Department of Energy & Climate Change

Study on Access to Smart Meter Benefits for Blind and Partially Sighted Consumers

Final Report

Undertaken by SQW, in partnership with i2 media research and Astutim

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The views expressed in this report are those of the authors, not necessarily those of the Department of Energy and Climate Change (nor do they reflect Government policy)

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Executive Summary

1. In June 2012 DECC commissioned SQW, in partnership with i2 media research and industry expert Rob Morland of Astutim, to undertake a study on Access to Smart Meter Benefits for Blind and Partially Sighted Consumers.

2. The overall purpose of the study was to identify and recommend feasible options for ensuring that blind and partially sighted (BPS) consumers are able to access the benefits from smart meter installation.

3. Our study adopted a mixed-method approach involving:

   - a review of existing evidence on the issues faced by blind and partially sighted people in using consumer devices
   - consultations with Ofgem, the Royal National Institute for the Blind (RNIB), Consumer Focus, the British Computer Association of the Blind and 13 industry players - including five energy suppliers and six vendors of In Home Displays (IHDs)
   - in-depth face-to-face interviews with 36 BPS consumers, of a range of ages and with varying degrees of sight loss
   - analysis of eight options for improving the accessibility of smart metering benefits, including consideration of: indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change; commercial model(s); incremental technical complexity and timescales; incremental operational implications; *indicative* incremental costs; and risks and opportunities.

Conclusions

4. Our overall conclusions are summarised below.

Smart metering will offer various benefits to BPS consumers

5. It was noted by some of our stakeholder consultees that blind and partially sighted people tended to be amongst the less well-off groups in society, and therefore particularly vulnerable to fuel poverty. Moreover, as we found in our interviews with BPS consumers, some are relatively high users of household energy (for example, as a result of staying at home for much of the day, through difficulty in accessing heating controls, or through the need for more lighting than would be used in a sighted household). As outlined in the Smart

Metering Impact Assessment[1], smart metering is expected to help consumers understand and reduce their energy consumption and costs, and this benefit will be welcomed by many households with BPS people.

6. Furthermore, our interviews with BPS consumers highlighted that the *current* situation with 'dumb meters' was far from accessible in many cases. Such meters are frequently in awkward positions in or outside the home, and have relatively small dials/numbers, which can make it particularly difficult for BPS consumers to take their own meter readings, or check those provided by energy suppliers. A small IHD device that can sit somewhere convenient in the house (e.g. in the kitchen or sitting room), and with relatively large numbers on the display, would represent a step forward for many in making their energy consumption information more accessible.

7. There was a fair degree of scepticism amongst our BPS interviewees over the relevance of some of the expected benefits of smart metering to them (for example, switching energy suppliers was seen by many as being more hassle than it is worth, and facilitating the installation of micro-generation was seen as being irrelevant to most – especially those living in flats). However, other benefits were more readily accepted and welcomed: peace of mind in knowing that you are only being billed for what you use, the ability to know how much energy you're using, the potential for time-of-use tariffs to reduce costs, and easier top-up methods for pre-payment meters. An alert to warn of appliances (such as ovens or hobs) being left on for an unusually long time would also be welcomed.

Many BPS consumers will be able to access smart metering information through standard IHDs, and/or through energy suppliers' websites, and/or through smartphone apps

8. Most BPS people are partially sighted[2], and these interviewees were generally keen to make as much use as possible of their remaining sight (holding a display up close, and/or using a magnifier), before resorting to other methods of accessing information such as speech output.

9. Amongst the current models of IHDs, some are relatively accessible to partially sighted people – though this also varies *within* displays (with some text being relatively large, but some text quite small and difficult to read).

10. Furthermore, several of our interviewees were proficient users of computers and the internet, and saw this as a good way of accessing smart metering information, provided that the online service was designed to be accessible (indeed eBilling was seen as a preferred method of receiving bills by many in this group, in preference to large print paper bills for example, as it provided

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48803/4906-smart-meter-rollout-domestic-ia-response.pdf

[2] Access Economics estimated that 88% of BPS people in the UK have mild or moderate sight loss, and 12% severe sight loss (http://www.rnib.org.uk/aboutus/Research/reports/2009andearlier/FSUK_Report.pdf)

instant access to assistive technologies available on the computer, such as zooming and screen readers). Smartphone users were typically enthusiastic about the built-in accessibility features of these devices, and saw smartphone apps as an obvious 'way to go' for accessing smart metering information.

11. Our interviews with energy suppliers and IHD vendors suggested that it is highly likely that energy suppliers will be providing their customers with access to their smart metering information through online web portals and through smartphone apps, as part of their core service offering.

However, for others (especially older people with severe sight loss), existing developments are not sufficient to ensure accessibility

12. With about 78% of BPS adults in Great Britain being 65 or older, most BPS people do not use the web, and only a small minority have smartphones (and we anticipate that this will continue to be the case by our reference year of 2017)[3]. These channels cannot therefore be regarded as a sufficient solution for BPS people.

