that the smart prepay consumers largely share the same characteristics as conventional prepay consumers. However, as the smart prepay market evolves, greater differentiation is likely to arise between the smart prepay customer segment and the residual conventional prepay customer segment.

3.1.3 New installations of PPMs

In 2014 300,000 new electricity PPMs and 320,000 gas PPMs were installed. This represented an increase in gas PPM installations of 9% but a fall in electricity PPM installation of 1%. Of the PPM installations in 2014, 60% were installed to deal with debt.

This movement of people towards PPMs is happening despite prepayment tariffs generally costing more than other payment methods. Thus, prepay consumers are on the highest tariffs, but are also generally the least able to afford them.

²⁵ Reforming the switching process for indebted prepayment meter customers, Ofgem September 2014 <https://www.ofgem.gov.uk/ofgem-publications/90376/openletter.pdf>

²⁶ Ofgem (2015), "Customer engagement with the energy market – tracking survey 2015 dataset. T309 "

²⁷ Ofgem (2015), "Customer engagement with the energy market – tracking survey 2015 dataset. T310 "

As reported by the CMA, the price differential between the cheapest prepayment tariffs and direct debit tariffs is between £260 and £330 per year, depending on location²⁸. There is a much smaller range of tariffs available for use on PPMs and the CMA found little evidence to suggest that competition is increasing in the prepayment market²⁹, with ‘fairly static’ gains available to dual fuel prepay consumers switching. This compares with sharp gains available if they switch to a credit meter, with a doubling between 2013 and 2015 in the gains available, depending on supplier. The CMA found that independent suppliers are claiming a growing share in the prepayment segment, reaching 8% for gas and 7% for electricity as of Q2 in 2015 but were disappointed to find no associated evidence of improved outcomes for prepay consumers.

Suppliers have argued that one factor in the higher comparative costs of prepayment tariffs is due to a different ‘cost to serve’ associated with the metering infrastructure for PPMs. In its final report, the CMA assessed the additional costs associated with serving prepay consumers to be £63 (£24 electricity; £39 gas). It did not consider that this is what is driving the difference in tariffs between prepayment and direct debit tariffs.

Most prepay consumers could have significantly lower energy costs if they moved away from a prepayment tariff to another payment method. Despite this, in 2014 only around 130,000 electricity consumers and 103,000 gas consumers switched from a PPM to a credit meter.³⁰ Research has shown that prepay consumers are more likely to have never switched supplier (46%) than direct debit consumers (26%).³¹ Ofgem data also shows that 20% of those who have never switched supplier are prepay consumers³² indicating that this group of consumers is over-represented amongst consumers who have never switched. It also indicates that just 11% of prepay consumers were aware that changing tariff within their current supplier was an option.³³ 28% of prepay consumers were also unaware they were able to change to a different supplier.³⁴

This may in part be due to problems encountered by prepay consumers when attempting to switch. Most switching sites ask you to identify your current method of payment and then tend only display those tariffs which use the same method of payment, which can make it hard for prepay consumers to compare tariffs and organise a switch. Prepay consumers, identified as over-represented amongst disengaged consumers, are likely to need to contact suppliers directly and negotiate to make a switch.

Another barrier, which Ofgem and others have already sought to address, is the practice by suppliers of charging consumers for the move from a PPM to a credit meter. Ofgem quote an average cost for removal of between £47 and £160 but also report that charges were only levied in 5% of meter removal cases in 2014.³⁵ Alternatively, suppliers may require consumers to put down a security

²⁸ CMA (2016) Full provisional decision on remedies Energy Market Investigation. Cabinet Office/gov.uk.

²⁹ Citizens Advice (2014), Topping-up or dropping-out: self-disconnection among prepayment meter users

³⁰ CMA (2016) Full provisional decision on remedies Energy Market Investigation. Cabinet Office/gov.uk.

³¹ Citizens Advice (2014), Topping-up or dropping-out: self-disconnection among prepayment meter users

³² Ofgem (2015), “Domestic Suppliers’ Social Obligations: 2014 annual report”

³³ Ofgem (2015), “Customer engagement with the energy market – tracking survey 2015 dataset. T91 ”

³⁴ Ofgem (2015), “Customer engagement with the energy market – tracking survey 2015 dataset. T94”

³⁵ Ofgem (2015), “Prepayment review: understanding supplier charging practices and barriers to switching”

deposit or undergo a credit check. In 2014 10 out of 18 suppliers required a security deposit and the average price charged was £211.³⁶ Progress has been made in the removal of such charges, with 5 of the 6 big energy suppliers voluntarily offering to not charge for removal of PPMs, though some smaller suppliers continue to charge for a credit meter to be installed^{37, 38} Furthermore, suppliers are not required to announce these changes. It is possible that consumers who have previously been put off changing due to the charges may not be aware of the changes and so may not bother re-asking to have their meter changed.

3.1.4 The current smart meter market

As outlined above, all energy suppliers are now legally obliged by the smart meter rollout obligation to take all reasonable steps to replace traditional energy meters with smart meters by the end of 2020. However, as of the end of December 2015, just 2.4 million homes out of the 26 million homes in Great Britain have had a smart meter installed. The number of homes with an operational smart meter is even fewer, at 2.32 million, which represents 4.6 % of all domestic meters³⁹. This shortfall between operation and installation may be due to technical issues or due to consumers switching supplier after having a meter installed to a supplier that cannot yet operate smart meters.

BEIS's public attitude tracker asks respondents if they have a smart meter installed in their home. In the latest wave, one in five respondents (20%) claimed currently to have a smart meter, of whom, two thirds (66%) reported having an in-home energy display or energy monitor installed in their home as well.⁴⁰ The tracker response is inconsistent with the industry-supplied figures on smart meter installations, as it would suggest that over 5 million homes in the UK already have a smart meter installed. Rather, it highlights that many people do not really understand what a smart meter is or how it differs from a standard meter.

However, the rate of installation of smart meters is increasing. During the last quarter of 2015 large energy suppliers installed 402,638 smart meters in domestic properties. This was almost double the number they installed in the first quarter of 2015 and over four times the amount installed in the first quarter of 2014.⁴¹ In the whole of 2015, across both small and large energy suppliers there were 1.5 million smart meters installed. Figure 1 shows the increase in the numbers of smart meters being installed.⁴²

The slow start has been partly due to problems with the Data Communication Company (DCC). The DCC are responsible for connecting smart meters with energy suppliers and their systems. The

³⁶ Topping up or dropping out: self-disconnection amongst prepayment meter users. Dhara Vyas, Citizens Advice & Citizens Advice Scotland, October 2014.
www.citizensadvice.org.uk/Global/Migrated_Documents/corporate/topping-up-or-dropping-out.pdf

³⁷ Money Saving Expert (2016) How to switch to a credit meter if you're with a supplier that charges you to do so. <http://www.moneysavingexpert.com/utilities/switch-prepaid-gas-electricity>

³⁸ Ofgem (2015), "Consumer vulnerability strategy progress report"

³⁹ DECC (2016), "Statistical release and data: Smart Meters, Great Britain, quarter 4 2015"

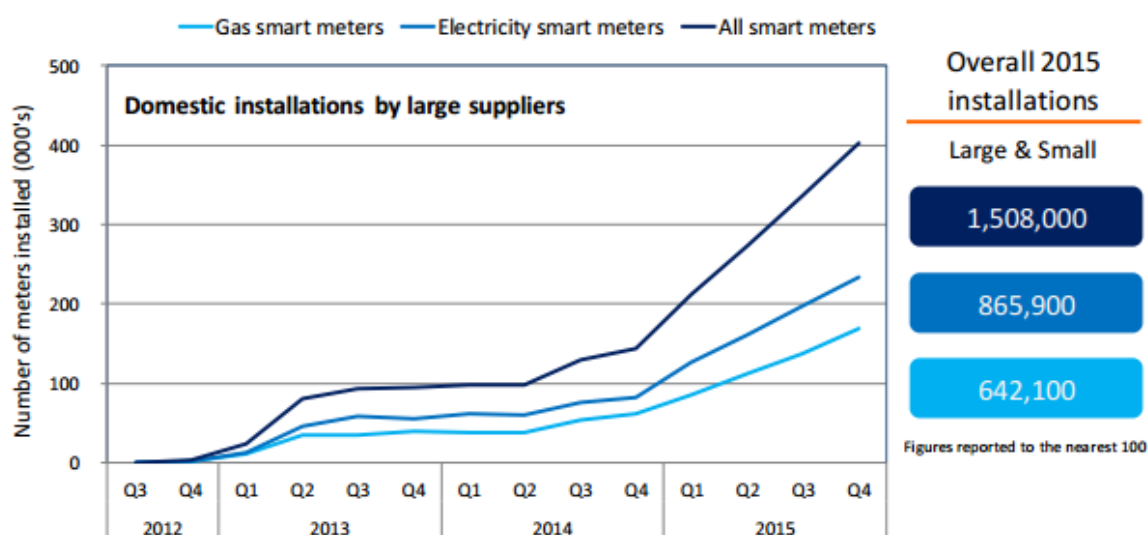
⁴⁰ DECC (2016) DECC Public Attitudes Tracker – Wave 17: Summary of key findings

⁴¹ DECC (2016), "Statistical release and data: Smart Meters, Great Britain, quarter 4 2015"

⁴² Reforming the switching process for indebted prepayment meter customers, Ofgem September 2014
<https://www.ofgem.gov.uk/ofgem-publications/90376/openletter.pdf>

company was originally supposed to go live in December 2015 but this was pushed back to April 2016 and now until 'before Christmas 2016'. Some suppliers have been waiting for the DCC to be up and running before commencing a full roll out.

Figure 1: Quarterly installation activity for large energy suppliers and overall installation activity during 2015 for large and small energy suppliers



3.1.5 The emerging smart prepayment sector

At the end of 2014, data showed that 15% of gas meters and 17% of electricity meters were PPMs and by the end of 2015, 4.6% of all meters were smart. What is less clear from the available data is the cross over between smart meters and PPMs and how many people are currently paying for their energy through smart prepay.⁴³

UK Government data suggests that the penetration of smart meters into the PPM sector is slightly higher than in the wider market.⁴⁴ The CMA estimates that 8% of dual fuel consumers who pay by PPM are on a smart meter. This figure is averaged across all suppliers, some of whom do not offer smart prepayment, whilst for other suppliers, the smart prepayment sector is an important area of market sector growth. Most notably, Utilita primarily serves prepay consumers and is promoting smart PPM. So the 8% average is very unevenly spread across the various energy suppliers' customer bases.⁴⁵

3.1.6 Numbers of consumers with smart meters who have switched payment mode

In the main rollout, SMETS 2 meters will offer much improved switching ability between suppliers, tariffs and payment modes. Already, with SMETS 1 meters and some 'smart type' meters, there is some capability to switch between payment mode (credit or prepayment) remotely. This potentially provides an indication of smart PPM usage. In 2014 nationwide there were 456 remote switches

⁴³ CMA(2016), "Energy market investigation: Provisional decision on remedies"

⁴⁴ CMA (2016) Full provisional decision on remedies Energy Market Investigation. Cabinet Office/gov.uk.

⁴⁵ Ibid

made from credit mode to prepayment mode for electricity and 236 remote switches for gas. In about two thirds of these cases the customer switched to prepayment mode was repaying a debt.⁴⁶

This small number of remote switches from credit to prepayment was far out-numbered, though, by remote switches from prepayment to credit: 836 such switches for electricity and 2,812 for gas took place over the same time period.⁴⁷ However, these figures for switches from prepayment to credit provide a misleading picture. In practice, a lot of these ‘prepayment to credit’ switches are associated with a supplier who was making temporary payment method switches to ensure continuity of supply for smart prepay consumers when moving across to a new supplier. It is likely that a majority of those consumers were switched back to prepayment mode immediately following the supplier switch, in line with the supplier’s policy.⁴⁸ Unless corrected in reporting methods, this effect is likely to persist in statistical reporting during the Smart Meter rollout, as the Smart standards require this temporary switch to credit mode on change of supplier to safeguard continuity of supply. The data for remote switches in 2014 from prepay to credit are likely to be further skewed by the fact that in 2014 Utilita were the only supplier offering smart prepayment and so any Utilita smart prepayment customer who chose to switch away from Utilita to a different supplier would have had to move first to a credit tariff.

This data on remote switching indicates that very small numbers of households with smart meters have switched from credit to prepayment mode to date. It also shows an emerging pattern of consumers getting smart meters installed and then switching provider, presumably to benefit from lower priced tariffs. However, it does not provide a picture of the total number of smart PPMs installed.

3.1.7 Suppliers undertaking early rollout of smart PPMs

Two independent suppliers, Ovo Energy and Utilita offer smart prepayment as standard, with big six suppliers British Gas and E.On currently running smart prepayment trials and another independent supplier, Utility Warehouse, also offering smart to prepay consumers. Other smaller suppliers have installed small numbers of smart PPMs.

Ovo Energy launched a ‘Smart PAYG+’ service in April 2015. By October 2015 the number of prepay consumers with Ovo had grown from 30,000 before the launch of their Smart PAYG+ service to 75,000, with 30% of these consumers smart enabled.⁴⁹ Utilita is the only energy supplier primarily focused on prepay consumers and has proactively marketed the smart prepayment option. Utility Warehouse also offers the option of smart to their prepay consumers. Amongst the big six, British Gas has a smart pay as you go service that it has been trialling and reports that it will soon start promoting to consumers.⁵⁰ E.On also reports plans to roll out fully a smart pay as you go service in 2016.

⁴⁶ Ofgem (2015), “Domestic Suppliers’ Social Obligations: 2014 annual report”

⁴⁷ Ofgem (2015), “Domestic Suppliers’ Social Obligations: 2014 annual report”

⁴⁸ Ibid

⁴⁹ Ovo (2015), “Smart prepayment for a smarter market: consultation response”

⁵⁰ British Gas (2016), “Smart prepayment for a smarter market: consultation response”

3.1.8 Future smart meter rollout to the PPM sector

Both within the industry and amongst consumer interest groups and politicians, there has been debate over whether or not rollout of smart meters to prepay consumers should be prioritised.⁵¹ Those in favour of a prioritised rollout highlight the urgency of enabling prepay consumers to get the benefits of a wider range of tariffs and express concerns that suppliers are unlikely to prioritise the roll out of smart meters to existing prepay consumers. On the other hand, Energy UK has commented that waiting until after teething problems with SMETS2 meter rollout have been addressed can avoid any financial or other harm to prepay consumers caused by technological hitches with the new system. The CMA's decision to exclude interoperable SMETS2 meters from the price cap is designed to incentivise suppliers to bring forward rollout of SMETS2 installation to prepay consumers.

In its proposed PPM price cap, the CMA includes what it considers to be an appropriate prepayment uplift to reflect the additional cost to serve prepay consumers. It considers that the move to smart metering will remove this additional cost to serve, enabling the price differentials between credit and prepayment to level out.⁵²

However, in informational interviews, suppliers referred to differing behaviours of customer segments, suggesting that the traditional prepayment segment, particularly those who are not confident users of smart phones or the internet, may still have a greater 'cost to serve' (for example, because they call for assistance etc.) than consumers who are more comfortable with using smart meter-related technologies to 'self-serve'. Whilst the PPM price cap (which is to be the subject of an Ofgem consultation) is likely to reduce the amount paid annually by consumers with conventional, 'smart type' or SMETS 1 meters, the tariffs for SMETS 2 consumers will be determined by the open market, with potentially the opportunity for savings coming mainly from the improved ability to switch more easily to more competitive (credit mode) tariffs.

3.1.9 Future changes to the customer profile of the smart PPM sector

Views differ as to whether the introduction of smart metering and smart prepayment will lead more people to choose a prepayment (or 'pay-as-you-go') method of paying for their energy. Smart Energy GB claimed from a survey undertaken by Populus on their behalf, that 'Almost half (48%) of the Great British population is interested in using smart pay-as-you-go services to buy their gas and electricity'.⁵³

The Populus survey was administered online, using a quota sample that claimed to be nationally representative. A shortcoming of the survey design is that it did not test for understanding of smart

⁵¹ See, for example, Dawn Butler MP's campaign, http://www.dawnbutler.org.uk/dawn_asks_for_smart_meters_to_be_given_to_prepay_users_first_as_cma_report_is_published, Utility Week article http://utilityweek.co.uk/news/prioritising-prepayment-would-delay-smart-rollout-warns-the-dcc/1166522#.V_Y_6Mn3hU4 and National Right to Fuel Campaign <http://right2fueluk.com/2014/06/smart-metering-and-prepayment-think-piece-2/>

⁵² CMA (2016), "Energy market investigation - appendix 3.6: Analysis of costs by payment method"

⁵³ SmartEnergyGB (2014), "Attitudes around buying gas and electricity with smart pay-as-you-go" <https://www.smartenergygb.org/en/~media/SmartEnergy/essential-documents/press-resources/english/Attitudes-around-buying-gas-and-electricity-with-smart-pay-as-you-go.ashx?la=en>

metering, in contrast to Ofgem's separate consumer outlook survey, which reports that GB-wide understanding of what a smart meter was stood at 25% in February 2016 (an increase from 18% in March 2015).⁵⁴ The explanation of 'the smart pay-as-you-go concept' used by Populus survey is also somewhat misleading, indicating that 'pay-as-you-go will not have to be more expensive than other ways of paying'. This is in sharp contrast to the current situation, though smart PPM tariffs are likely to be more closely aligned with standard credit or direct debit tariffs in the future. This suggests these findings regarding the potential popularity of pay-as-you-go should be regarded with some scepticism.

Shortcomings in the design and response accuracy of questions about smart PPM used in these general consumer surveys regarding attitudes to smart meters make it difficult to establish a robust basis for assumptions regarding the likely consumer appetite for smart PPM.

⁵⁴ Smart Energy GB (2015) Smart energy outlook February 2016. <https://www.smartenergygb.org/smart-energy-outlook-feb2016>

3.1.10 Suppliers' marketing of smart PPM⁵⁵

Suppliers' early rollout marketing strategy for smart PPM appears to vary in direct relation to whether they already have an existing legacy base of existing prepayment consumers or are a relatively new entrant, seeking to grow their customer base. In either case, existing prepay users have been the main initial target audience for the early smart PPM rollout. The new entrant reported using a multi-channel marketing strategy to acquire new consumers from the Big Six, whereas those with an established base of prepay consumers have used less visible marketing to switch their existing consumers with conventional PPMs onto smart PPMs. More visible marketing of smart prepayment (promoted as 'pay as you go (PAYG)') was envisaged for the future main rollout, as part of a wider multi-channel marketing strategy.

One Big Six supplier had, to date, specifically excluded prepay consumers with an existing debt from their smart PPM programme, due to functionality issues with their smart-type PPM. They were running a trial to test functionality for debt recovery via smart PPM. The other Big Six supplier had principally targeted existing consumers who had a conventional PPM fitted due to debt issues.

The key marketing messages for attracting consumers to switch to smart PPM were identified in terms of offering greater choice and flexibility of different top-up methods for improved customer 'convenience' and 'comfort'. The offer of a proprietary app, with the ability to provide push notifications or text message alerts to top up and a greater choice of payment method were similarly identified as offering improved 'convenience' 'control', particularly attractive to 'more tech savvy' but low-income consumers, who use smart phones. This appeal was also linked to the rebranding of prepayment as PAYG, helping to remove the potential social stigma associated with conventional top-up practices, such as queueing at the local shop to charge up a card.

Those energy supplier representatives interviewed were understandably reticent in answering commercially sensitive questions about their future customer engagement strategy, indicating that it was hard to predict and would depend on what their competitors do. One future marketing opportunity hinted at was the development of flexible payment methods on a single tariff, with the ability to move between direct debit and prepay on a seasonal basis.

However, a note of scepticism was sounded about the future growth of the PPM market once the full smart meter rollout happens, on the basis that benefits currently associated with smart PPM (control over energy usage) will become available to credit consumers with smart meters, and probably at more attractive tariff rates. A scenario was presented whereby the number of prepay consumers would fall as the smart meter rollout makes it easier for prepay consumers to switch to a cheaper credit tariff. In terms of the competitiveness of open market set PPM tariffs, one interviewee considered that a 'cost-to-serve' differential will remain,⁵⁶ notably around how many

⁵⁵ All interviews predated the CMA Energy Investigation final report, which confirmed the interim PPM price cap, whilst interviews with Big Six representatives also pre-dated the CMA interim report.

⁵⁶ 'cost-to-serve' is the analysis of and calculation of all the business activities and overhead costs incurred to service a customer. It is used in supply chain management, to calculate the profitability of a customer account. In energy supplier sector benchmarking, KPIs are measured across metering, billing, payment and contact centre. This is used to identify opportunities to control costs and enhance profitability. See e.g. Datamonitor (2005) UK Utilities Residential Cost-to-serve Benchmarks and Metrics: Unravelling the Cost Drivers <http://www.datamonitor.com/Products/Free/Report/DMEN0338/010DMEN0338.pdf>

times people call their supplier for customer service versus how much they manage their account online, with the assumption that people who remain on PPM tariffs are likely to continue to have an above average 'cost to serve'.

Views varied regarding the importance and value of the in-house device as against a proprietary app. However, BEIS has confirmed that all suppliers must make a genuine offer of an IHD, and that any other device must be additional to that. This should mean that all suppliers will offer an IHD. Suppliers may also additionally offer consumers use of a proprietary app that works on converged devices, such as smart phones or tablets. This could, for example, enable consumers (including other household members) to view their IHD at home and use an app-based monitor when they are out. One interviewee indicated that their development of apps and online functionality for credit consumers is likely to be prioritised ahead of offers aimed at prepay consumers.

3.1.11 Discussion

The proposed interim price cap remedy for PPM tariffs is likely to be an important influence on the marketing strategy of suppliers, including a focus on reducing the 'cost to serve' of existing prepay consumers, which may encourage suppliers to move residual consumers with conventional PPMs across to smart meters. It may also motivate greater efforts amongst suppliers to improve customer awareness of the improved payment options offered by smart PPM, as a means of minimising the 'cost to serve' of such consumers.

Debt recovery and household budgeting via the smart meter may emerge as important aspects of the marketing strategy for smart PPM, as a way for consumers to feel more in control and keep better track of their budget and debt repayments, with technologies that allow for this.

The offer of proprietary apps in addition to IHDs seems likely to emerge as a distinguishing marketing offer, for those using prepay tariffs as for other consumers. Citizens Advice and Big Brother Watch have both expressed concerns that where consumers take up the offer of proprietary apps, this will enable suppliers to access detailed data on their energy usage, without enabling consumers to leverage the value of this data to receive additional benefits⁵⁷. By contrast, IHDs enable consumers to maintain control of the detailed data within their homes and to choose how much detailed data to allow their supplier to access. The clarification on the obligation for a genuine offer of an IHD is likely to be important for prepay consumers to gain the benefits of the IHD or the IHD plus a proprietary app.

3.2 Changing supplier communications with prepay consumers

From the informational interviews, it seems that supplier communication with conventional prepay consumers remains very limited, with an annual statement provided, as required by the regulator. It was suggested that in part, this was influenced by the preference of prepay consumers, who reportedly tend not to have a strong relationship with their supplier.

By contrast, where smart PPM is used as an acquisition strategy, a greater variety of communication channels are used, including paper and email communications at sign-up stage, followed by ongoing use of digital channels, including online. Consumers can also 'self-serve', using apps to check

⁵⁷ Citizens Advice Response to DECC's "Consultation on amending Smart Meter In-home Display Licence Conditions" <http://bit.ly/1TZ1JyW>

information, such as their credit levels. For low income consumers using smart phones, reportedly the offer of an app is 'a game changer', attracting consumers to switch supplier. Though such consumers may be less likely than average to have broadband, being unwilling or financially unable to commit to lengthy contracts, they tend to use a smart phone as their dominant device. Smart prepay consumers were typified as students and young professionals in rented accommodation as well as young families and people living in social housing. Suppliers with a legacy customer base are also likely to have a separate segment of older, post-family households who may own their own home but are less 'tech-engaged' and have not yet switched to smart meters.

None of the interviewees identified, unsolicited, plans to use smart metering functionalities to deliver energy efficiency messaging regarding potential behavioural changes. They identified as important their use of messaging opportunities related to payment issues, including alerting the need to top up, availability of friendly credit, and on how to use their smart meter. One of the interviewees recognised opportunities further into the roll-out for a variety of messaging, including 'proactive messaging' to prompt action by the customer to top up or messaging of information for the customer, to consider but not necessarily take immediate action. However, when specifically asked about the possibility of sending texts to raise awareness, for example, concerning potential eligibility for Warm Homes Discount (WHD), the same interviewee expressed concern about not wanting to 'pester' consumers with information that they find 'worthless' or 'irritating'. For prepay consumers, in particular, it was suggested that they may not feel the need for that kind of communication from their supplier.

The lack of mention of use of smart meter capabilities to improve messaging about energy efficiency suggests this may be an area for attention as part of the rollout of smart PPMs to vulnerable and fuel poor households.

3.3 Vulnerable and fuel poor consumers

The energy supplier representatives interviewed were clear that people who require an uninterrupted energy supply due to an existing health conditions should not use prepayment. However, there was recognition that for some vulnerable consumers, PPM may be appropriate. As an example, it was pointed out that physically disabled consumers who find it difficult to get to the shop to top up, but who do have access to the internet via a device at home, smart PPM offers the convenience of top up from home.

For low income consumers, considered to be 'fuel poor', rather than 'vulnerable', smart PPM was typified as offering improved budget control and convenience, making use of email top-up reminders, easier balance checking and top-up, and an improved customer experience.

Less attention was given to the benefits of smart PPM for older, post-family households currently on Big Six conventional PPM tariffs, typified as fuel poor and less tech-savvy. However, smart PPM was considered to offer a generally improved basic level of service for PPM users, removing a number of current inconveniences associated with PPM, such as losing the card, needing to go to the shop and back when they don't want to, and having to 'go into their cupboard or under the stairs' to insert a key.

Improved communications with prepay consumers via pro-active alarms, alerts and notifications were identified as offering improved 'comfort' and 'confidence' and offering a 'simpler' relationship

with energy, particularly for consumers who may not welcome being contacted directly about their situation, even though they are struggling.

The improved near real time information potentially available to suppliers from customer smart meters was also identified as enabling suppliers to better fulfil their duty of care obligations to vulnerable consumers, with an example given of being able to contact vulnerable consumers directly to make sure they're OK, having greater flexibility to adjust credit limits and timing of disconnections, so that for a customer in a particularly tricky situation, they can stop the meter from going into a disconnected state.

However, whilst smart PPM will provide increased online and offline channels for consumers to contact the supplier, it was also noted that smart metering will also provide tools so that consumers can 'self-serve' and won't need to contact their supplier. There was general circumspection about the possibility of rolling out more frequent messaging to consumers, with reservations about the appetite amongst prepay consumers for regular communications with their energy supplier.

Reluctance amongst consumers or suppliers for using the improved channels to engage about energy efficiency behaviour changes and ways to save money would make it less likely that consumers adopt behaviour changes that enable them to spend less money on energy. This reflects the finding of an international study on demand response programmes that consumers do not sufficiently understand how smart meter technologies might assist them to reduce or improve the predictability of their household costs and that negative customer dispositions towards energy utility companies present an important barrier (Lewis et al 2012).⁵⁸

⁵⁸ Lewis, P., Brennan, S., Stromback, J. & Kennedy, D. (2012) Empower Demand 2: Energy efficiency through Information and Communication Technology – Best Practice Examples and Guidance.

4 Qualitative research with conventional PPM switchers

4.1 Introduction

Qualitative quasi-experimental research was conducted with two groups of former conventional prepay householders who had switched to smart PPM (conventional PPM switchers). A test group (n=15) received in-depth tailored advice and support on use of their smart meter display to manage and reduce fuel consumption and a control group (n=15) did not receive any energy efficiency advice. Telephone semi-structured interviews about their energy consumption and use of their smart meter and IHD were conducted with householders from both groups. The research is reported in full, in Simpson, K., Smith, K. & Thomas, K. (2016)⁵⁹. The methodology used is presented in summary in 2.3 above. Below are summarised relevant findings from this study.

This section is structured to answer the revised research questions:

- What has been the experience of consumers moving from conventional prepay to smart prepay?
- How has the switch to smart prepay affected energy consumption in fuel-poor households?
- How are households using their IHDs with what effects for their energy behaviours and finances?
- How are households using new top-up options, with what effects for their lifestyles and finances?
- What health effects are associated with the shift to smart prepay?
- What messages or actions merit further attention as possible means of enabling consumers to more fully realise the benefits of smart PPM?

4.2 What have been the experience of consumers moving from conventional prepay to smart prepay?

Householders reported that their switch from conventional prepay to smart prepay was instigated by door-to-door sales people, telephone sales, or recommendation of Utilita by a friend.

Householders were attracted mainly by the flexible top-up options, the availability of Emergency Credit and Friendly Credit, the accessible meter, and a cheaper tariff (without a standing charge⁶⁰).

During the installation of the smart meter, installers were reported to have provided a general overview of the meter and IHD to each participant and to have offered general advice in relation to checking credit and topping up. Most householders said it was just the main prepayment functions that were demonstrated, with only three householders stating that the installer showed them how to use other screens on the display. Every participating householder was provided with a booklet on using the smart meter display but only two made reference to reading it.

⁵⁹ Simpson, K., Smith, K. & Thomas, K. (2016) Smart Prepayment meters: householder experiences. Centre for Sustainable Energy for Cheshire Lehmann Fund.

⁶⁰ The Utilita standing charge is incorporated into the unit price per kWh. This is useful because if a household doesn't use fuel e.g. whilst on holiday, there would be no deductions from the meter. Issues can occur e.g. with loss of electricity supply for freezers with tariffs with standing charges if all remaining credit on a meter is used up to pay the standing charge

Householders in both the home visit group (HV) (n=15) and control group (CG) (n=15) cited the key benefits of smart prepay to be:

- Increased awareness of energy use enabling more careful budgeting 15
- Accessible display location 13
- Flexible top-up options 7
- Cheaper energy costs 5
- Ability to see the live energy use of appliances 4
- Automatic credit top-up (no need to put a key/card in the meter) 4
- Checking the history of fuel use 3

Other benefits mentioned were the ability to top-up small amounts, checking top-ups have gone through without having to check the possibly inaccessible meter, and the householder's child thinking the smart PPM is "cool"! There was a general sense that smart prepay was up-to-date; it was equated with technology like smart phones.

4.3 How has the switch to smart prepay affected energy consumption in fuel-poor households?

Reduced electricity costs were reported by ten householders (5 CG, 5 HV) following the installation of a smart PPM. Six householders (three CG, three HV) noticed no reduction in their energy costs, and one householder (HV12) reported increased expenditure on electricity following the smart PPM installation. For those who had noticed savings, the reasons included having switched to a cheaper tariff and increased awareness of energy use leading to behaviour changes within the home and subsequent electricity cost savings:

"I reckon it's probably 'cause it is a cheaper tariff and again I'm also aware that I've got this meter that can monitor my electric and stuff and show me my usage. So I think it's a bit of everything. A combination of a lower tariff and also you being aware, you being much more knowledgeable about your usage and not basically keeping everything on." [CG 11]

"In the winter I would usually just whack the heating on and then go upstairs or you know do whatever and sometimes I'd forget it was on and it would end up being on sort three or four hours, whereas I realise now that it doesn't have to be on that long for the house to be warm. I sort of tend to notice it a bit more because you know exactly how much it's costing." [CG12]

However, these self-reported financial benefits and behavioural changes need to be viewed with some scepticism, both due to the tendency of participants to over-state socially-desirable behaviours and the lack of a suitable set of data on actual energy consumption to verify these claims (see also 2.5 above, which describes the limitations of the energy consumption data provided for the households that participated in the study).⁶¹

⁶¹ See e.g. Pepper, M., Jackson, T. and Uzzell, D. (2009) An examination of the values that motivate socially conscious and frugal consumer behaviours. *International Journal of Consumer Studies*, 33: 126–136. doi: 10.1111/j.1470-6431.2009.00753.x

One householder (HV12) had bought a dishwasher after the display was installed as he knew he could afford to use it and his energy use had increased as a result. He had bought a plug energy monitor to measure individual appliance use after being loaned one during the visit. His energy literacy had improved, and he was able to make lifestyle choices based on that. In contrast, some households that reduced their fuel use had done so by cutting back on heating and hot drinks. Such behaviours could have harmful effects on health.

Some householders were unsure why they were paying less for electricity but noted that the amount they were regularly topping up was now lasting longer:

"It's been pretty good. I used to put on £50 a week, not on the smart meter, on the other.... But now £20 is lasting me over a week and a half" [HV 4]

As a result of reduced energy costs, some householders were able to reduce the frequency with which they entered Emergency Credit or were disconnected from their energy supply. Overall, ten householders had entered Emergency Credit mode, seven of whom stated they entered it less frequently than with their previous conventional prepay meter:

"I go in less since I've had the new one. I really do now whereas before I was always, always in Emergency Credit...I don't know. I think maybe it is less I'm using, it's not running as quick" [CG 11]

"Less [using Emergency Credit], because before I'd wait for it to go [laughs] before I put some money on it. That's right in front of you so it's a lot easier. And you've got the alarm as well..." [CG 13]

Only two participating householders had been disconnected from their supply, in one case for their gas supply, and for one case both for their gas and their electricity supply.

4.4 How are households using their IHDs, with what effects on their energy-related behaviours and finances?

The qualitative research explored the ways in which the switch to smart PPM were associated with attitudinal or behavioural changes which could lead to increased energy efficiency or other ways of addressing adverse effects of fuel poverty.

It found that the majority of householders used their IHD for credit-related activities only - to check their credit balance, make sure a top up had gone through to the meter, or to do a manual top up. Using the IHD for energy efficiency or to manage fuel payments was limited. Nine householders (5 CG, 4 HV pre-visit) reported experimenting with costing appliances using the live energy use dial screen on the smart meter display. Four householders (3 CG, 1 HV pre-visit) had set a daily target for fuel use to assist with budgeting and avoid self-disconnection, and five (all CG) had set a credit alert. Twelve householders (6 CG, 6 HV pre-visit) had used the History screens to monitor their energy use by day, week and month. Householders did not recall being given guidance at installation stage on how to use the smart meter display to increase energy efficiency.

Householders reported that they had not really referenced printed literature left at their home for reference. This included the booklets provided at the point of installation and a play sheet provided by an advisor.

The delivery of interactive sessions by trained volunteers did appear to encourage increased householder engagement with their smart meter display for energy efficiency and budgeting

purposes. Thirteen householders (6 CG, 7 HV post-visit) had used the display to measure the energy use of individual appliances, and had adjusted their behaviour as a result to reduce their energy expenditure. This included economising changes made to bathing, cooking, and laundry practices, switching appliances off standby, and monitoring children's entertainment-related energy use (e.g. restricting use of the Xbox). However, it is not possible to conclude whether these practices were routinized and sustained over a longer time period.

17 householders (6 CG, 11 HV post-visit) had used the history screen to compare their energy use from one week to the next and for three this was a key benefit of having a smart meter display:

"Yeah, that's [history screen] the function I use the most I reckon. I like to break it down over a week and see what my cost is and if I'm within my target.... I like to try and keep tabs of what I'm using and to budget really." [HV 10]

The Message screen was used by 19 householders (10 CG, 9 HV post-visit). The relatively high use of this screen is probably related to a message about a £12 Government rebate which was made to smart prepay consumers by 12th November.

The findings indicate that householders are using their smart PPMs to reduce and manage their fuel use to some extent, but that there remains plenty of scope for their greater use to avoid energy waste and to achieve financial savings for households.

4.5 How are households using smart prepay top-up options, with what effects for their lifestyles and finances?

Some householders appeared to feel less anxious about running out of credit as a result of having the option to top up online, or whilst away from home, which seemed to create a feeling of increased control of their energy use. However, over half the householders still topped up at the shop at least sometimes, with some continuing to do so routinely, whilst others had switched to topping up online or over the phone. This indicates some continuation of behaviours associated with a greater than average 'cost to serve' which, without regulator intervention, could mean continued higher than average PPM tariffs.

Topping up from home was noted as a particular benefit by those who had limited mobility, or children to care for:

"I've got a daughter and the amount of times she's in bed and it's 9 o'clock at night and I've gone, "Oh no I need to get electric but the shops shut and my daughters in bed." [CG 14]

One challenge mentioned by six householders was difficulty topping up their gas credit. There was a delay between making the payment and receiving the gas credit: comparable problems were not reported to arise with electricity top ups. Householders would sometimes manually enter the code into the display but it appeared to cause disruption and concern to those who highlighted it, and could be an area to provide more information on.

4.6 What health effects are associated with smart prepay?

The key reported health benefit resulting from having a smart PPM appears to be a reduction in stress or increase in "peace of mind", particularly associated with the option of entering Friendly

Credit without being charged any extra cost for those with caring responsibilities or limited mobility. Smart prepay also saved householders having to venture out to top up in cold or wet weather, and was convenient for topping up if away from home e.g. if in hospital. An additional preventative health benefit was the automatic top ups made to the meter, which avoided householders having to bend down or climb a ladder to put the key in the meter.

4.7 What messages or actions merit further attention in terms of enabling consumers to fully realise the benefits of smart PPM?

The experiences and accounts given by participants led to the identification of a number of potential learning points regarding the way information and advice is provided to encourage consumers to benefit from their smart PPM.

The research identified a risk of rebound effect, where energy consumption increases following an energy efficiency intervention⁶²) and a risk of people taking actions which, whilst they do help to reduce their energy consumption, may also increase potential risks of harm to their health and wellbeing as a consequence of fuel poverty. This would suggest that guidance on use of the IHD, particularly when aimed at vulnerable and fuel poor households, should take care to promote energy choices which also safeguard health and wellbeing, rather than solely emphasising reductions in consumption.

The findings generally indicate that there remains plenty of scope for improvement in the provision of energy efficiency advice against the SMICoP requirement. The limited recall of guidance at installation stage on how to use the smart meter display to increase energy efficiency suggests that the timing and mode of energy efficiency advice as part of the installation process requires further thought so that consumers are better equipped to make fuller use of their IHDs to save energy and manage their expenditure on energy. Similarly, the limited reported use made of play sheets would suggest that leaving printed literature, whilst it may be useful for reference, may not be an optimal means of achieving behavioural changes amongst smart PPM users.

The relatively high usage made of the message facility on the IHD does indicate a potential method for conveying key energy efficiency and payment management prompts aimed at smart prepay consumers. The project duration is too short to know whether such interest in this facility will be sustained, or if interest is likely to be limited to information on rebates.

⁶² The rebound effect is an increased consumption of energy services following an improvement in the technical efficiency of delivering those services. This increased consumption offsets the energy savings that may otherwise be achieved. Sorrell, S., Dimitroupoulos, J. (2008) The rebound effect: Microeconomic definitions, limitations and extensions Ecological Economics Volume 65, pp 636–649

5 Qualitative case studies of smart prepay consumers

This section presents the three case studies of consumers who participated in home visits with interviews and follow-up telephone interviews, structured to explore their experience of using a smart PPM, an in-home display (IHD) and/or a proprietary app or other device, and the effects on their energy related behaviours. The experiences and views of householders provide insights into possible areas for further investigation concerning how people's experience of switching to smart PPM and their responses to different technology options may affect fuel poverty. However, the small size of the achieved sample means that the findings cannot be regarded as generalizable to other smart PPM households.

Each case study is presented separately below. This is followed by a comparison of the information that can be viewed using an IHD only and in an IHD with app, for top-up, budgeting and energy management purposes.

Case study: H1

Occupancy

Ms B is 38 and lives with her partner and three children. One daughter has asthma. Ms B is in receipt of Employment and Support Allowance and Council Tax Credit. The household income is less than £16,000 a year.

Property and household details

The family lives in a rented council property, a semi-detached three bedroom house which was previously two separate flats. It has an Energy Performance Certificate (EPC) rating of 72%, with external wall insulation, 200mm loft insulation, double glazing and gas central heating.



Ms B reported issues with damp and mould in the property in her daughter's bedroom, particularly around the eaves where loft insulation was lacking. A roof leak had soaked the loft insulation, and the council were in the process of repairing the roof and replacing the insulation. Ms B had just redecorated the bedroom at the time of the visit.

The heating is controlled using the room thermostat in the hall, usually set to 20 °C. Ms B reported that she only put the heating on for the children's' bath and bed time. She said that the upstairs tended to be too hot, and only the upstairs radiators on the landing and her son's bedroom were ever turned on. The downstairs radiators were all set on full.

She uses gas for bathing and cooking. Tuesday is bedding wash day and the washing machine and tumble drier are used for five sets of bed linen. She has a one cup water boiler rather than a kettle.

Previous and current energy use and motivation to switch to smart prepay

Ms B reported that she typically spends £15 on gas (£7 in summer) and £15-£25 on electricity per week, making her a medium gas user and high electricity user. This was corroborated by her IHD which showed that for May 2015-April 2016 she spent £859 on electricity and £492 on gas. As her smart PPM was installed in July 2015, this roughly works out as £20 a week for electricity and £11 for gas.

Ms B was previously with Scottish Power on a PPM, and about six years previously had paid by direct debit (then £65 a month). She knew about Utilita as they had come up as the cheapest tariff on a comparison site she'd visited, and she'd spoken with a door to door salesman who convinced her to change supplier. She said that it was the personal contact which had instigated the switch, not viewing the price comparison website. She said that the conversation had felt quite pressurised:

"There was almost quite a lot of pressure to take...I'd decided anyway that we were gonna go it. But he wasn't going to leave until we'd taken it..."

She wanted to switch to smart prepayment for the convenience of the flexible top up options primarily. Ms B topped up online.

Mainly the online top ups and the convenience, that was the thing that sold it to me, the fact that I wouldn't have to be the one to run to the shop in the morning when it had all run out.

Ms B said that in spite of the cheaper tariff she was spending the same on her fuel bills with the smart PPM as she did with the conventional PPM.

What were their experiences of the switching and installation process?

Ms B reported that the installer didn't really show her how to use the IHD. She didn't mention either having received a booklet from Utilita at installation or having looking at it since installation.

How did they engage with their smart meter display?

Ms B said she checked the dual fuel credit balance screen on the IHD - it was one of the few screens she used. She also routinely checked after topping up on the electricity or gas top up screens that the top up had been credited to the meter. She said that didn't like looking at these screens though. She found the long list of entries "shocking". She found the IHD easy to use, but thought that older people would struggle with it. She considered that her use of the IHD hadn't really changed in the 10 months she'd had it installed.

When the smart meter was first fitted she had worked out the cost of using the tumble drier (40p) from the change in her electricity credit balance. Using the tumble drier was a particular worry for her as she thought it was a high energy-using appliance. She hadn't costed any other appliances or household routines in the same way. She'd also checked her tariff details on the Tariff screen when she first got the IHD. She had read messages sent to the IHD (including one about the Warm Home Discount) but she said she didn't find these messages particularly informative or useful.

After six months, Ms B flicked through the other screens on the display. She'd set a credit alert of £1 for each fuel, but didn't find the alert especially helpful. The IHD beeped once and lit up (that was it!), and if she wasn't in the kitchen the alert was missed by everyone except the dog, which got stressed by the sound! She thought getting a text could be useful as an additional alert.

Ms B had also manually entered a top up voucher code into the IHD a few times when the top up hadn't been credited to the meter.

Behaviour change as a result of having the IHD

Ms B didn't indicate any change in behaviour as a result of having the IHD, but was more aware of her energy use.

"Yeah, the smart meter. It's made me more aware of what things cost, really. Shockingly so."

Did anything notable occur during the home visit around using the smart meter display to manage household energy use?

During the visit, advisors described how to compare current usage to the previous day's usage on the gas and electricity single fuel screens. Ms B wasn't familiar at all with the History screens, and advisors helped her explore how to use the day, week and monthly usage screens. For example, in the week view of the previous 8 days, they identified that electricity usage had peaked on Tuesday (wash day) for the week at £3, and that the electricity spend for the period covered was £17. In the

month view the annual energy usage was visible, totalling around £1300, slightly above the average British energy consumption for a family 3-bed semi.

When household advisers showed Ms B the 'Checking the Tariff' screen, this led into a conversation about appliance use. The Utilita Smart Energy tariff offers a variable rate – 16.5p for the first 240kWh of electricity, then a slightly lower rate. For gas, the rate changes from 5.493p/kWh after 488 kWh⁶³. Ms B wanted to know how long it would take her to use 488 kWh of gas. Advisers explained that it is complex to estimate this, because gas appliances don't have kW ratings like electrical appliances. For electricity, using 240 kWh was equated to Ms B's use of her tumble drier, which at 3 kW power rating could run for 80 hours. The IHD showed that Ms B's previous week's electricity use was 120kWh, so she'd have a couple of weeks' use each month at the higher tariff rate. The IHD could also have been used to show gas use in kWh for that period. With experimentation (as given in the Play Sheet) it would be possible for Ms B to work out the cost and kWh usage for heating and cooking.

From looking at the history screens Ms B also saw that her peak electricity usage the previous week had occurred when the kids were home (18-21 kWh a day) but that when they were away for the weekend it dropped to 4-5 kWh. The advisers were unable to find out what appliances the children regularly used which could account for this large difference in electricity.

Ms B set a daily energy use target on the Settings screen during the visit, based on her weekly fuel use, of £3 for electricity and £1.50 for gas. The target could be set in kWh or £. The default £ settings for electricity of £7.50 was too high, and didn't correlate with the default target in kWh of 3kWh. Personalising the daily target amount, advisers explained, could help Ms B stay within her fuel budget and help her avoid self-disconnection between her fortnightly benefits payments.

The dual fuel energy dial screen was also explored by advisers with Ms B to work out the base load of the home. Advisers also suggested that Ms B could refer to it as a quick visual check that all appliances had been turned off before leaving the home. Ms B said that she tended to be forgetful about the iron and had left it on a few times by accident. The electric energy dial was also used by advisers to illustrate the jump in energy use when the one cup water boiler was switched on. This gave Ms B the idea to test the optimal way to dry her washing:

"I always think, "I must spin that washing on the faster spin!" Because we have got a really fast spin, I think we've got 1600, but I only ever spin it on 1200, why? Because what that costs in the washing machine, would probably save us in the tumble drier"

Energy efficient practices were also discussed with Ms B, including reducing the room thermostat to avoid overheating in the home, adjusting the thermostatic radiator valves (TRVs), utilising the gas fire in the lounge, and using the IHD to experiment with what would be the most effective heating

⁶³ The Utilita website describes two smart prepay tariffs: 'Smart Energy' and 'Smart Energy Plus'. Smart Energy Plus (for low users) has a zero standing charge and a single unit rate. Smart Energy has a daily standing charge and lower unit rate which is ideal for average users. They automatically switch customers to the best available tariff. The Smart Energy tariff standing charge is collected through the kWh rate within a month. The standing charge is collected over a specific number of kWh (the higher price for the first 240kWh for electricity and 488kWh for gas). If not all of those kWhs are used the customer does not pay the full standing charge. If the consumer uses more than the specified amount within the month, they pay the lower rate i.e. pay for the energy consumed. Adapted from <https://utilita.co.uk/tariffs/prices.php>

regime (two heating periods vs heating for longer at a lower temperature). Ms B stated that she'd used more gas when she first moved into the property as she'd not been shown how to use the central heating system:

"Nobody shows you, nobody explains it, they give you a piece of paper about how to switch it on and off. I think the first two years we lived here, we had our hot water on constant, and when the guy came to check the gas, he said, "You've got your hot water heating all the time." So he did turn it off then..."

Did any changes in energy use occur after the home visit?

Since the home visit Ms B had noticed when her electricity use was highest, and had changed her laundry routine as a result:

"I've noticed though that actually the peaks of my electric are first thing in the morning and in the evenings, which is obviously my dishwasher and my washing machine and tumble dryer. So I've tried to dry as much as I can without the tumble dryer. And I've also noticed that putting in smaller loads is better than piling it in, just from watching the meter."

She also realised that she'd underestimated the cost of using the tumble drier, and was using it less and drying clothes outside. She was also reusing clothes rather than having clean on every time to save money.

Ms B thought that the IHD had made her more aware of her energy use:

"Just made me more aware of my appliances, using them more efficiently from watching the meter and taking note."

However for lower energy use appliances, being aware of their energy use hadn't translated into behaviour change. Ms B indicated that she now knew that she should switch off the TVs rather than leave them on standby, but she hadn't taken action on this. Apart from changes in her laundry practices, she reported that her appliance use and household routines hadn't changed since the advice visit.

She said she was using the display more and in new ways since the home visit. She found the electricity energy dial screen and the daily use screen (for when she was using most energy) particularly informative.

Benefits and drawbacks of smart prepay

Ms B said that the flexible top ups were really useful and were less stressful than topping up a conventional PPM, so that within a few minutes of topping-up remotely, the electricity would be back on. Another advantage of smart prepay was that she no longer had to go outside to check the meter.

She said she continued to use Emergency Credit all the time and had been in so-called 'Friendly Credit' the previous weekend. A drawback of smart prepay was that Ms B had experienced difficulties with getting the gas reconnected (see below). She also had found that if the electricity was disconnected, the IHD stopped working. She thought it would be handy if it could have chargeable batteries, as otherwise it was impossible to see what was going on with the fuel supply.

Ms B was interested in checking comparison sites and potentially changing suppliers, but had been told that removing the smart meter would cost £250. She felt that she had been tricked by the supplier about this. Advisers reassured her that as the smart meter roll out progressed switching supplier would become quicker and easier. She was also concerned about the health impacts of smart meters from information circulating on the internet and via social media. She said that friends and neighbours were scared of switching to smart meters for this reason. Advisers shared information on the relative health risks of the radio frequencies used by smart meters compared to other commonly encountered social phenomena like shift work and drinking coffee, in order to reassure Ms B.⁶⁴

Potential smart prepay effects on energy consumption and household lifestyle

Availability of Emergency and Friendly Credit

Ms B said that she used Emergency Credit all the time and was frequently in Friendly Credit over the weekend. She commented that in relation to Emergency and Friendly Credit with smart prepay:

“I think with this, I know more of what's going on with it, perhaps not technically, but I know more of what's happening that affects me.”

Disconnection

On three occasions the household ran out of credit on gas, and getting the gas back on was described as ‘a nightmare’ - not as straightforward as with the electricity which took only a few minutes to be reconnected. There was a delay to the gas being reconnected. Ms B had called Utilita customer services each time this occurred, as it required pressing a combination of buttons on the smart meter, which she needed help with.

There was also a problem with electricity disconnection as the IHD no longer worked and had no battery back-up. This left Ms B with no way of knowing what was happening with her energy supply.

Flexible top ups

Flexible top ups saved Ms B time as she didn’t have to go off to the shops to top up. This also reduced her stress levels.

Impact on household finances

Ms B did not report any savings as a result of switching to smart prepay.

Value of advice received

Which advice did people most benefit from?

Ms B said that she’d found out much more about her IHD from the advice visit, and that it could do a lot more than she realised.

“I'm quite shocked at how much is on there that I didn't know of, to be honest.”

She thought her 12 year old son would like experimenting with it.

⁶⁴ International Agency for Research on Cancer of the World Health Organisation (IARC)

She remembered at her mum's the meter had a spinning disc, so her mum could "see if the money was flying out of her purse or not". She said that it was a bit more of a mystery now, but that with the IHD she could see what her energy use was in a similar way.

Utilising the history screens and setting daily targets were very useful for Ms B, as was identifying the base load to check that all appliances had been switched off before going out.

Relevance for advice provision to consumers

This case study illustrates a number of opportunities for advice or other actions which could support the household to get more benefits out of their IHD. Whilst specific to the individual households, these may have wider relevance. As such, they could form the basis for future trial design regarding the effectiveness of different advice message or forms of advice delivered in line with SMICoP.

A first step towards creating a stronger understanding of the relationship between information on the IHD and household energy use could potentially be encouraged by supporting consumers to conduct a 'safety check before going out' on the home's basic level of energy use - with all appliances except essentials turned off. This check could be used to lead into a discussion about reducing this basic hourly usage by switching unnecessary appliances off standby, followed by costing the use of appliances and household routines.

Advice on how to routinely use the IHD to cost space and water heating could prompt instruction/demonstration on how to use the domestic heating system efficiently. As heating comprises 60% of domestic fuel use, this is an important focus for attention to help households affordably manage their thermal comfort, reduce worry, and, where necessary, address the potential risks associated with under heating.

Consumers could be encouraged to personalise the credit alert and daily energy targets as a proactive step to reduce their risk of self-disconnection and to keep track of their energy use. This facility on the IHD could usefully be combined with consumers opting in to receive a text message for credit alerts, daily targets and crediting of top ups to the meter. As most households have a mobile phone this could be useful for a wide range of consumers, and circumvents the alert on the IHD possibly being missed.

Households may need reassurance about smart meters and switching supplier in the medium term, particularly former conventional prepay consumers who have experienced past difficulties in switching. Health scares about smart meters may need to be clarified and put in perspective if the householder is concerned about this.

Suppliers could help smart prepay consumers by including a back-up rechargeable battery in the IHD (for roaming use of the IHD and also if there was a loss of supply (disconnection or power cut)). However, this would require consumers to recharge the batteries.

Case study: H2

Occupancy

Mr L is 42 and lives with his wife and four children. He is a carer for his daughter who is severely autistic. He is in receipt of Employment and Support Allowance, Child Tax Credit, Council Tax Benefit, and Housing Benefit. The household income is less than £16,000 a year. Mr L said that after food, being able to afford to pay for energy was his top priority.

Property and household details

Mr L is a council tenant and lives in a three bed semi-detached house. It has loft insulation, double glazing and gas central heating.



Advisers identified that the property is unsuitable for cavity wall insulation and that there is a significant damp and mould problem in the home. The kitchen had been refitted shortly after the family had moved into the property. Mr L had fitted extractor fans himself in the kitchen and bathroom, as well as the existing fans, and the council were currently installing a positive pressure ventilation unit in the loft. Mr L had redecorated the lounge and an upstairs bedroom five months before but the mould was reappearing. He also reported having had to throw away furniture and bags of clothes that had become mouldy. He felt that he had been proactive in doing as much as he could to tackle the mould, including wiping down the mould and fitting new doors with seals. He'd been advised by council surveyors to maintain a good level of heat in the property, but this was proving to be expensive.

Mr L set the heating to 20-21 °C and controlled it via the room thermostat in the hall.

There is an electric shower and cooker. The household TVs are all A+ rated and the majority of the lighting were low energy bulbs. Mr L bought A or A+ replacement appliances. The combi boiler is less than five years old.

Previous and current energy use and motivation to switch to smart prepay

Mr L reported having switched supplier following previous negative experiences with large suppliers and had opted for a cheaper tariff from a local energy supplier that offered green energy and also offered flexible top up options.

He recounted an expensive, painful history of involvement with energy suppliers. When the family moved into the property they were with SSE and despite asking to be put onto the cheapest tariff found they were paying £400 a month for fuel. They disputed this, and switched supplier to npower, paying £175 a month direct debit. Mr L got into debt with npower following a reported mix up associated with a change to direct debit dates. Prepayment meters were installed to recover the debt about three years ago. He wasn't happy with npower's customer service so switched to Ovo Energy standard prepay, which had considerably cheaper tariffs, and then to their smart prepay in April 2016. He said his previous payments to npower were double the amount he now pays to Ovo.

Mr L used to spend £20-25 a week on gas and £30-£35 on electricity per week with npower. He now uses the Ovo smartphone app to top up £40 weekly, sometimes a bit more, for both fuels. His card details are already recorded in his online account, and he just has to log in with his password to top up. He spent more on electricity than gas, and is a high electricity user and medium gas user. The IHD showed that for the previous 8 days Mr L had spent £40 on electricity and £15 on gas.

Mr L topped up using the Ovo smartphone app.

What were their experiences of the switching and installation process?

Mr L said that the installer had been thorough and had shown him all the screens on the IHD. He described the dual fuel and separate gas and electricity screens, history, and the different units (£/h, kWh and CO₂) in which energy use information could be presented on the IHD.

"Yeah, he showed us there were split screens, single screens for each of the use, there was history, but it takes time for the history to build up, there was the CO₂ levels, the energy levels, all those on there."

He also recalled that the installer said it was OK to turn the IHD off and put it away.

"And the actual guy said to us, 'If you want to just turn it off and just put it away, you can. You don't have to, kind of, sit there all the time. But a lot of people sit there when they first get it, and just watch...'"

How did they engage with their IHD?

Mr L had his IHD turned off most of the time and used the smartphone app instead to monitor his energy use.

"I haven't really used it that much, I just kind of look on the phone. My wife just said today, 'Oh look, have a look at this!' And just flick through it."

"A lot of the time I just have it off, because we just kept on looking at it, so now we just look on the phone, 'cause it's easier. So you just say, 'How much have we used?' We check every day just to see, and then once a week we say, 'Oh look at that one!' And I'll say, 'The tumble dryer was on then.' Sunday dinner, the tumble dryer, the washing machine and the dishwasher was on. So I can tell when it's gonna spike, and stuff."

He said when he first got the display he checked it once or twice a week, but found the smart phone app more user friendly. He found the smart phone touch screen easy to slide to view different screens, and he could check his credit balance and top up if he was out.

However the functionality of both the IHD and smart phone app were restricted and the quality of information available to inform energy efficiency actions was found by advisers to be very limited. Mr L was on the Ovo Energy all online Smart PAYG + tariff, where all financial information about his account was accessible via his smartphone or computer but was not relayed to the IHD. The smartphone app shows the credit balance and days left, the top ups made, and history screens with energy use by day, week and month shown in numerical form rather than in a chart format. The app history screens gave more detail than those on the IHD. For example, it was possible to revisit a day in the previous month and drill down for more information, which it is not possible to do on the IHD.

However it is not possible to view real-time energy use, as only the previous day's data was available on the app.

The IHD had no financial information – it showed 'Est. bill' followed by a figure, in place of the credit balance on the dual fuel screen. This meant it was impossible during the home visit to establish the hourly cost of the home's baseload, or the use of appliances or household routines. This could be done on the smart phone app retrospectively, for example noting the cost of fuels used on a day when the household was out and had turned all appliances off, or doing an energy experiment like comparing washing machine programmes by noting the on and off times of each programme and then checking the phone app the next day for cost of usage during those times. The IHD has real time energy use but not financial information. Energy experiments would need to therefore calculate cost from energy usage. The hassle involved either way is potentially off-putting.

Mr L had used changes in the credit balance on his smartphone app combined with spikes in use on the history screen (IHD or smart phone) to cost appliances or household routines. For example he now used a 30 °C washing programme for most laundry as he could see that it was cheaper to do so from the phone app.

On the IHD he'd used the 'rev counter' energy dial screens to observe when spikes occurred in his electricity usage which correlated with cooking and laundry. He said that he equated the spikes in energy use shown in a graph with visual prompts like red lights or spinning discs on other energy meters:

"And I, kind of, know, we use the...[most energy] when it spikes, even when we had the normal meters, 'cause you see the little red light, or the disk would spin around. So, you put your cooker on, or if you've got fan heaters on...that's one thing I've, kind of, turned the fuse off on the fan heater in the bathroom"

Mr L said he hadn't set a daily target on the IHD because he checked his credit level on the phone every day. He also said he knew what his financial limits were, and didn't think it was worthwhile setting a daily target when his energy use was mainly affected by the building condition:

"I'm not too concerned with setting a limit at the moment. I think if I'm gonna start setting limits, that'll be when I, kind of, start to say, "Right then, we're gonna insulate the house, we're gonna have it all sorted.....And because we haven't got that, there's no point in going too mad on it."

He reported that he did what he could to be energy efficient by purchasing energy efficient lights and appliances.

He hadn't set up a credit alert on the IHD but had done so on the phone app, which had a dual fuel credit alert of £2. He hadn't yet used the IHD to check his tariff rate (he had switched supplier only the month before).

Behaviour change as a result of having the IHD

Mr L reported a number of behaviour changes to reduce his electricity use, informed by the IHD. These actions included disabling the fan heater in the bathroom, remembering to turning lights off more frequently and using the tumble drier less frequently, using the washing line instead.

Mr L reflected on how household occupancy levels and household activities directly related to energy consumption, recalling how in the previous week, family illness had meant more people were at home during the day and consequently the electricity use had gone up more than usual. On days when the family went out, he noted that the electricity use was lower than usual. He also mentioned that the TVs and computers tended to be left on in the house, and despite being proactive on energy efficiency in other ways, he wasn't prepared to turn them off, influenced by past trying circumstances:

"In our house, 'cause we're always using stuff, it's like I know which things are the most expensive ones. In the old days, when we were just on a meter and really struggling, I'd sit and think, "Right then, make sure the kids have got their lights on, or turn everything off in the house..." You know, we've had it before, years ago, where we've been on bread and butter and turned everything off and stuff. Kind of, been in the dark and left a couple of things on. But we're not like that anymore."

He appeared to prioritise appliance use for the children, and made his home environment as comfortable as possible for them within his means. Mr L was already quite vigilant in turning off lights and appliances from previous disconnection experiences. However he related that he seemed to have a bit of a blind spot when it came to boiling the kettle, which his wife had picked up on:

"The one thing we have done is, I used to turn the kettle on, forget about it, and then go back and turn it on again. My missus will say, "That costs us 50p⁶⁵ every time you do that!" I'd done it five times a row.... So, I'm a lot more, with the kettle, not boiling it unnecessarily."

He discussed with advisers the ongoing home improvements that he was doing, but did not directly relate this to the IHD. He had already renovated the floor in the hall with thick green matting underlay and laminate flooring on top of the concrete floor, and planned to do the kitchen next. The central heating had been made 'child proof' so his daughter couldn't turn it on. He wanted to insulate the walls, and asked an adviser about a potential council housing solar panel scheme (which has since been withdrawn), as the home's orientation would have been suitable for this. Mr L had previously lived in off gas properties with renewable energy.

Did anything notable occur during the home visit around using the smart meter display to manage household energy use?

Mr L showed advisers the Ovo smartphone app and they explored the IHD together. Looking at the IHD history screens, Mr L identified a cold day in the previous week which showed higher than average gas usage. He recalled that he'd found the back door left open that day, so that the heating had stayed on. Mr L also identified points in their weekly routine, where energy usage is particularly high, including cooking the Sunday roast, and lower usage patterns on quiet days when everyone was out.

⁶⁵ The cost of boiling a kettle with one cup of water is about 1p, so 50p shows lack of knowledge of the real cost (which the IHD can't easily supply due to the online tariff) but the usefulness of exaggeration to reduce energy waste!

He knew that the tumble drier was the appliance that used the most electricity in the home. With a baby in reusable nappies, he reported that the drier tended to be on constantly over the winter, and he recognised the condensation issue that arose as a result.

Did any changes in energy use occur after the home visit?

The household reported having made quite a few behavioural changes in the three weeks since the home visit, partly due to the warmer summer weather. The heating had been turned down (or not put on) and washing was put on the line rather than in the tumble drier. If the drier was used it was put on for 10 minutes rather than an hour. The kettle was used with exactly the right amount of water, and the dishwasher and washing machine only used when full. All lights were now low energy bulbs. Mr L had noticed a drop in energy use as a result.

"And our consumption's gone down a lot now we've been thinking about things more.... 'cause weekly I can see we've gone from £38.51 one week, another week was £43.00 and then down to £33 - so like £10 saving on the week before."

His lowest weekly usage had been £30, less than half his previous weekly usage on nPower prepay. He attributed these savings primarily to the tariff change, but also due to energy efficiency changes.

"I think a lot was down to the tariff they were charging us, and with having the app and having the little thing [IHD], we can actually see that you can make yourself a lot more efficient. 'Cause we were being efficient anyway, but I think it was more the actual changing over to them and the tariff.....So we've gone to a cheaper tariff, we're halving our price anyways, but we're now managing to make it even cheaper by streamlining when we use stuff, you know, making ourselves more efficient."

He hadn't used the IHD since the visit but continued to use daily usage figures from the phone app to correlate household activities with spikes in fuel use. He knew that on a typical day when the heating hadn't been on, then the fuel use would be about £3, whereas on other days, such as when they used the tumble drier, it would typically be about £4.

Mr L indicated that convenience sometimes triumphed over cost considerations in household routines:

"Sometimes it's easier, even on a sunny day, it's easier to put your stuff in the tumble dryer, so you don't have to bother hanging it out, but those few extra minutes can save you, well, if you look at it over the year, it could save you quite a lot of money."

He told the advisers that the children were starting to look at the phone app and would watch it, linking appliance use with energy use. They'd begun to ask permission before using appliances, indicating some awareness of the cost associated with their use of appliances.

Benefits and drawbacks of smart prepay

Mr L was delighted with his smart PPM, and had had no problems with it at all. He said smart prepay was a real improvement on previous payment methods:

"With the old prepayment meters we had, sometimes you'd put your key in, and it would just say: error. And you'd have to keep, kind of, wiggling it around. So, I was always worried that when we topped it up that you'd, like, put it in and nothing would happen,

and you then have to go back to the shop. And usually a lot of the shop-keepers would be like: no, that's not our problem! But with this, it's just so easy, it's even easier, I find, than having a direct debit, with the prepayment one.....'cause you can see what you're using, you're paying for it as you go along, so we've got no nasty bills, and that.

He also liked smart prepay as he perceived that it meant he wasn't supporting what he saw as malpractice by large energy suppliers profiting from consumers whose accounts are in credit but don't give those consumers any rewards in return. Customer service was very important to him, after what he perceived to be poor treatment from his past energy suppliers. He considered that this was of growing importance for people when choosing their fuel supplier. He said he would recommend Ovo Energy to anyone for their good customer service and as a local company. He felt that the online smart prepay system worked for him. He considered that the phone app and IHD were straightforward to use, and felt that it gave him more control over what he was using energy for in the home.

"You can actually see what you're using, it's not just: this how much money you're spending every day, I think it gives you more control over looking at what you're using."

Potential smart prepay effects on energy consumption and household lifestyle

Availability of Emergency and Friendly Credit

Mr L hadn't used Emergency or Friendly Credit.

Disconnection

Mr L hadn't self-disconnected in the short time he'd had his smart PPM. This was partly due to the dual fuel approach, which he found really good because it avoided disconnection on one fuel if the other had credit.

Flexible top ups

Mr L found the online topping up with the phone app really useful. The phone was in his hand and he could just hit the app, it came up and he checked the credit balance or topped up really quickly. It also saved him wasting time going down to the shops in the rain to top up and problems he'd encountered in the past topping up at shops.

Although Mr L topped up online he also had a dual fuel card that he could use at the shops if needed. He was aware that the Ovo online account also offers the potential to automate top ups e.g. topping up on the same day each month like a direct debit, or to auto top-up when the account reaches a self-determined low credit amount, which can reduce the chance of self-disconnection. However Mr L preferred to do top ups himself.

He thought that the smart phone app would be useful to some consumers, for example for retired people with internet access, and consumers with smart phones. He wondered whether those with PAYG smart phones might find that the app might use up an excessive amount of phone credit. He felt the app could help households on low incomes to work out what was costing them money on their fuel bill.

Impact on household finances

Mr L was saving about £20-£25 a week just from the tariff change and behavioural changes the household had previously identified at the home visit.

"At the moment we're saying, 'Yeah, this is great!' 'Cause it's, like, saving us, like I said, £20 to £25 a week.....And we look at each other, 'Is this right? Are they gonna bill us? Is this right? Are we gonna get stung? No, we're not...' "

After the home visit, at the end of May, he'd been able to reduce his fuel bills even more and was beginning to build up credit on his account.

"So, last month [April, after switching] was like £139, a lot less than what we were paying before, 'cause we were paying £120, £240, at least £240 a month. Then this month, which is nearly over, we're on £117."

He also saved money by not going to the shops to top up, because, as he put it, it cut out the middle man, and also it reduced the opportunity for the children to pester him to buy something else while they were in the shop. As an enthusiastic user, he also identified potential benefits for other people. For example, he felt that older people could benefit from smart prepay, with the right support, by setting up automatic payments, rather than being in credit to a big supplier and finding it hard to get their money back.

He also thought that smart prepay was a good financial strategy:

"You don't waste money. 'Cause you see what you're using and you're paying for it, you know, and if we wanted to we could probably bring our bill down a bit more. But, like I said, it's pretty much, with four kids, a household of six people, unless we say, 'You can have one shower a week!' You know, back to those, kinds of times, and things. Maybe when the cooker goes, get a better cooker, and looking at the gas prices, maybe get a gas cooker"

He thought the system was a lot simpler and better to manage financially:

"I can't see how you can get into trouble with this system, unless you're absolutely terrible with your money, and stuff."

Value of advice received

Which advice did people most benefit from?

Mr L had been shown by the installer how to use the IHD, and had received support from his energy supplier with questions post-install. He also had a well written user manual for the IHD.

Relevance for advice provision to consumers

This case study illustrated for the home energy advisers a number of opportunities for advice or other actions which could support the household to get more benefits out of their IHD. Whilst specific to the individual households, these may have wider relevance. As such, they could form the basis for future trial design regarding the effectiveness of different advice message or forms of advice delivered in line with SMICoP.

Mr L was unaware of the functionality offered by the IHD to enable real-time energy experimentation with financial feedback. By contrast, the Ovo phone app only gave retrospective daily, not hourly data, making it unsuitable for real-time experimentation.

Explaining to consumers that an IHD is capable of being used for real-time energy experimentation with financial feedback would be valuable to help them make informed choices about energy-using household practices. This offers consumers a simple way to do energy experiments to cost home energy use, to understand which appliances, if used for long periods, can add significantly to energy costs.

Case study: H3

Occupancy

Mrs W is 41 and lives with her teenage son and an asthmatic daughter who is recovering from a long term illness. Mrs W is her carer. She is in receipt of Job Seekers Allowance, Carer's Allowance and Child Tax Credit. The household income is less than £16,000 a year.

Property and household details

Mrs W lives in a three bed semi-detached council house. It has loft insulation, double glazing and gas central heating but no cavity wall insulation. There are issues with damp and mould in the property, and the council is in the process of fitting extractor fans.

Gas is used for cooking and hot water. A new central heating system was fitted within the last five years, and Mrs W noticed a drop in her gas bill after it had been fitted. She has a tumble drier but only uses it occasionally in the winter, preferring to hang up clothes inside the house to dry. She has two fridge freezers and a fridge, an A-rated new washing machine, a one cup water boiler and coffee maker. A Sky box was always on standby. There were no other large energy-using appliances.

She had fitted LED lighting throughout the property, and said that the home was really warm, especially after replacing the downstairs carpet with laminate flooring with a thin foam underlay.

Previous and current energy use and motivation to switch to smart prepay

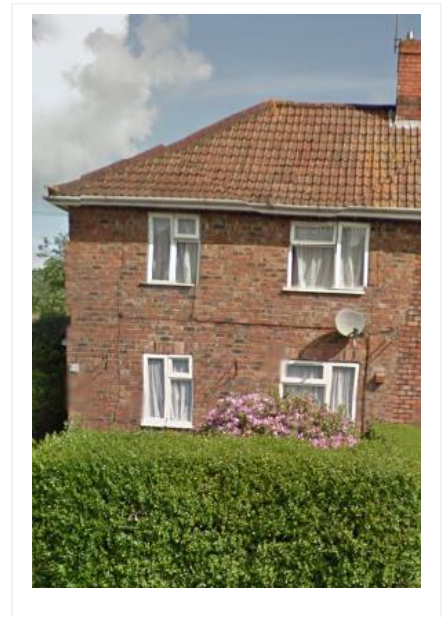
Mrs W switched supplier because her fixed prepay tariff with British Gas was coming to an end. She asked the supplier for a smart meter but they refused, saying that she had a poor credit history.

Mrs W: *"I was after a smart prepay, and she said, no, my credit rating was too bad, that I couldn't have it."*

Adviser: *"Okay. That doesn't make any sense if you're staying with the same payment method."*

Mrs W: *"I was quite willing to stay with British Gas, it was not a problem, but because I, sort of, requested something and was told that by them, I thought, well, if you're gonna tell me that now, when you do nationally roll out the smart meters, I'm not gonna get one, because you've just told me my credit rating's...what's the point."*

She switched to Ovo Energy because she wanted smart PPM. She reported that there hadn't been a massive change in tariff rates in the switch of supplier. She had her smart meters installed a month earlier, in mid-April 2016. She topped up by smart phone app, paying from her main bank account by credit/debit card.



Before switching, Mrs W spent £20 a month on electricity and £5 on gas, making her a low user for both fuels. She stated that the day before the visit, she had spent 24p on gas and £1.64 on electricity.

What were their experiences of the switching and installation process?

During the installation of the gas smart meter, the installer had discovered that the old meter was leaking a small amount of gas. Once the new meter had been installed, Mrs W found that she could light her gas cooker immediately without having to wait for the ignition. The meter upgrade would help save a little on the fuel bill, as well as being safer.

Mrs W reported that she had not been offered the choice of having an IHD at installation, and did not have one. It is possible that she was offered an IHD but didn't want one, as after being asked at the end of the visit by an adviser about having an IHD she said:

"I'm not particularly bothered, to be honest. If my energy levels were higher than what they are normally, then I would look into it, but at the moment because I know what they are every day, they're in a certain ball park, then I find it a lot easier just to stick with the app"

She used the Ovo smartphone app to monitor her fuel use and top up. She said that the family were quite techy, and that she didn't think she could get her fuel bill any lower at the moment. She had experienced problems initially getting the smartphone app to work. The installers said that it would take 7-24 hours before she could register online. Mrs W called Ovo customer services when she couldn't enter her personal details, and the issue was resolved within ten minutes.

She mentioned that she'd previously had a British Gas energy monitor (which she didn't rate as especially useful and was now obsolete) and knew where most of the electricity went. For example, she recalled that her basic usage had been 16p a day when she'd been using the energy monitor. She'd seen a change in fuel use when she changed her TV to a newer model, and that the infrequently used stereo now had new speakers. She said she knew what appliances made the electricity go up more. On her son's Xbox, she thought that the new versions were slightly more energy efficient than the original one.

The installer showed Mrs W how to enter Emergency Credit on the smart meters, but she hadn't looked at them since they were installed.

How did they engage with their smart meter display?

As Mrs W didn't have an IHD, she showed advisers how she used the phone app. The credit balance of £26.11 indicated that she had 11 days of dual fuel credit on her account. She could identify from the daily history of her fuel use what she'd been doing on a high electricity use day:

"It's nice to see the daily one, 'cause you can see, like I said, what you've used every day, and you say, "Oh alright, we spent £3 that day, why was it £3 that day? What day was that?" You go back on your calendar, "That was the day I did the washing, the day I mowed the lawn..." "

She had a look at the electricity use for the previous Sunday when her son had been in his bedroom all day on his Xbox, and the usage was £1.49.

Mrs W also knew that she could access information via the website, on which she'd set up a text and email credit alert to let her know when her balance dipped below a certain amount. She also received a text and email confirmation after topping up with her new balance. She especially liked the way she could see a top up loading into her account; she said it rolled on like a counter. This was reassuring, less stressful and much easier than the hit and miss approach of topping up at the shops.

"We've had times when I've gone down the shop, topped up my key, come back and there's nothing on there. Then you've got to keep your receipt, waddle back down to the shop, argue with the guy behind the counter for 10 minutes [laughter] and say, "Look, there's nothing on the key. Put it in the meter!" So, it's so much easier. Like I said, you get a balance check, it tells you what your balance is if you're running low, so there's no more going to bed at night worrying that the meter's gonna die out."

Mrs W didn't use the phone app to check whether appliances had been left on but was in the habit of turning everything off when family members had gone out or she was going out. For example her son frequently left his bedroom light on, and she could hear his Xbox humming if he left it on.

Behaviour change as a result of having the IHD

Mrs W reported no energy efficiency behaviour changes as a result of switching to smart prepay.

Advisers discussed with Mrs W the pros and cons of just having the smartphone app without an IHD. Mrs W realised that her smart phone app lacked some of the functionality of the IHD to give her financial information on her baseload and cost of using appliances or household routines, but as a low energy user she wasn't motivated to delve into this further. She liked the convenience of the smart phone app.

Did any changes in energy use occur after the home visit?

No follow up interview was conducted, as advisers had been unable to offer any energy efficiency advice based on the use of an IHD during the home visit.

Benefits and drawbacks of smart prepay

The main benefit of smart prepay for Mrs W was the convenience of having information about her home's fuel credit balance and fuel use on her smart phone, and being able to top up with it. For example she said that when she got paid she could make an informed decision about how much to top up that week, and if there was spare money she could put it towards food or give it to her son for bus fares.

As well as this improvement in financial flexibility, Mrs W reported that she could also access information on her home's energy situation anywhere. During the home visit she described how her eldest daughter was going to house sit for her whilst she was on holiday. Her daughter would download the Ovo app and top up from Mrs W's bank account, so Mrs W would be able to check that the house still was in credit whilst she was away and also top up remotely if necessary.

There was a minor safety and financial benefit from having a new gas meter fitted that didn't leak.

Potential smart prepay effects on energy consumption and household lifestyle

Availability of Emergency and Friendly Credit

Mrs W didn't know whether Friendly Credit was available with the Ovo account, and hadn't entered Emergency Credit (which had £5 available only). The installer had shown her what to do to enter Emergency Credit on the meters. It couldn't be done on the smart phone app.

Disconnection

In the month Mrs W had had her smart PPM she hadn't self-disconnected.

Flexible top ups

Online top ups had saved Mrs W time and cut out the anxiety of having to top up at the shops.

"It's peace of mind really, more than anything, knowing that you can do it wherever, whenever, half past two in the morning, whatever. No more stressing out when you've woken up and that meter's been off for six, seven hours."

Also the stressful household presence of the old prepay meters had gone, and managing fuel use was now easier and less worrisome.

"When we had the old meters it was constantly: better check the meters to be sure of what we've got. That was a daily thing, you'd come down in the morning: better check the gas and electric. We don't need to do that anymore."

"It's nice not to have that extra bit of worry that you're not listening out for something that's gonna go off without you knowing."

So Mrs W's behaviour had changed in relation to managing her fuel bills, but not her fuel use. Whereas she previously worried about her fuel use, she was now in the habit of checking her emails, Facebook notifications, and then her fuel use online, and she valued this as a positive lifestyle improvement.

Impact on household finances

The improved budgeting around fuel bills and payments meant that on a weekly basis Mrs W could put money towards other household areas that needed them.

Value of advice received

Which advice did people most benefit from?

The installer advice about the leaky old gas meter was useful for Mrs W.

Relevance for advice provision to consumers

This case study illustrated for the home energy advisers a number of opportunities for advice or other actions which could support the household to get more benefits out of their smart PPM when used with an app. These recommendations are specific to the individual households but may have wider relevance. As such, they could form the basis for future trial design regarding the effectiveness of different advice message or forms of advice delivered in line with SMICoP.

Whilst the immediacy of the phone app is useful and provides lifestyle benefits valued by households, current versions do not provide suitable information to check a household's base load use or to easily conduct energy efficiency experiments on appliance costs. Trials which test the ability of households to achieve demand reduction and energy savings by using either their IHD or their app, or using them in combination, could generate valuable evidence to show the relative merits of these devices for achieving different types of benefits, and the value placed on these by consumers.

Trials of IHD could also usefully explore how they can be used to with children to make them more energy aware and train them in energy efficiency practices.

5.1 Round-up of case study findings

In all three case studies the promised benefits of smart prepay for encouraging adoption of more energy efficient practices were not being fully realised. To a varying degree, the households either didn't have an IHD or were not utilising it effectively. H1 mainly used the credit balance screen and hadn't used the history screens to support fuel budgeting and was frequently in Emergency or Friendly Credit. There was little difference in her use of conventional and smart prepay, with the main benefit valued being flexible top up options and automatic credit of top ups to the meter. This limited use may have been associated with poor advice at installation. H2 used his phone app and didn't refer often to the IHD, which showed real time energy use information. His energy savings seemed mainly to be due to the more competitive tariff offered by his new supplier and as a result of his own awareness of energy efficiency options. H3 didn't have an IHD at all and, self-identifying as already being a low user, showed little motivation to try to change behaviours to limit energy waste.

All interviewees reported having benefitted from noting their credit balance on the IHD or phone app, rather than having to go to the meter to do so. They also all used the flexible top-up options, and all topped up online.

"Just go online, press it in, they've got our card details. Go online, put the password in, £40 top-up - done. Or if you want £5, as much as you want, but we're just putting £40 on a week at the moment. We used a bit extra last week, we usually top-up on a Wednesday, we topped up today, so a day early, and we put £40 on" [H2]

The reported benefits of topping up online were identified as saving time and money by not having to go to the shops, reassurance of seeing the top-up show up and convenience benefits from no longer needing to go outside to top up the meter:

"And this one at the front is not accessible - that's my electric at the front. So, it's just so much nicer than standing out there with storms coming in" [H1]

For H3 seeing her top up automatically credit her account was really reassuring:

"You can go into top-up, and just pick which one you want to....[top up - gas or electric] and you can watch it, when you go back to the energy screen, you actually see it loading on, it rolls on like a counter." [H3]

For H2 (Ovo Energy customer) he also benefitted from dual fuel, which was useful in that there wasn't a potential build-up of credit on one fuel at the expense of the other. However, should a household self-disconnect on dual fuel there would be no gas or electricity, which could present a severe risk.

Reduced worry around controlling energy use through flexible top up options, automatic credit to the meter and credit alerts were also acknowledged, making the home feel more homely without the stressful presence of the old-style prepay meter:

"Things change as to what you do, and it's no more, 'Hang on, is that the electric meter bleeping again?' So, it's nice not to have that extra bit of worry that you're not listening out for something that's gonna go off without you knowing." [H3]

The improved ease of information about fuel use seemed to help households keep on top of their energy use on a weekly basis:

"I get paid, I check what we need... 'Well, we only need to put £15 on this week, we'll put £15 on.' Which means I've got a fiver to either put towards the food or give to the boy for his bus fare - something like that. It varies from week to week as to what we've used." [H3]

Whilst the case study householders did report benefits from their new smart PPM and IHD, there were significant limitations compared with what they could have achieved. The coverage and quality of advice offered at the point of installation may have had a part to play, but a number of other factors were identified that are likely to have played a part in limiting the use of IHDs to save energy, including lack of motivation and technical issues with the IHD.

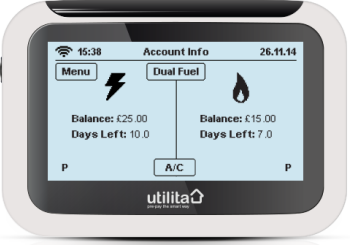
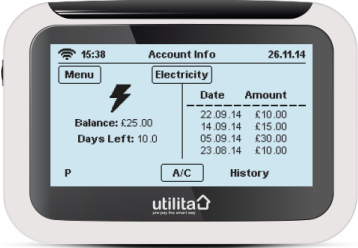
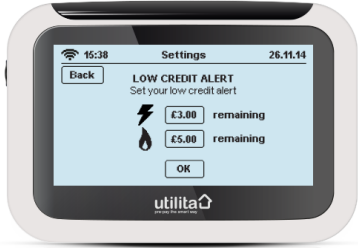
5.2 IHDs and Apps for Smart Prepay Compared

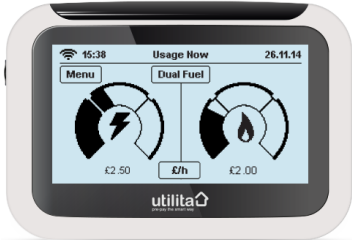
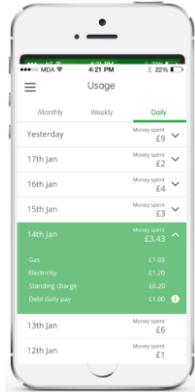
This section looks at what functionalities are offered by the apps used by case study households including top up options, energy consumption feedback, target setting, alerts and messaging. BEIS has clarified the requirement that all households should receive a genuine offer of an IHD and that any offer of an app or other proprietary device should be additional to an IHD. However, it is possible that, even with an IHD, some consumers will choose to use an app on their smart phone rather than their IHD. Suppliers are only required to maintain and replace IHDs for a year after supplying it. After this date, if their IHD is lost or broken, consumers may revert to use of an app only. This section sets out some comparisons on what current versions of apps allow consumers to do, as compared to IHDs.

5.2.1 Smart prepay IHD and phone app functionality

This comparison uses photoshops of Utilita IHDs and an OVO Energy app, comparing an 'IHD only' and an 'all online' tariff, with IHD and phone app. Whilst all IHDs have to adhere to SMETS standards, suppliers have greater freedom in the capabilities of proprietary apps. It is likely that there will be further development in the capabilities of apps, viewed on a smart phone or tablet.

Activity	IHD	IHD and phone app
Top up methods	Phone, PayPoint, phone app (basic), online, text. Separate fuels.	Phone app, online, text. Auto top up (when account reaches a

		selected minimum credit level), and rolling top up (schedule regular top ups each month) capability on phone app. Dual fuel top ups possible.
Credit balance (<i>default screen</i>) <i>To see how much money is left and how long it is estimated to last.</i>		IHD has 'Est. bill' (estimated bill) followed by a figure, in place of the credit balance on the dual fuel screen. Phone app screen shows balance and days left. 
Top up history To keep track of spending	Shown for individual fuels 	On IHD and phone app
Setting credit alert To warn that credit will need to be topped up soon.		On IHD
Setting daily target Set in £, to help with fuel budgeting (e.g. to avoid self-disconnection before salary/benefits payments made) and for goals for energy efficiency.		On IHD

Messages To alert customer that credit is nearly used or, to advise of tariff changes or on the availability of fuel rebates or the Warm Home Discount. Messaging could be expanded to include information on use of the IHD, energy efficiency and fuel budgeting.		On IHD
Live energy use To view actual usage by fuel type	Energy dial can show real time usage in £/h, kWh and CO₂ emissions 	Phone app shows previous day usage in £.
Historical usage To compare energy usage over time to understand patterns of usage.	Shows real time energy use in bar chart format by day (30 minute increments), week or month in £/hr, kWh, and CO₂ emissions. Gives total for period being viewed, maximum usage and target usage. 	Phone app shows usage from any previous day, week or month in £. No real time £/h feedback on energy use available.⁶⁶ 
Manual top up, entering emergency credit, tariff details		On IHD

5.2.2 Advantages/disadvantages of the phone app (online tariff) and IHD

This section outlines some of the advantages and disadvantages of an IHD and proprietary phone app combination compared with use of an IHD alone, based on the observations of advisers who visited householders' homes. This analysis is based on current early rollout versions of IHDs and

⁶⁶ The lack of real time £/h feedback indicates that the IHD is not SMETS-compliant.

apps. The functions offered to consumers by SMETS2 generation IHDs and by next generation proprietary apps are likely to be an improvement on those reviewed here, based on IHDs and apps viewed in householders' homes.

The app and online tariff seen operated in a dual fuel topping up mode, rather than having individual gas and electricity top ups. This was useful as it simplified topping up, but could present a disadvantage if credit was to run out and both fuels were to be disconnected at the same time.

The app could be set to automatically top up if credit dropped to a household-specified minimum level, or so that top ups would be made on a selected date each month. It was possible to examine the fuel use in £/day for any previous day, but without detailed information on time of energy consumption.

A drawback of the IHD and phone app was that real time energy usage was visible on the IHD only in kWh or carbon emissions, not in £/hour whilst financial information was only available online via the phone app or website. This arrangement makes it difficult for householders to explore the cost of their routine home energy activities or of the energy costs of individual appliances, in order to identify how they can reduce energy waste. £/hour is the most relevant unit of measurement for householders, especially those on prepay. Whilst householders can estimate the cost of home activities on the phone app from changes in their credit balance, it is more difficult to obtain a realistic idea by using the IHD (this would involve a two-step process to identify the kWh used and to calculate that cost using the kWh unit price).

Another disadvantage identified was that the household energy usage data is updated overnight for the phone app so that real time energy use information in £/hour is unavailable for the online tariff. Energy use is displayed numerically in £/day (for all previous days), without an incremented chart breakdown of usage in 15/30 minute intervals.

If a householder wanted to make full use of their IHD or IHD/phone app combination to reduce energy waste and manage their fuel bills, then the automatic top up capability on the phone app (either by credit level or rolling) would appear to offer an advantage in ensuring that self-disconnection only occurs if there is no cash in the bank account. However, the extent to which these facilities were being used by smart prepay consumers wasn't ascertained. From previous research, it seems that prepay consumers prefer to feel in direct control of their fuel payments without using automated payment functions.⁶⁷

⁶⁷ Smart Metering Prepayment in Great Britain. Making prepaid energy work in a smart world. Consumer Focus and Accenture (2013) p8

6 Modelling a switch to Smart Prepay

6.1.1 Introduction

As the roll out of smart meters gathers pace, increasing numbers of people will be using smart PPM to pay for their energy. This transition will involve switching those currently on 'conventional' PPM to smart PPM. In addition, some households currently on standard meters (and paying by standard credit or direct debit) may be attracted to smart 'pay as you go' options marketed by suppliers, and choose to switch to a prepay tariff. Many of the latter group of households, as well as younger low-income households on conventional PPM, are likely to use smart phone or tablet apps to engage with their energy use and pay for their energy, and are regularly labelled as being 'tech savvy'. A proportion of these households can be considered as pioneers of new technology.

Tariffs for smart PPM are likely to be lower than their conventional counterparts, partly as a reflection of the reduced cost to supply energy to these households (smart PPM are just standard smart meters remotely switched to function in prepayment mode) and – initially, at least – in an attempt by energy suppliers to attract new consumers; these tariffs are often referred to as 'acquisition tariffs'. However, suppliers may justify tariffs somewhat higher than direct debit tariffs on the basis that the customer behaviours of certain PPM customer segments mean they have a higher 'cost-to-serve' than other customer segments (see earlier discussion at 3.1.5).

In reality, it is uncertain exactly how smart prepayment tariffs will compare with, say, standard variable rate tariffs paid for by direct debit or by standard credit, but it is probable that they will be lower than existing prepayment tariffs, particularly in light of the planned CMA PPM interim price cap. The design of the interim price cap is intended to provide some scope for competitive pricing of PPM tariffs beneath the capped maximum annual cost. Suppliers may choose to offer differing 'smart' and 'conventional' tariffs. Notably the exclusion of SMETS 2 meters from the price cap makes it hard to be certain how the tariffs for SMETS2 meters will compare with other PPM tariffs up until 2020.

As a result, it is likely that vulnerable consumers currently on PPM tariffs will benefit from lower energy bills. Furthermore, reducing the tariffs of some prepayment consumers could have an impact on national fuel poverty rates. Here, we investigate a potential future scenario.

The modelling presented here attempts to forecast a possible smart prepay future using comprehensive data sets and an advanced energy models. As discussed in 1.3 above, this is in place of the intended analysis of actual customer consumption data, which was not available for this study.

6.2 Modelling methodology

6.2.1 Potential impacts on fuel poverty: EHS analysis

Modelling to estimate the impact of smart PPM on fuel poverty used the English Housing Survey (EHS) data set. This is the official data set used to calculate national fuel poverty statistics in England by BEIS. It contains information on dwellings and households and a specific fuel poverty dataset. The data includes information on modelled energy consumption statistics and has been used to apply new assumed energy prices for smart prepayment tariffs. In turn, these have been used to update energy costs and estimate potential impacts on fuel poverty. It is important to note that the results

of this are indicative of fuel poverty changes rather than a comprehensive reassessment of fuel poverty under a smart meter future. For example, the modelling has not taken into account other changes likely to influence fuel poverty, such as increased energy efficiency, demand reduction and changes in the energy market or other possible influences on energy prices.

6.2.2 Potential impacts on annual energy bills changes: DIMPSA

CSE employed its analytical model – DIMPSA (‘Distributional Impacts Policy & Strategic Analysis’) – which is designed to undertake distributional impacts analysis of policy proposals. It is based on the socio-demographically representative sample of GB households surveyed in the ONS Living Costs and Food (LCF) Survey and it derives modelled household energy consumption based on stated expenditure on fuel bills and known local fuel costs (by payment method) at the time of the survey. This is ‘actual’ energy consumption as reported by households, as opposed to a ‘modelled’ energy consumption produced by an energy assessment or SAP calculation (which assumes certain target internal temperatures are achieved). The key difference between the two approaches being that actual consumption tends to be lower than modelled consumption (because most households do not use enough energy to meet target temperatures). Using this DIMPSA data will tend to result in more realistic changes in energy costs (with a more realistic baseline), which modelled energy consumption data tend to overestimate.

CSE have use the DIMPSA dataset (derived from the LCF) to model a transition to smart meters, and estimate typical fuel cost changes that would occur as a result, assuming that future smart prepayment tariffs are lower than existing PPM tariffs.

6.2.3 Modelling Assumptions

Two core assumptions were required in order to anticipate two key aspects of the smart prepayment market: a) who is most likely to use smart PPMs, and; b) how much are they likely to pay for smart prepay energy.

6.2.3.1 Households switching to smart prepayment

It was assumed that the main households who are likely to be switching to Smart PPM tariffs are the following groups:

- Existing ‘conventional’ prepay consumers transferred for debt reasons
- Existing ‘conventional’ prepay consumers transferred for other reasons (i.e. not in debt on meter but switched for other reasons)
- New consumers attracted by a smart prepayment (or ‘Pay as you go’) way of interacting with energy.

Using a recent survey conducted by Smart Energy GB,⁶⁸ estimates were made of the number of households in each age band who were likely to switch to smart PPM, based on the proportion who were very interested. Recognising the possible over-estimation of levels of interest, an estimate of only households ‘very interested’ were used in the modelling. These final numbers used in the modelling were compiled using a proportion of the existing conventional PPM customer base, which

⁶⁸ Attitudes around buying gas and electricity with smart pay-as-you-go, Smart Energy GB; survey conducted by Populus, 2014.

was then topped up with non-prepay consumers to match total numbers predicted by the Smart Energy GB survey.

As previously noted at 3.1.9 above, the Populus survey is not without shortcomings. It uses a quota sampling method rather than probability sampling, administered via a self-completion online survey. It introduces ‘the smart pay-as-you-go concept’ as a means of paying that ‘will not have to be more expensive than other ways of paying’. It then asks a question “Overall, how interested would you be in using a smart meter operating in pay-as-you-go mode?” This would suggest that the reported interest in prepay is likely to overestimate stated interest in prepayment.

The predictions used in the modelling attempt to correct this somewhat, by only using the % of people who stated they were ‘very interested’, not ‘interested’. Even then, it is likely that this stated interest may be higher than those who actually switch to a smart prepayment tariff. In the absence of a more reliable basis for predicting likely uptake, the responses to this survey have been used as a guide for the modelling.

Table 1: Overall interest using a smart meter operating in pay-as-you-go mode (GB)

Age band	‘Interested’ or ‘very interested’ in a smart prepay meter (%) [#]	Estimate of households ‘very interested’ in a smart prepay meter ⁶⁹ (%)	Estimate of households ‘very interested’ in a smart prepay meter (000s)
18-34	59%	35%	1,629
35-54	52%	24%	2,336
55	35%	11%	1,212
All Households	48%	20%	5,178

Finally, it was also assumed that there would be no change in the energy behaviour and annual energy consumption levels of households. There is arguably likely to be some change as a result of smart meters being installed, particularly relating to the use of In Home Displays (IHD). However, many low income households may already tightly restrict their energy consumption to manage fuel costs and may have little desire or opportunity to reduce their energy consumption further. In the absence of any robust evidence and certainty of this impact, it was decided that attempting to account for associated changes in energy consumption would make the modelling more complex without necessarily bringing additional accuracy or insight.

6.2.3.2 Future smart prepayment tariffs

When considering potential future energy tariffs, the existing smart PPM customer base and its overall market share is not of a sufficient size to use as a basis for future scenario modelling. For the modelling conducted to date we have used established fuel price statistics for non-smart meter tariffs published by BEIS.⁷⁰ The modelling has also reflected the introduction of a PPM price cap from

⁶⁹ Estimate of those who were ‘very interested’ only – data unavailable at age group level.

⁷⁰ <https://www.gov.uk/government/statistical-data-sets/annual-domestic-energy-price-statistics>

January 2017, which will apply to all PPM tariffs, with the exception of SMETS 2-compliant smart meters.

As a result of these considerations, the modelling here considers a future scenario in which energy tariffs for smart prepay consumers are reduced to a level similar or closer to direct debit tariffs.

6.2.4 Modelling assumptions summary:

The modelling work has considered three different modelling scenarios to cover several possible future situations.

Option 1: 90% of existing households using conventional PPM will migrate to smart PPM, with smart PPM tariffs dropping to similar levels to existing Direct Debit rates.

- 90% of existing households using conventional PPM will migrate to smart PPM; a total of 3.15 million households in England, 3.40 million households in Great Britain.
- A further 1.4 million non-prepay consumers in England (1.78 million in GB) will sign up for smart prepayment tariffs.
- Tariffs for new smart prepay consumers will match existing direct debit tariffs in each England region and devolved nation.

Option 2: 70% of existing households using conventional PPM will migrate to smart PPM, with smart PPM tariffs dropping to similar levels to existing Direct Debit rates.

- 70% of existing households using conventional PPM will migrate to smart PPM; a total of 2.45 million households in England, 2.65 million households in Great Britain.
- A further 2.1 million non-prepay consumers in England (2.5 million in GB) will sign up for smart prepayment tariffs.
- Tariffs for new smart prepay consumers will match existing direct debit tariffs in each England region and devolved nation.

Option 3: 90% of existing households using conventional PPM will migrate to smart PPM, with smart PPM tariffs dropping to levels half way between existing conventional PPM and Direct Debit rates.

- 90% of existing households using conventional PPM will migrate to smart PPM; a total of 3.15 million households in England, 3.40 million households in Great Britain.
- A further 1.4 million non-prepay consumers in England (1.78 million in GB) will sign up for smart prepayment tariffs.
- Tariffs for new smart prepay consumers will reduce to a level that is halfway between existing conventional PPM tariffs and direct debit tariffs.

Common assumptions across all three options:

- It is assumed that annual energy consumption will remain the same after transferring to a smart PPM and tariffs (the current fuel poverty calculation does not use any additional details to adjust energy consumption to account for any influence of a SM or IHD).

- The group of non-PPM meter consumers switched to smart PPM will comprise proportionally higher numbers of younger households, many of whom have access to smart phones, and who are currently paying by conventional credit or direct debit.

6.3 Modelling results

6.3.1 Part 1: Impacts on Fuel Poverty

The fuel poverty calculation has been replicated using the EHS 2013 and 2013 fuel prices available from the BEIS (metered fuels) and Sutherland tables (unmetered fuels). A proportion of England households were then selected for smart prepayment tariffs (using the assumptions details above) and transferred to a new smart prepayment tariff. Their fuel bills, using constant annual energy consumption, were then recalculated and equivalised, and a new fuel bill threshold calculated allowing the determination of fuel poverty status of each case in the EHS. Figure 1 shows the modelled changing method of payment experienced by households under Option 1 scenario.

Figure 1: The modelled changed of method of payment arrangements for all households in England under Option 1 (n = ~22.6 million households)



Key: ● SC = Standard Credit (Blue); ● DD = Direct Debit (Green); ● PPM = prepayment meter (Orange); ● Smart PPM = Smart Prepay.

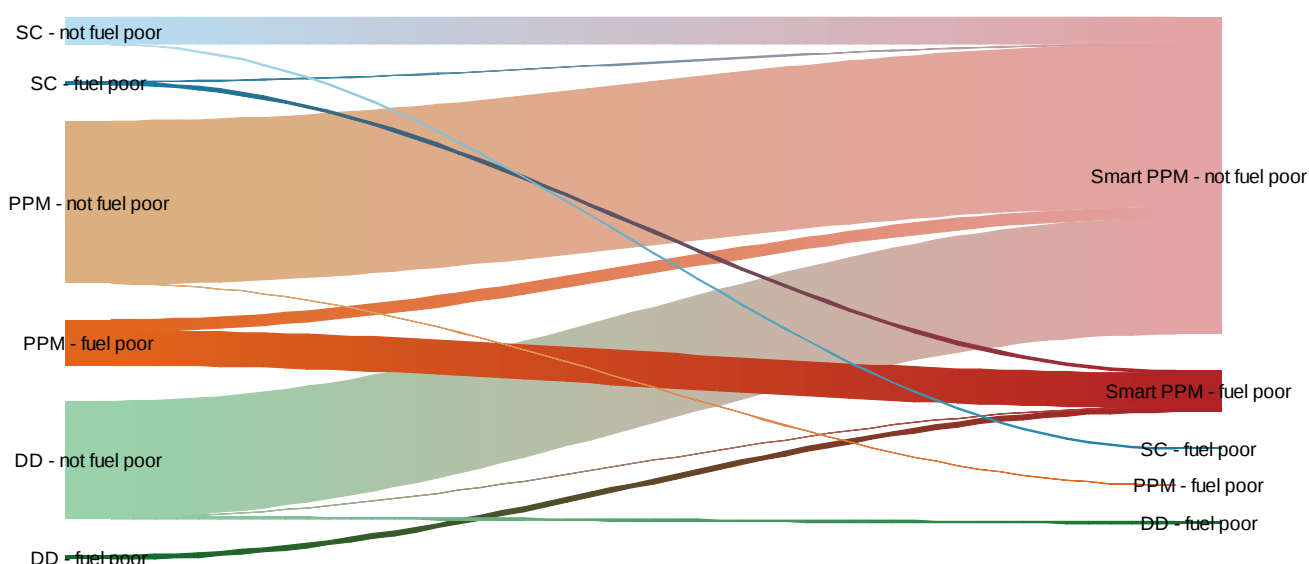
6.3.1.1 Headline results

Between 85,000 and 139,000 households (depending on the scenario) were brought out of fuel poverty as a result of switching to a cheaper smart PPM tariff. Option 1 (in which 90% of existing convention prepay consumers were switched to smart PPMs with tariffs matching existing direct debit tariff rates) resulted in the biggest reduction in fuel poverty.

Table 2: Numbers of fuel poor households by method of payment (MOP) for electricity before modelling and after modelling. The recalculation of the LIHC fuel cost threshold results in some households previous above the threshold and not in fuel poverty are above the fuel cost threshold after the modelling.

	Original MoP	Option 1 (000s)	Option 2 (000s)	Option 3 (000s)
Households removed from fuel poverty	Conventional PPM	181	166	95
	Standard credit	9	11	10
	Total	190	177	104
Households moving in to fuel poverty	Conventional PPM	1	2	2
	Standard credit	18	16	0
	Direct debit	32	28	18
	Total	51	46	19
Net change		139	131	85

Figure 2: Changing fuel poverty circumstances and method of payment arrangements for houses experiencing a change in either fuel poverty or method of payment for electricity under Option 1. [Note: Households not experiencing changing in circumstances are not shown] (n = ~5.9 million households)



Key: ● SC = Standard Credit (Blue); ● DD = Direct Debit (Green); ● PPM = prepayment meter (Orange); ● Smart PPM = Smart Prepay.

The changing method of payment and resulting fuel poverty status from a modelled switch to smart PPM is illustrated in Figure 2. Here the outcomes for only households experiencing a change in either fuel poverty status or method of payment are shown (all other households' situations remain the same in respect of their fuel poverty status or method of payment). The majority of households switching to Smart PPM are non-fuel poor conventional prepay consumers (light orange to light red), although a significant proportion of households that were fuel poor and on conventional PPM tariffs are taken out of fuel poverty (dark orange to light red). However, the majority of existing fuel poor households on conventional PPMs who switched to smart prepayments remained fuel poor (dark orange to dark red), and this group comprises the majority of fuel poor households on smart PPM. A

small number of households originally paying by Direct Debit, Standard credit or convention PPM and who are not fuel poor were brought into fuel poverty as a result of the changing LIHC fuel cost threshold. This is explained further below.

However, the majority of households being taken out of fuel poverty are those who were originally on conventional PPM. For option 1, 181,000 households switching from conventional PPM to smart PPM were taken out of fuel poverty, dropping to 166,000 for Option 2. Option 3 had approximately half the impact on fuel poverty for existing PPMs with 95,000 households being removed from fuel poverty.

Despite a number of households remaining in fuel poverty after switching from conventional PPM to smart PPM, many households experienced a reduction in their fuel poverty gap (Table 3). For Option 1, the average fuel poverty gap of this group reduced from £449 to £341 after switching to smart PPMs. For Option 2 and for Option 3 these changes were £457 to £347 and £397 to £343, respectively.

For households who remained in fuel poverty and didn't switch to smart PPMs (i.e. remained on their original method of payment), there was a small increase in their average fuel poverty gap. This is due to the lowering of the LIHC fuel cost threshold, as a result of some households experiencing a reduction in their energy bills, affecting the national average.

Overall, the total number of households in fuel poverty reduced from 2.46 million to 2.32 million under Option 1, 2.33 million under Option 2 and 2.37 million under Option 3 (

Table 4).

Table 3: Changing fuel poverty gaps for households remaining in fuel poverty by original and modelled method of payment

Original Method of payment	Post modelling method of payment	Option 1		Option 2		Option 3	
		Original FP gap	New FP gap	Original FP gap	New FP gap	Original FP gap	New FP gap
Direct debit	No change	£445	£466	£447	£465	£444	£452
Standard credit		£511	£531	£514	£533	£512	£520
Conventional PPM		£308	£327	£269	£287	£263	£271
Direct debit	Switch to smart PPM	£350	£369	£359	£376	£357	£429
Conventional PPM		£449	£341	£457	£347	£397	£343
Standard credit		£586	£468	£559	£435	£586	£516

Table 4: Numbers of households (000s) in fuel poverty by method of payment for the original baseline scenario and the three modelling a switch to smart PPM scenarios.

Method of payment	Before switch	Option 1	Option 2	Option 3
Direct debit	1,091	1,046	1,019	1,033
Standard credit	595	556	545	539
Conventional PPM	773	33	85	24
Smart PPM	0	684	679	778
All households	2,458	2,319	2,327	2,374

6.3.2 Part 2: Impacts on energy bills

An estimate of potential bill savings from the roll-out of Smart PPM has been produced using DIMPSA and the Living Costs and Food (LCF) survey and fuel prices available from BEIS (metered fuels) and Sutherland tables (unmetered fuels). A proportion of England households were then selected for smart prepayment tariffs (using the assumptions details above) and transferred to a new smart prepayment tariff. Their new energy bills, using constant annual energy consumption, were then recalculated and the overall bills savings calculated.

Note: This method has been used to estimate potential energy bill savings as the LCF survey collects information on actual expenditure on fuel and therefore provides a more accurate indicator of actual fuel costs and the likely savings, rather than modelled energy requirement and costs used for the fuel poverty calculation.

6.3.2.1 Headline Results

When assuming that future energy tariffs for smart PPM will be comparable to direct debit tariffs, it was found that all existing prepay consumers switching to smart PPM saw a reduction in their energy bills. However, the extent of the savings was dependent on the tariff setting. For Options 1 and 2 where smart PPM tariffs were comparable to Direct Debit tariffs, the average annual bills savings for conventional prepay consumers switching to smart PPM was approximately £100 (Table 5). However, for the higher smart PPM tariffs modelled in Option 3, the savings for this group were less, averaging approximately £47 per year.

For Option 1 and 2, some households not using conventional PPM but switching to smart PPM saw their bills reduce, with the exception of those currently paying by direct debit. On average these households experienced a smaller annual bill reduction of £23-24. However, for Option 3, this group saw an increase in bill, predominantly due to households switching from conventional Direct Debit tariffs to more expensive smart PPM tariffs. On average this group experienced an increase of £54 on their annual bill.

Table 5: Estimated fuel bills savings for households switching to smart PPM (n: 4.6 million households in England switched to smart PPMs; source: DIMPSA and the Living Costs and Food (LCF) survey)

Scenario	Household type	Original total energy bill	Estimated new total energy bill	Estimated change in energy bill	Number of households
Option 1	Non-PPM households	£1,493	£1,469	−£23	1,992,796
	Existing PPM households	£1,101	£1,001	−£100	3,401,118
	All households	£1,245	£1,174	−£72	5,174,193
Option 2	Non-PPM households	£1,453	£1,429	−£24	2,529,151
	Existing PPM households	£1,093	£994	−£100	2,645,043
	All households	£1,269	£1,206	−£63	5,174,193
Option 3	Non-PPM households	£1,487	£1,542	+£54	1,992,621
	Existing PPM households	£1,090	£1,043	−£47	3,400,848
	All households	£1,238	£1,228	−£10	5,395,648

The majority of households switching from ‘conventional’ PPM meters to smart meters in PPM mode and benefiting from lower energy bills were in the lowest income deciles (Figure 3). However, for Options 1 and 2 households on higher incomes experienced significantly higher average energy savings, a result of these households consuming more energy and all households being shifted to lower tariffs (or similar tariffs for those originally on direct debit). Option 1 which switched a higher proportion of conventional prepay consumers to smart prepay consumers had a bigger impact in terms of the numbers of households in the lowest income deciles being switched to lower tariffs.

For Option 3, high proportions of lower income households were also switched to smart PPM. However, the average savings were lower and more similar across all income deciles, a result of a higher smart PPM tariff in this scenario.

Non-prepay consumers who switched to smart PPM from their previous payment method had higher incomes on average and were more likely to be from higher income deciles. For Option 1 and 2, these households experienced bill reductions with average energy savings across all income deciles generally similar and varying between £18 and £28. However for Option 3, this group experienced bill increases, with the size of increase larger for higher incomes. This is a result of a number of factors; higher income households are more likely to be on direct debit tariffs and therefore will have shifted to a higher tariff smart PPM in this scenario, also higher income households tend to have higher energy consumption levels and so tariff changes have a more pronounced impact on the annual energy bills of these households.

Figure 3: Option 1: Number of households switching to smart PPM and average bill savings, by disposable income decile

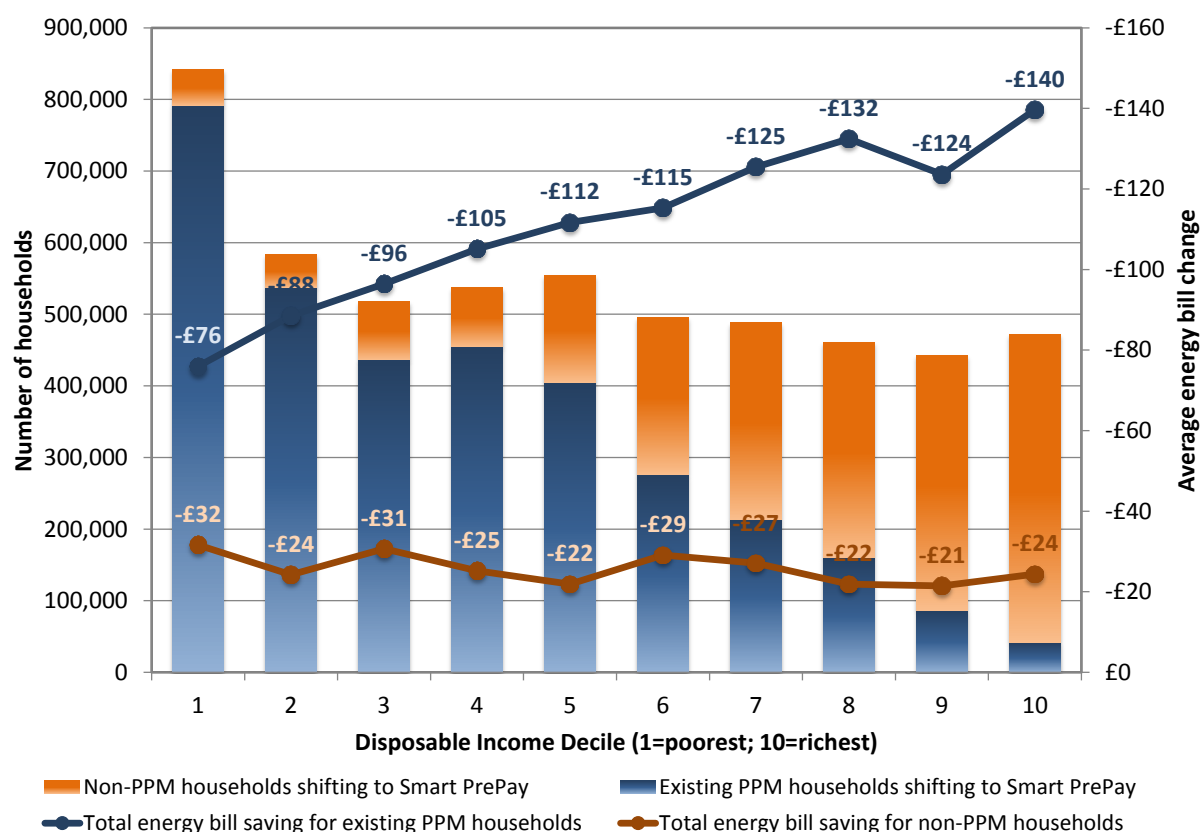


Figure 4: Option 2: Number of households switching to smart PPM and average bill savings, by disposable income decile

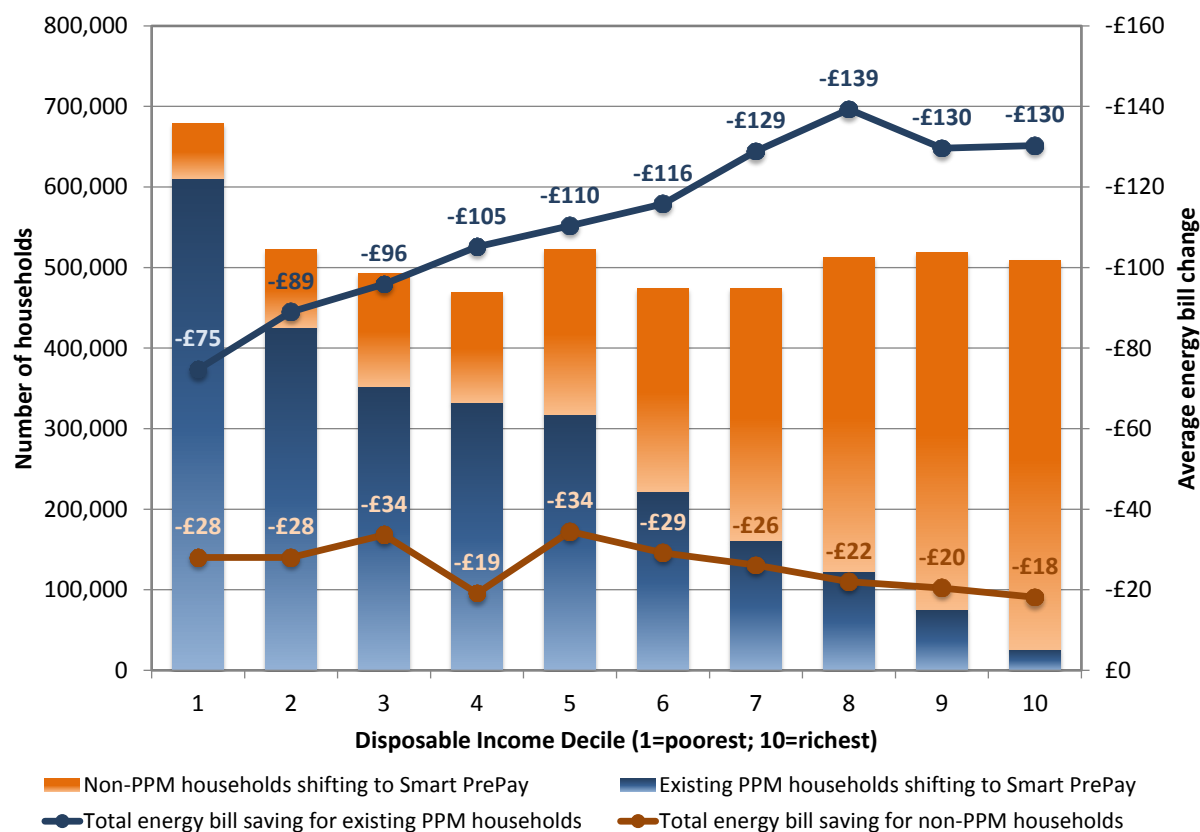
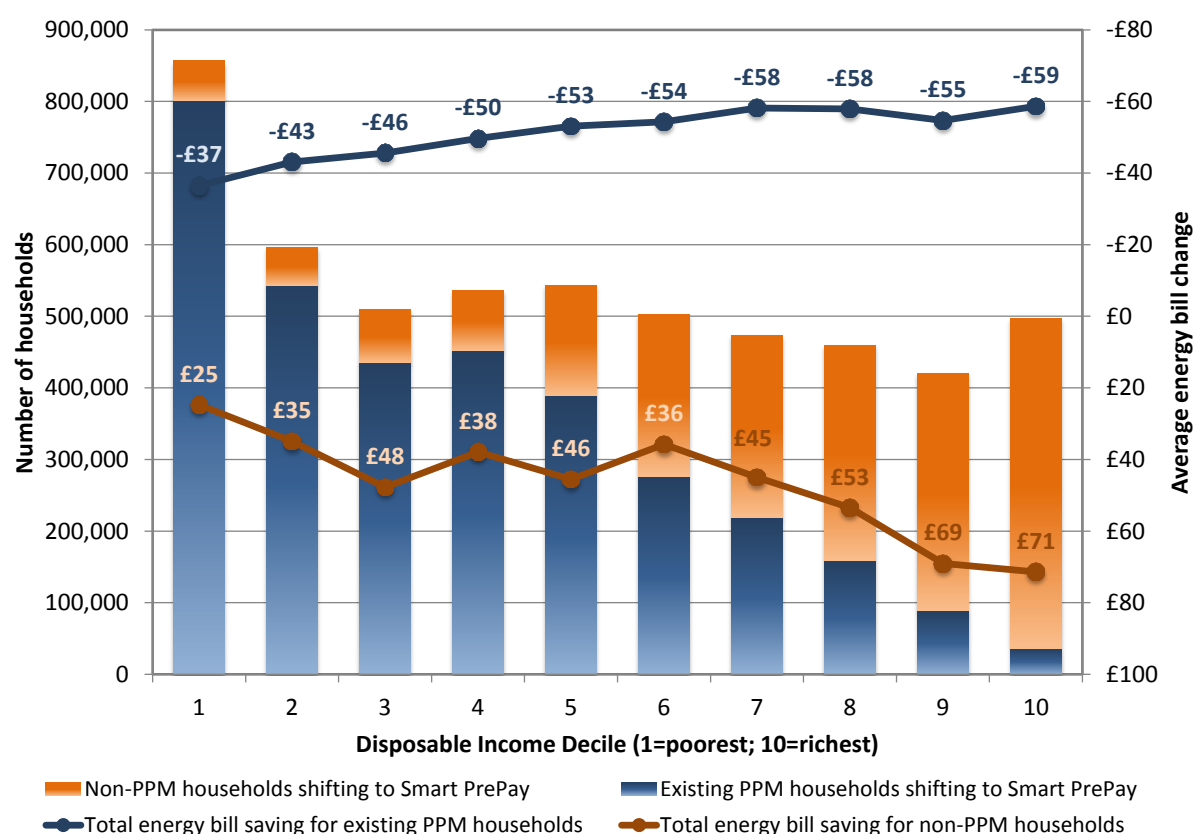


Figure 5: Option 3: Number of households switching to smart PPM and average bill savings, by disposable income decile



6.4 Conclusions

The modelling has assumed that 20% of the population will switch to using smart PPM by the end of 2020, with a varying proportion of this group comprising households who have switched from conventional PPM to smart PPM. Assuming that tariffs for this method of payment will be reduced to align with existing direct debit tariffs, the modelling found that:

- The proportion of those shifting from conventional PPM to smart PPM and the particular tariff level of smart PPM had a notable impact on the numbers of households in fuel poverty and the fuel poverty gap of those remaining in fuel poverty. Switching higher numbers of conventional prepay consumers to smart PPM and setting tariffs of these meters at levels comparable to direct debit rates had the largest positive impact.
- Between, 181,000 and 95,000 households who switched from conventional PPM to smart PPM were taken out of fuel poverty, for Option 1 and Option 3 respectively. The difference between these two scenarios was the smart PPM tariff, suggesting that future smart PPM tariff will be particularly influential on future levels of fuel poverty.
- The average fuel poverty gap for households who switched from conventional PPM to smart PPM but remained in fuel poverty reduced from £480 to £363.
- The average 'actual' energy bill reductions for households who switched from conventional PPM to smart PPM was approximately £100 where smart PPM tariff were reduced to similar levels as existing direct debit tariffs.

7 'Proof of concept' experimental analysis of customer data

7.1 Analysis performed for this study

Utilita provided CSE with energy consumption data for electricity and gas for 28 of the 30 households who took part in the qualitative analysis work reported in Section 4 above. The data was provided under a specific contract and data sharing agreement; CSE received permission to analyse the data for the purposes of this project. The core set of data contains the meter number, fuel type, meter type and half hourly intervals of energy consumption in kWh for consumers who received either a home visit or telephone advice session. Information on the date and type of the intervention was available for the analysis.

There are a number of limitations regarding the data and being able to draw conclusions on both consumption patterns and impacts of the intervention. Having only 28 sets of customer data limits the weight that can be placed on any findings and how representative these can be of the wider roll out of smart PPMs and the behaviour of this section of the market. Furthermore limitations are associated with the timing of the intervention and the period of time for which data was provided. Interventions occurred from the end of August to the end of October; before or in the early part of the heating season. Pre-intervention data for most cases covered the late spring and summer months, starting in May, June or July. Data for three consumers covers a period from the last week of January 2015 or early February. The data supplied extended beyond the date of the intervention until the end of December. This means that drawing any detailed conclusions on the impact of the interventions is difficult; there is not sufficient data to establish baseline levels of consumptions, nor account for seasonal influences, nor assess how sustained any impact is.

Nevertheless, being given access to this data for analytic purposes provided an opportunity to perform experimental analysis as a proof of concept for future investigation of changes in customer consumption patterns. The analysis also prompted thought on the requisite data characteristics to generate more trustworthy findings from future research.

Several analyses were performed. Monthly consumption and average annual weekly load profiles for all households were examined. The customer data was interrogated for a four week period, namely the two weeks either side of the intervention. An example of the analysis is provided in Figure 6, showing the average annual weekly load profiles for all households. A full set of the results from the analysis can be found in Appendix 1.

In summary, the small size of the data set (reflecting the limited number of consumers involved in the primarily qualitative study), the limited time period covered by the data supplied and the timing of the intervention make it difficult to draw any conclusions on the impact. However, the analysis does demonstrate the use of potential techniques for informative analysis if a richer data set becomes available.

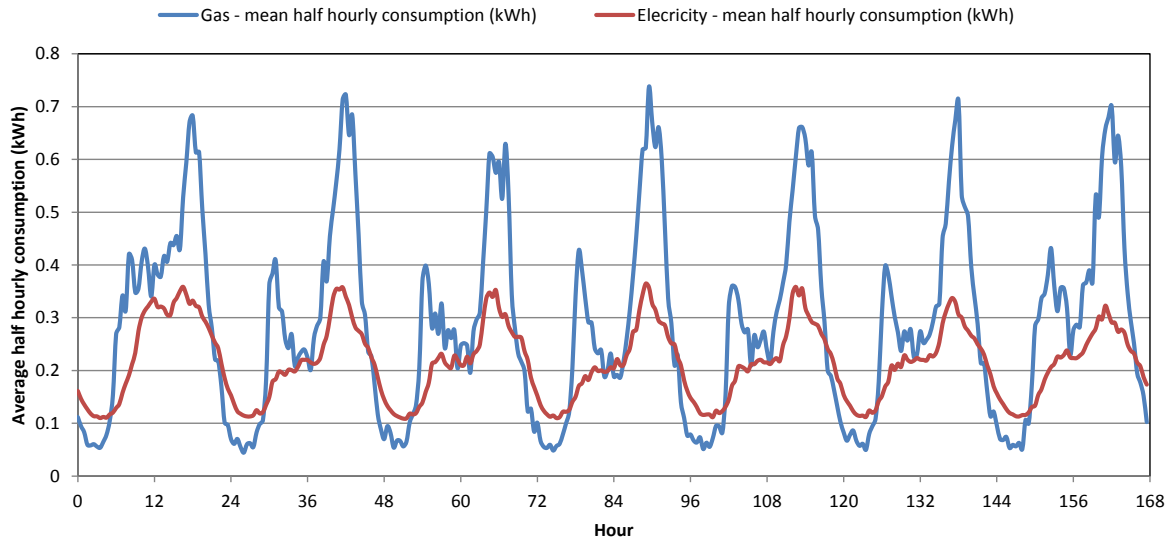


Figure 6: Average half hourly energy consumption each month for all consumers by gas and electricity.

7.2 Future data collection and analysis

For future analysis to yield more useful results, care should be taken to set out the data specification requirements, including additional socio-demographic and other information on the households and their homes. For instance, discussions with data providers such as energy companies should be held before data provision occurs so that the intended use and exact requirements, as well as the limitations of the data, are understood by both parties.

Ideally, the analysis of interventions would use a full year's worth of data before and after an intervention was due to occur, use weather data to adjust and normalise across and between seasons, and capture any changing demographics in the household (e.g. different working patterns, changes in the household, purchase of new large appliances, etc.).

A set of data with significant numbers of consumers (100-1000s) would allow statistical clustering of different energy profiles into distinct groups. With the further inclusion of information on socio demographic characteristics, the different heating and electricity consumption behaviours of different groups could be explored. This analysis has a number of potential uses. For instance, understanding the energy profiles of different types of consumers across different seasons would help when considering the implications for the design of time of use tariffs, or to inform engagement and behavioural change strategies aimed at shifting peak load

With the supply of information on credit levels of customer accounts and the timeline of tariff rates applied to customer accounts, it would be possible to show levels of debt, top up rates and occurrences of self-disconnection. Furthermore, monthly and annual fuel bills, plus estimations on the fuel bill savings from any interventions, could also be reported on.

The exploratory analysis for this report has shown that such analytic techniques, when applied to a larger and richer set of data covering a longer time period, have the potential to yield valuable and insightful information on the energy-related behaviours of those using smart prepay meters. Future projects should look to ensure that the data set used for analysis is for a sufficiently large customer sample base, covers a period of at least a year, is supported by anonymised socio-demographics and

customer account/tariff details, so that associations between patterns of behaviour and customer 'type' can be identified.

8 Discussion

This research has contributed towards understanding of the changing smart PPM sector and the potential effects of smart PPM rollout for fuel poverty levels. It has generated new insights into the experiences of consumers, helping to identify where further effort is required for fuel poor households on prepay tariffs to realise the benefits of smart metering. It has also illustrated the potential value of techniques to analyse actual customer consumption data to understand changing patterns in energy consumption.

8.1 The changing smart PPM market

Overall numbers of prepay consumers are increasing but, so far, few prepay consumers appear to be permanently switching to credit meters. Energy debt is a key factor for consumers being moved onto PPM, though amongst existing prepay consumers not currently in debt, there is a tendency to report using their meter as a budgeting tool. The figures on numbers of smart PPM installed are not clear, with a highly uneven spread across suppliers. The leading current suppliers are Utilita, Ovo Energy, British Gas, as well as E.On and Utility Warehouse and possibly others. Marketing of smart PPM to date has targeted households using conventional PPM, either within a supplier's existing customer base or as an acquisition strategy by new entrants.

The CMA's interim PPM price cap, due to commence in January 2017, will have an important effect on bringing down fuel bills for all PPM households, whilst the effect of the exemption of SMETS2 meters from the price cap is harder to predict.

The offer of proprietary apps on converged devices (principally smart phones and tablets) in addition to the mandatory offer of an IHD is likely to differentiate offers by suppliers. From a supplier perspective, this supports a reduction in the 'cost to serve' of prepay consumers, by encouraging them to increasingly 'self-serve' rather than use shop-based top-up or phone-based customer services. The widening take-up of mobile phone, including amongst low income households, means that the convenience of a smart phone app will have broad appeal, with the exception of a likely residual group of mainly older digitally excluded households. From suppliers' perspectives, the increased availability of near real-time data on consumers may enhance their ability to 'check up' on vulnerable clients and take action to help avoid disconnection, as well as to use customer data as intelligence for developing their marketing strategy. Suppliers apparent lack of interest in proactively communicating with prepay consumers about use of their IHDs for budgeting and demand reduction purposes could limit the customer benefits realised from having a smart meter installed.

8.2 The potential contribution of smart PPM for addressing fuel poverty

Consumers with conventional PPMs have been identified as disadvantaged in their ability to access cheaper tariffs. The CMA interim PPM price cap is one of the remedies intended to overcome this problem, with the expectation that the rollout of smart meter technology will overcome the price differential between prepayment and credit/direct debit tariffs in the longer term.

The quantitative modelling assumed that 20% of the population will switch to using smart PPM by the end of 2020, with a varying proportion of this group comprising households who have switched from conventional PPM to smart PPM. Assuming that tariffs for this method of payment will be reduced to align with existing direct debit tariffs, the modelling found that:

- The proportion of those shifting to conventional PPM to smart PPM and the particular tariff level of smart PPM tariff rate had a notable impact on the numbers of households in fuel poverty and the fuel poverty gap of those remaining in fuel poverty. Switching higher numbers of conventional prepay consumers to smart PPM and setting tariffs of these meters at levels comparable to direct debit rates had the largest positive impact.
- Between, 181,000 and 95,000 households who switched from conventional PPM to smart PPM were taken out of fuel poverty. The difference between these two scenarios was the smart PPM tariff, supporting the CMA interim PPM price cap. This suggests that future changes to smart PPM tariffs will be particularly influential on future levels of fuel poverty.
- The average fuel poverty gap for households who switched from conventional PPM to smart PPM but remained in fuel poverty reduced from £480 to £363.
- The average 'actual' energy bill reduction for households who switched from conventional PPM to smart PPM was approximately £100 where smart PPM tariff were reduced to similar levels as existing direct debit tariffs.

This indicates that a tariff reduction for prepay consumers, whether achieved through an imposed price cap or through the efficiencies associated with the smart meter rollout, would make a meaningful impact on rates of fuel poverty, even without any behavioural efficiency improvements.

8.3 Consumer experiences of smart PPM

The qualitative research, notably the trial with 30 households, enabled exploration of householders' experiences of smart PPM and IHDs. Overall the householders reported positive experiences in using their smart meters. Following exploration of how to use the IHD a change in householder engagement with the display for reducing energy waste and managing energy use was noted, in comparison to the control group who did not receive the advice. The analysis indicates that there remains much room for greater realisation of benefits by householders in relation to their use of their IHD. Whilst each householder had received some guidance on using the IHD, some were unaware of how to use the display to reduce energy waste in the home and manage fuel budgets. Time shortages, fuel poverty or challenging circumstances limit household's capacity to understand and so make best use from their IHDs. The findings suggest that the relative effectiveness of different engagement methods need to be explored, recognising the limited benefits being achieved from current advice provided at installation or in home visits and supply of 'leave behind' materials.

The small number of case studies also indicate that household preferences for use of an IHD or an app for smart PPM credit and energy consumption checking purposes is a closely related area worthy of further research. Reliance on a smart phone app with an online tariff would appear to potentially limit opportunities to experiment with the energy consumption of different devices, for use in making informed choices towards saving energy.

The case studies illustrate the trickiness of expecting that smart technologies will enable households to make changes to their daily or weekly routines to save money, where that change seems regressive and restrictive:

"Cause you see what you're using and you're paying for it, you know, and if we wanted to we could probably bring our bill down a bit more. But, like I said, it's pretty much, with four kids, a household of six people, unless we say, "You can have one shower a

week!" You know, back to those, kinds of times, and things. Maybe when the cooker goes, get a better cooker, and looking at the gas prices, maybe get a gas cooker." [H2]

Other recent research has sought to explore how messaging can prompt consumers to rethink their energy behaviours. An example of recent research by Vellei et al⁷¹ found that energy efficiency tips sent to smart phones based on real-time environmental data (temperature and CO₂ levels) could lower room temperatures without adversely effecting occupants' thermal comfort. This could enhance occupants' perceived control of their environment whilst reducing energy use from wasteful heating practices. Research by National Energy Action with prepay and smart prepay consumers that combined energy efficiency tips, gamification and social media has also highlighted that simple energy reduction tips delivered in a playful, community-orientated way can help fuel poor households reduce their fuel bills.⁷²

8.4 Understanding actual customer energy consumption and behaviours

The smart metering programme seeks to bring about long term energy consumption behavioural changes amongst households, both for system wide benefits of demand reduction and for direct household benefits. The experimental research undertaken illustrates potential analytic techniques for exploring actual customer data to create a segmented understanding of patterns in energy consumption and top-up. This type of analysis could be usefully used in trials of measures to promote time-of-use tariffs or behaviour change measures. In order to draw reliable conclusions from such research, data should be drawn from a sufficiently large customer sample base, cover a period of at least a year, and be supported by anonymised socio-demographics and customer account/tariff details, so that associations between patterns of behaviour and customer 'type' can be identified.

⁷¹ Vellei, M., Natarjan, S., Biri, B., Padget, J., Walker, I. (2016) The effect of real-time context-aware feedback on occupants' heating behaviour and thermal adaptation. *Energy in Buildings* Volume 123, pp 179-191

⁷² Stephenson, A., Ruse J.L., Lemon, M. (2016) Social Media and Smart Phones: A way of influencing behavioural change using feedback. *TEDDINET Energy Feedback Symposium 2016* (2016) Issue: July, pp 221-228

9 Implications for research, policy and practice

This research backs up the importance of the requirement that suppliers provide a genuine offer of an IHD with all smart meters and for any other proprietary device or app to be offered as additional, not as an alternative to the IHD.

It also provides evidence in support of the importance of the SMICoP minimum standards, particularly the sections on ‘Demonstrating the System to the Customer’ and ‘Provision of Energy Efficiency Guidance’ for prepayment consumers.

The research identifies that there remains much room for improving the effectiveness of information and advice delivered regarding the use of smart meters to realise energy efficiency benefits. This is important both to realise benefits for households, in terms of taking the stress out of household energy use and decrease self-disconnection and to facilitate informed, healthy energy choices that avoid compounding fuel poverty or increasing energy use. At a policy level, this is important to realise long term behavioural changes as outcomes of the smart meter programme, and the attributed Net Present Value of £5.73bn of benefits to consumers in the smart meter roll out, which includes £5.69bn in savings from reduced energy consumption.

The reported poor recall of advice provided at the time of installation and householders’ relatively limited use of their IHD and app for energy management purposes would suggest that supplier in-house installation procedures require more careful development and monitoring as part of their customer support. This should include tailoring such procedures for PPM consumers who are in vulnerable situations (as required by SMICoP). The research identified daily target setting, credit alert setting and use of real time energy usage data for experimentation as specific IHD functionalities that could be particularly useful for vulnerable and fuel poor prepayment consumers.

In terms of messaging, the research suggests that amongst vulnerable and low income PPM households, it may help to present IHDs as a way to avoid the harsh choices of ‘heat or eat’ and as a helpful tool for making healthy or money-wise energy choices. The findings indicate that the approach taken needs to encourage consumers to set aside common perceptions that “they’ve already done all they can”, so that they are prepared to look again at what further actions they can take to manage their energy usage.

A series of recommended actions are identified for consideration by OFGEM, BEIS, Smart Energy GB, Energy UK and energy suppliers, towards enabling vulnerable and fuel poor prepayment consumers to realize the benefits of smart PPM rollout. Further trials or other research may be required to test the effectiveness of these suggested actions. A number of these recommendations are reproduced or adapted from Simpson et al 2016. Recommendations are ordered by target audience (and, for suppliers, by installation stage).

9.1.1 OFGEM

- Request and review material evidence of compliance with SMICoP minimum standards, in particular on ‘Demonstrating the System to the Customer’ and ‘Provision of Energy Efficiency Guidance’. OFGEM should satisfy itself that for prepayment consumers, energy efficiency guidance is not being skipped over to fit in time for demonstration of the prepayment functions, particularly where installers are under pressure to achieve high target numbers of installations so that suppliers can meet the 2020 deadline.

- Request suppliers to review and report on prepayment customer feedback regarding energy efficiency advice and prepayment functions.
- Encourage supplier-led trials of 'beyond the minimum standards' energy efficiency advice to smart PPM consumers.

9.2 BEIS

- Work with OFGEM to identify where suppliers need to be pushed harder and held to account to undertake actions as part of the smart meter rollout which will contribute towards the policy target of reducing fuel poverty.

9.2.1 Smart Energy GB

- Develop campaign materials aimed at smart PPM consumers that promote awareness of the use of IHDs as helpful tools to help low income households to reduce and manage energy use as well as more convenient top up and credit-checking.

9.2.2 Energy UK

- Support and co-ordinate efforts by suppliers to fulfil SMICoP minimum standards, particularly 'Demonstrating the System to the Customer' and 'Provision of Energy Efficiency Guidance' for their prepayment consumers.
- Encourage suppliers in their development of a smart PPM 'pre-installation to post-installation' customer engagement strategy and/or of other actions to enable vulnerable and fuel poor PPM consumers to realise the benefits of smart metering.

9.2.3 Energy suppliers

- Develop a smart PPM 'pre-installation to post-installation' customer engagement strategy, which will enable them to meet and exceed the SMICoP minimum standards for 'Demonstrating the System to the Customer' and 'Provision of Energy Efficiency Guidance', recognising that many PPM consumers may be at greater risk of being in a vulnerable situation.

Pre installation

- Energy suppliers or display manufacturers produce videos/other guidance to communicate how to use their specific display to achieve a number of energy demand reduction and budgeting activities including detailed guidance on the smart meter display and its screens; establishing a baseload and how to reduce it; costing appliances and household activities like space heating; energy reducing choices e.g. use a microwave rather than hob for reheating (whilst emphasising healthy actions); checking historical usage and setting a daily target for fuel budgeting. For smart prepay additional activities should include topping up methods; manual topping up; setting a credit alert to avoid disconnection; different credit modes, and how to enter Emergency and Friendly Credit.

During installation

- Installers carry tablet-type devices for consumers to view videos or tutorials which:

- prepare consumers (including all energy users in home) for their use of different functions on the IHD;
- help consumers to think about their key home practices where energy demand could be reduced;
- encourage consumers to ask the installer questions and play with the display themselves.

Post-install

- Design and implement an annual programme of post-install energy efficiency messages delivered via the messaging function on their displays. This would be designed to encourage consumers to adopt an ongoing energy monitoring approach to promote energy management and demand reduction.
- Track householder engagement with messages, to provide evidence of energy efficiency guidance delivery and as an indicator of levels of consumer motivation;
- Adapt messaging for different customer energy usage groups and/or using different media e.g. text, email, social media, audio, to suit all communication needs (as per SMICoP requirement).
- Frame energy advice to PPM consumers as helping to encourage healthy and less wasteful energy choices, to avoid exacerbating fuel poverty and increased energy use (rebound).
- Provide energy reports to households which present the cumulative effects of their energy efficiency actions on their fuel use/bill, and also compare them to similar (ideally local) households. This draws from Burchell et al (2016)⁷³, who studied the effect of weekly email communications alongside IHD energy consumption feedback, provided within the context of a programme of community workshops and events. It incorporated web-based feedback on fuel use from energy monitors for some householders with comparisons to a project household average, and 'the best 20%'. The research found that the community context and weekly emails (which were friendly, informal, action-orientated and included a local reference) could prompt and prolong householder engagement with energy consumption monitoring and feedback.
- Offer a phone top-up registration service for consumers who want to top up by phone but don't have internet access.
- Resource and support community-based advice, such as local trained energy champions to deliver events and home visits.

⁷³ Burchell, K., Rettie, R., Roberts, T.C. (2016) Householder engagement with energy consumption feedback: The role of community action and communications. Energy Policy Volume 88, pp 178-186

Appendix 1: Experimental analysis of Smart PPM Customer Data of Households in Qualitative Quasi-Experimental Research

In the qualitative research, as reported in Section 4, half of the households (n=15) participated in an interview and an interactive advice session on use of their smart PPM during a home visit by energy advisers from CSE. They then received a follow-up call four to six weeks later. Advice sessions were led predominantly by volunteers experienced in conducting home visits, trained in energy awareness and the use of IHDs. A control group (n=15) received a stand-alone 15 minute telephone interview, during which no advice was given. All home visits and interviews were conducted in late summer/autumn 2015.

Advice provided to the households during the home visit included the use of the IHD. This focused on householder baseload (for example, encouraging people to switching off appliances not leave them on standby, and checking that everything was off before going out); costing appliances; and using the display to monitor and manage fuel bills.

Utilita provided CSE with energy consumption data for electricity and gas for 28 of the 30 households covering several months either side of the intervention, with consent from householders to analyse the data for the purposes of this project.

The core set of data contains the meter number, fuel type, meter type and half hourly intervals of energy consumption in kWh. In addition, some supplementary data, which included the date and type of the intervention was used in the analysis.

As mentioned above, all the home visits and interviews were conducted in late summer/autumn 2015 (in the months of August to October). At this time of year, most households have not yet started to use their central heating. Pre-intervention data for most cases covered the spring and summer months, although for three consumers, data was provided dating back as far as the last week of January 2015 or early February. For the majority of consumers, data starts in May, June or July. Data was provided for a period after the intervention until the end of December. The timing of the intervention and the time period for which data was provided limited our ability to draw valid conclusions on the impact of the interventions as there was insufficient data either to establish baseline levels of consumption or account for seasonal influences.

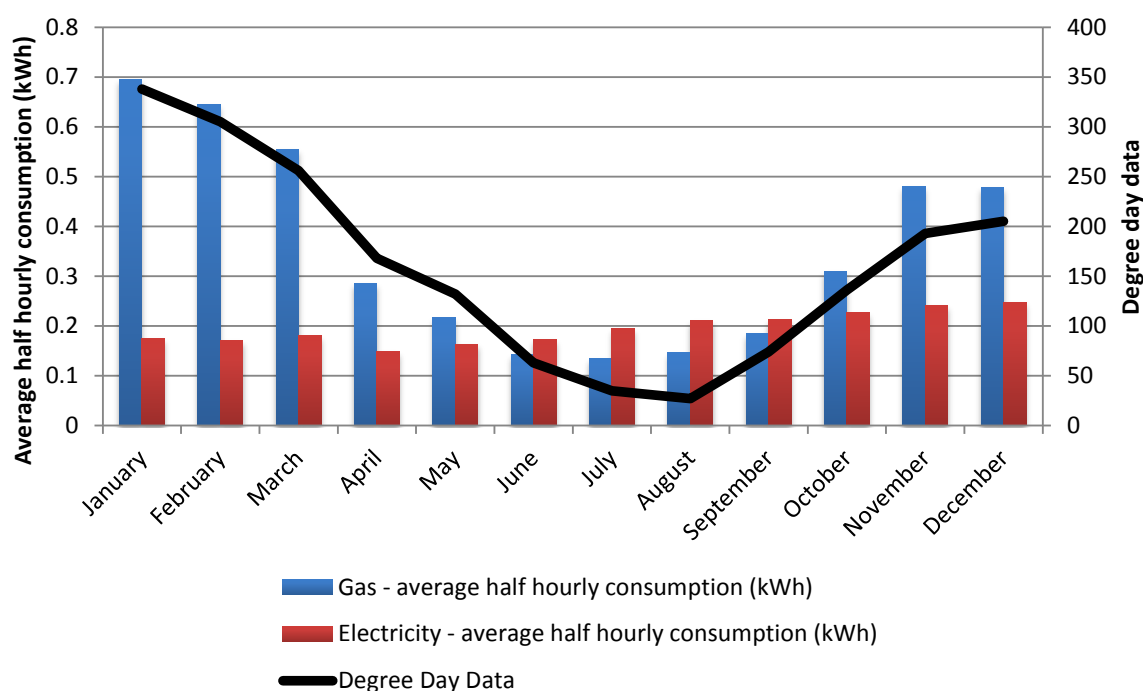
Recognising these limitations on our ability to draw valid conclusions, the data was been interrogated for a four week period around the intervention for each household, with the two weeks before and after the invention investigated. This analysis is presented below. However data for individual cases is not reported here, as to do so would give a misleading sense of validity of the findings.

Data analysis

Average energy consumption patterns

Average half hourly consumption was analysed for each month for all consumers, for both gas and electricity, as presented in Figure 7.

Figure 7: Average half hourly energy consumption each month for all consumers by gas and electricity.



Gas consumption has not been normalised for the weather. As a guide to seasonal heating requirements, degree day data⁷⁴ has been plotted on the graph. The winter of 2015/16 was unseasonably warm, as reflected in the low number of degree days and the lower average consumption in November and December 2015 when compared with that in January and February 2015. Figure 7 also illustrates the difficulty in assessing the impact of interventions delivered in the late summer/autumn period (August to the end of October), as gas consumption was significantly lower before this period than after this period.

An attempt was also made to analyse average weekly energy consumption patterns. The fact that the start date of consumption data supply is not the same for all cases makes it harder to predict half hourly average electricity consumption. Between May and July, data for a large number of cases is introduced. These cases appear to be generally higher consumption consumers than those cases for which earlier data has been supplied. This shows up as a trend of increasing average electricity consumption in the summer months amongst the consumers participating in the research. Such an increase would not normally be expected until the start of winter, when an increased use of lighting usually increases average electricity consumption. With these important reservations in mind, an analysis of the changing patterns of energy consumption is presented below.

⁷⁴ Degree day data is a reflection of how often and to what extent the external temperature drops below a nominal 'base temperature'. In the UK, a value of 15.5°C is used for the base temperature. If the average outside air temperature on a given day is below this base temperature, it is deemed that heating is required and that heating requirements that day will be in proportion to the temperature deficit in degrees. *Degree days* are a summation of the daily temperature deficits over a month, and are, by definition, proportional to cumulative heat requirements over the same period.

Figure 8: Average half hourly average energy consumption for all cases over a typical week (a week starts at 00:00 Sunday and runs until 23:59 Saturday)

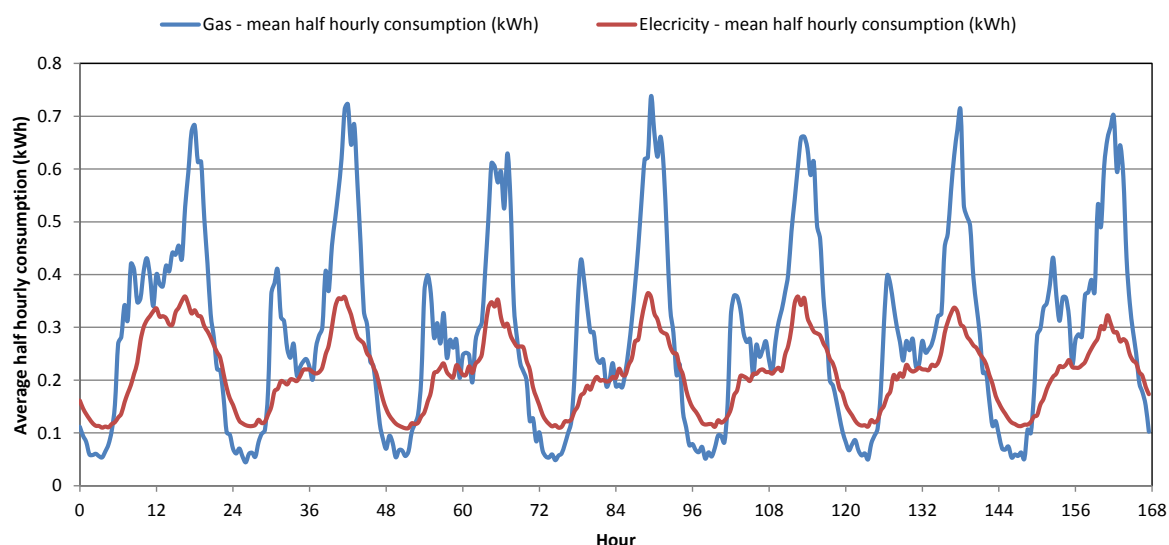


Figure 8 above shows the half hourly energy consumption over the average week for gas and electricity using all customer data collected in 2015 (the week runs from 00:00 Sunday through to 23:59 on Saturday). It can be seen that Sunday has a different distinct heating pattern from the weekdays. In particular, there is a later, higher and wider peak of electricity consumption in the morning, and Sunday does not have the early gas consumption peak seen in the week days and Saturday, reflecting a non-work day for the majority of people, and, perhaps, the fact that most people still enjoy a Sunday morning lie in. Weekday gas consumption profiles are categorised by an early morning sharp peak of consumption and less electricity consumption in the morning than at weekends. Saturday appears to be less distinct from weekdays than Sunday, but with a slightly later gas consumption peak in the morning.

Intervention analysis

The date of intervention delivery was recorded so that the electricity and gas consumption data for each customer over a two week period either side of the intervention was analysed. For control group cases, consumption data over a two week period either side of the telephone call (no advice) was also analysed. The graphs shown here summarise this analysis, with the results for electricity and gas presented separately.

There are some shortcomings with this approach, including the limited amount of data used, but the analysis is intended as a snapshot for the fortnight before and fortnight after intervention occurred to ascertain whether it is possible to determine whether any change in consumption took place. It is not possible without other external information to directly associate any change wholly with the intervention itself. However, the work here serves as a demonstration of what is possible through data analysis of smart meter data. More discussion about additional possibilities is included in Section 7.

Electricity consumption

Data was available for 28 households, fourteen from the test group, who received a home visit, and fourteen from the control group, who had received a 15 minute phone call only (no advice). Data for

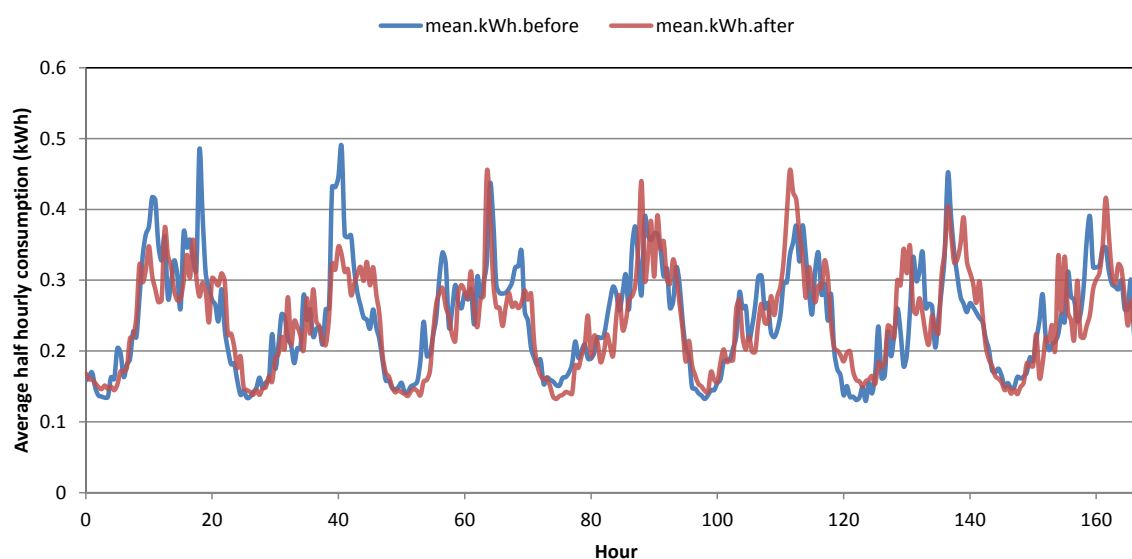
individual cases is not reported here, due to the limited validity of these results. However, as Table 6 shows, eight of the ‘test’ households and ten of the control group households used less electricity in the fortnight following the intervention (or phone call), when compared to the previous fortnight. The average energy consumption reduction amongst those from the test group whose consumption fell was 16 kWh, whereas amongst those in the control group whose consumption fell, the average reduction in consumption was 11kWh. Six households in the test group used more energy in the fortnight following the intervention whereas four households in the control used more energy in the fortnight following a phone call.

Further analysis was conducted to examine the average energy consumption profiles of households experiencing a reduction in their electricity consumption following either the intervention or the phone calls made to the control group households, for the fortnight prior to and following the intervention (see Figure 9). The only discernible difference appears to be a reduction in the morning and afternoon peaks on Sunday and Monday. The overnight baseload levels do not seem to have reduced.

Table 6: Numbers of households seeing a change in electricity consumption in the fortnight after receiving an intervention.

Intervention type	Consumption change	Average change in consumption (kWh)	Number of customers
Home-visit & phone (test)	Reduction in consumption	-16.6	8
	Increase in consumption	9.5	6
Phone (control)	Reduction in consumption	-11.5	10
	Increase in consumption	18.6	4

Figure 9: Before and after average weekly electricity consumption profile of households experiencing a reduction in their electricity consumption. This combined test cases and control cases.



Gas consumption

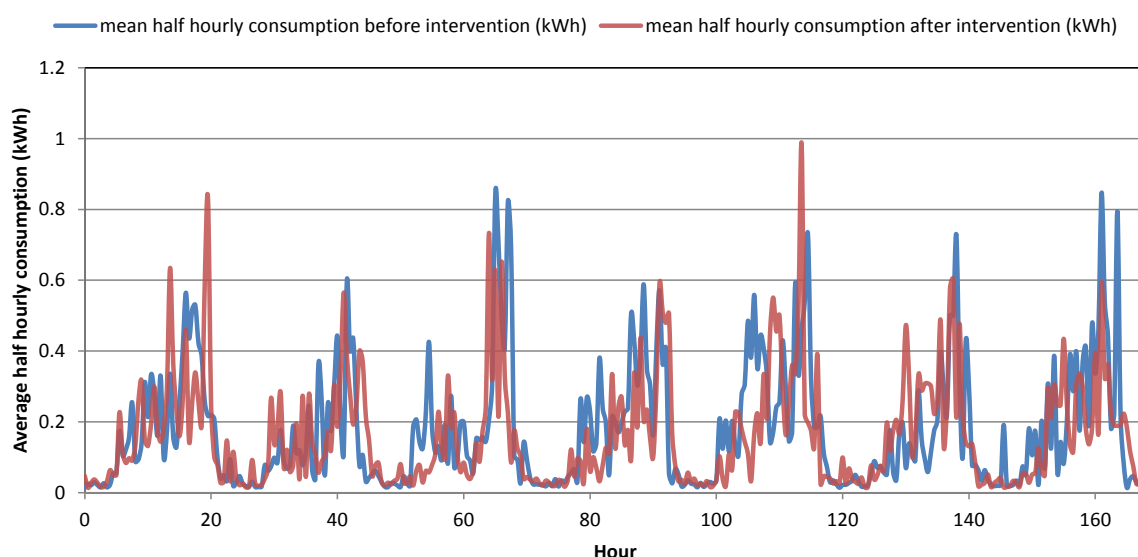
As with the electricity analysis, data on gas consumption was available for 28 consumers. As Table 7 shows, a reduction in their gas consumption in the fortnight following the intervention was recorded for just two of the test households, whereas reductions were recorded for ten of the control group households. The average increases in consumption amongst households which recorded an increase in consumption (55 kWh amongst test group households; 51 kWh amongst control group households) was greater than the reduction recorded for households whose energy consumption fell (-16kWh amongst test group households; -20 amongst control group households).

Table 7: Numbers of households seeing a change in gas consumption in the fortnight after receiving an intervention.

Intervention type	Consumption change	Average change in consumption (kWh)	Number of consumers
Home-visit	Reduction in consumption	-16	2
	Increase in consumption	55	12
Phone	Reduction in consumption	-20	10
	Increase in consumption	51	4

Figure 10 shows the average gas consumption profiles of the 12 consumers who experienced a reduction in their energy consumption. From this graph it is difficult to identify any pattern to the reduction. The general noise of the signal and variance in the peaks illustrates the difficulty in analysing gas consumption data over a short period of time. The overnight baseload levels do not appear to have reduced, nor do the on or off times of the heating scheme, which suggests that any changes are more likely to be incidental than attributable to the intervention.

Figure 10: Before and after average weekly electricity consumption profile of households experiencing a reduction in their gas consumption following a home visit of advice via the phone.



Limitations

The analysis profiled the average weekly energy consumption for electricity and gas for participating households. Limitations in the size of the data set, the duration of the data collected and the timing of the intervention make it difficult to attribute any change in overall energy consumption to the intervention. The analysis does illustrate the use of potential techniques for future analysis if a richer data set is made available, as discussed in Chapter 7 above.

Appendix 2: Home Visit Form and Follow Up Phone Call Sheet for Case Study Householders

Home Visit Form

Time and date of visit:		Advisors:	
Client name:		Main phone no:	
Email:		Alternative no:	
		Date of Birth:	
Address:			
Tenancy	Owner Private tenant Council tenant Housing Association tenant		
Who do you live with (including ages)?	Children under 16 (or 18 if in FTE) _____ People with long term illness or disability _____ People over 60 _____		
Do you receive any benefits? Which ones?			
What is your typical weekly or monthly income?			

Energy Bills

Current Spend (Gas)		Current Spend (Elec)	
Do they have high energy bills? (Factors/reasons)			
Top up method			
Any fuel debt?	Gas Electricity		
Does the client have specific energy-related questions or issues e.g. use of heating system, damp and mould?			

Energy Efficiency Details

Property type, age and wall type:
Energy efficiency measures (insulation, double glazing, draught-proofing, renewable technology):

Heating and Hot water system: Fuel type, Age, Heating controls	
Shower (if applicable): Gas or electric?	
Cooker: Gas or electric?	
Housing Condition	
Notes:	☐ Condensation issues ☐ Rising damp ☐ Presence of damp ☐ Significant draughts ☐ Presence of mould ☐ Any cold spots/cold bridging ☐ Penetrating water ☐ Really cold in winter or hot in summer
Health and Wellbeing	
Are there any significant health issues in the home including Asthma, COPD, strokes, CVS conditions, mobility restrictions, stress or depression	
Do they use any electrical medical equipment? (stairlift, oxygen machine, hoist, nebuliser, purifier)	
If yes to the above, are they on the Priority Service Register? (WPD and energy supplier) (IF NOT DO THEY WANT TO DO THIS THEMSELVES - 0845 724 0240 - OR CSE TO DO THIS FOR THEM)	

SMART PAYG METER AND SMART METER DISPLAY

Roughly how long ago did they switch to smart pre pay and have the new meter installed?

What led them to switch to smart pre pay? (debt, £, ease of top up, having SMD, other) Explore if due to debt or choice. Or if pre-installed, what was their initial response to having a smart PPM?

Were they shown how to use the smart meter display by the installer? What did (s)he show them? [If already in house, were they given any information on using the smart meter display?

How did the client use the smart meter display to begin with?

- Which screens
- Frequency of use
- Ease of use
- Did anything change (e.g. how use appliances) as a result?

Has that changed? How do they use the smart meter display now?**get them to show you on the SMD.**

Have you encountered any particular difficulties in adapting to using a smart PPM?

Have they used the SMD to do any of the following? **(some they may have mentioned already. Tick which apply)**

- | | |
|---|-----------------------------------|
| 1. Checking credit left and type of credit (e.g. if in Emergency or Friendly Credit | (Dual Fuel screen) |
| 2. Setting daily targets and credit alert | (Settings screen) |
| 3. Budgeting fuel bills | (History screen) |
| 4. Costing appliances/lighting to help reduce bills | (History/Electricity/Gas screens) |
| 5. Checking top up history | (Account info screen) |
| 6. Checking tariff details | (Tariff screen) |
| 7. Doing a manual top up | (Payment screen) |

Which of the above will be most useful to you? **(Circle the number above and cover in more depth on the SMD)**

How have they used smart PPM in managing their household finances (including debt)?
Identify base load (use Play Sheet)
Check current gas and electricity usage (History, day in £, or Electricity and Gas screens, A/C Usage now) Then ask client to go round the home and turn off as many appliances as possible. Recheck. Estimate base load for the home for a week. Electricity [Gas]
Cost energy use of appliances
Boiling the kettle (Electricity screen, A/C Usage now and £) As on Play sheet, compare cost of boiling water with normal fill of kettle and 1 mug fill of kettle. How much saving by heating just enough water for a mug of tea in 1 month?
Lights or something relevant for the household – fan, fish tank (As above)
Explain how to cost a bigger appliance e.g. washing machine on different temperature settings or washing cycles How this might be useful to reduce fuel bills?
Ongoing monitoring, daily targets, and their use for budgeting
Check historical fuel use (History, day and weeks in £). Jot down any useful information like average daily, weekly and monthly use. Check for any peaks – xbox? Explore setting daily targets based on previous usage (Settings screen) Explore how fuel use might change in winter and planning for that
Setting credit alerts
Explore setting credit alerts (Settings screen)

Anything else?
Do they expect to stay on PPM or switch to a different form of payment? Explore reasons why/why not.
Is there anything else in relation to the SMD they want to find out about?
Referrals
Please note down any referrals to CSE projects or for other assistance:
Advisor notes

Smart PPM - Home Visit follow up phone call record sheet

House:

Name:

Postcode:

Time and date of follow up call:

Intro

This is a brief follow up call after and visited you on

It should take 10-15 minutes.

We really appreciate your time and assistance with this. Are you happy to continue with the study today?

Firstly, can I just check that you're happy that we audio record the call. This is for research purposes only – it won't be shared with anyone else.

Consent

Audio recording YES NO

Do you have any questions before we get going?

Follow up questions

- Since we visited you, have there been any changes at home such as:
- The way you heat the home?
- The way you use hot water?
- The way you top up?
- Use of electrical devices (refer to pre-interview to check what they said)?
- The amount of time you spend at home (either in evenings or going on trips etc.)?
- The appliances you use at home? (e.g. heating system)
- Household activities that use energy like cooking, heating, bathing, or entertainment?
- When you've been at home? (e.g. have you been away for more than 5 days)
- Who lives with you in your home?

When we visited we took a look at the smart meter display and the information it can give you.

- Have you used the display since then?
- What have you used it for?
- Have you played around with the otherscreens since we saw you?

If needed prompt, or check at end.

Did you use the smart meter display to do any of the following?

a) Check on credit left? Yes/No

If yes roughly how often?

b) Identified the amount of gas and electricity that your home uses every day even if you were out? (e.g. for the fridge)

[NB: this can be tricky unless you go away for a day or so] Yes/No

- c) Cost a household activity or using an appliance e.g. using the washing machine, leaving the lights and TV on.

REFER TO HV FORM AND ASK SPECIFICALLY ABOUT WHAT WAS DISCUSSED IN THE VISIT

- | | |
|---|--------|
| | Yes/No |
| d) Find out how much electricity or gas you've used in the week or month? | Yes/No |
| e) Changed your personal daily target for electricity and gas use? | Yes/No |
| f) Changed your credit alert? | Yes/No |
| g) Anything else? | |

(Only mention if person is unclear - manual top up, tariffs, messages)

- If applicable: Do you use the display less, the same amount or more now?
- What (if anything) has the smart meter display been useful for?

Note anything mentioned

- Since we visited you, have you changed how you do things in your home from using the smart meter display?
- Have you talked to any family, friends or relatives about what the display shows you?
(check for 'people who live in the home' and 'friends/family/neighbours')
- Since we visited you, has anybody else in your home used the smart meter display?
- Did they do so before or is this something new?
- Since we visited, did the information we provided have any impact on energy anybody else's energy use (prompt for Qs on Xbox/children)
- Do you know roughly how much electricity you've used in last month? (£ or kWh)

(Do they know this from where to look for this on the IHD or is it a guesstimate?)

- Have you had any problems with your smart PAYG meter and the display?
e.g. any problems with a payment not going through which lead to a disconnection? Is this since we visited you?
- Have you had a disconnection of fuel supply since we visited from running out of credit? Is this different to when you had a prepayment meter? (i.e. did having Friendly Credit and the display to show credit remaining help?)
- Has anything that we haven't already mentioned changed since we visited you?

On the advice we offered

- How did you get on with the play sheet we gave you?
- What did you think of the advice we offered when we visited?
- How confident do you feel now about your ability to use the smart meter and display?
- Is there anything the advice has helped you do differently using the smart meter display (e.g. to manage your finances, to top up remotely, to reduce usage)?
- Was there anything we covered, where the advice wasn't particularly helpful?
- Do you have any suggestions for extra things we could offer advice on, in relation to smart prepayment meters?
- How would you summarise the value of having a smart prepayment meter for your household?
- How does that balance against any downsides of having a smart prepayment meter?

Finally:

- Is there any other information you'd like the display to give you that would help you manage your fuel bills?
- Is there anything else you want to mention about your display, meters or energy use or anything else?