13. None of the IHD vendors we spoke to for this research had firm plans, at the time of the interviews, to integrate text-to-speech functionality into their IHDs. This poses a particular problem for older people with severe sight loss – unlikely to be users of the web or smartphone apps, and unable to read a standard IHD display.

Some form of text-to-speech output from IHDs would address those at highest risk of exclusion, but would also benefit many other BPS consumers

14. There was a clear and consistent message from our interviews with BPS consumers (as well as from our discussions with consumer representative groups), that text-to-speech functionality would be particularly helpful in IHDs.

15. This was especially the case for those with severe sight loss, for whom text-to-speech would be essential in order to access the information on a display at all.

16. However, it was also relevant for a wider group – assisting those with moderate sight loss to interact with the IHD more easily, by complementing and confirming the information obtained by these people using their remaining sight.

[3] Source: SQW analysis, using data from Access Economics research for RNIB, 2009 (http://www.rnib.org.uk/aboutus/Research/reports/2009andearlier/FSUK_Report.pdf) and Ofcom's Communications Market Report 2012 (http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr12/CMR_UK_2012.pdf)

Our options analysis indicates that an approach addressing multiple information channels would be appropriate

17. On balance, we consider that the most appropriate approach would be a combination of a niche IHD targeted at BPS people with actions to ensure that applications developed through normal market forces for the web and smartphones are designed to be accessible to BPS consumers.

18. We suggest that the integration of Text to Speech – TTS - functionality in mainstream IHDs would be an unnecessarily costly solution – adding a feature into the basic device which in practice would only be used by a minority of consumers. Moreover, a targeted approach would allow much greater opportunity to ensure that other important IHD features (the display, buttons and menus) are designed with BPS consumers more specifically in mind. Neither the option of integrating TTS functionality into mainstream IHDs nor an accessory TTS device to interface with standard IHDs would do anything to improve the visual accessibility of IHD displays – which is a particularly important consideration for those with partial sight.

19. Solutions providing information through SMS messages to mobile phones, a telephone helpline and face-to-face support may develop to an extent through 'business as usual' – for example: energy usage SMS alerts may be introduced as an additional service for energy consumers; energy efficiency helplines may be enhanced by advisors pulling up the caller's recent energy consumption information, with permission; and organisations already supporting BPS people may develop their services to take account of the introduction of smart metering. We envisage that such developments would be welcome, as they would provide additional means for BPS people (and others) to understand their energy consumption better. However, we would not see any of these three measures as providing, on its own, sufficiently equivalent access to smart metering information for BPS consumers.

Recommendations

20. Given the findings from our research, we offer the following recommendations for consideration by DECC, energy suppliers, IHD vendors, and other stakeholders:

- **Recommendation 1. Increase industry awareness of good practice in making products and services usable by BPS consumers.**

- **Recommendation 2. Energy suppliers should offer IHDs tailored specifically for BPS consumers.**

- **Recommendation 3. Regular published accessibility audits should be established of major energy suppliers' online and smartphone apps for smart metering.**

- **Recommendation 4. Organisations supporting BPS people should prepare to adapt existing support services, with appropriate**

support from energy suppliers, to take account of the introduction of smart metering.

- **Recommendation 5. Options should be considered for energy suppliers to develop more comprehensive knowledge of which of their customers are blind or partially sighted.**

1. Introduction

Study context

1.1 The UK Government's vision is for smart energy meters to be rolled out throughout Great Britain by 2019. This will play a key role in enabling the transition to a low carbon economy through reducing energy demand, enabling time-shifts in demand to reduce peak load generation, improving the quality and efficiency of energy distribution networks, facilitating increased take-up of lower carbon transport (e.g. electric vehicles) and heating (e.g. electric heat pumps), and enabling increased take-up of zero-carbon local micro-generation of energy.

1.2 The scale of this task is enormous and complex: the Smart Metering Implementation Programme aims to roll out about 53 million smart electricity and gas meters to about 30 million premises (28 million homes and 2 million small businesses) by the end of 2019. This involves coordinating a wide variety of stakeholders in substantive operational, commercial, and regulatory developments, together with a major marketing challenge in engaging consumers and ensuring that the smart metering implementation does indeed change energy consumption patterns.

1.3 There are expected to be substantial *consumer benefits* associated with smart metering. The programme's latest Impact Assessment (April 2012) values these at £4.4 billion, discounted over a 19 year period.

1.4 First and foremost, the provision of real-time feedback on energy consumption has been demonstrated to lead to a reduction in energy demand, through highlighting the costs of energy, relative energy usage and energy-intensive appliances, and thereby modifying consumer behaviours. This in turn leads to lower energy bills for consumers. The programme's IA assumes that smart metering will lead to an average 2.8% reduction in annual electricity consumption (for both credit and pre-paid meters), a 2% reduction in gas consumption for credit gas meters and 0.5% reduction in gas consumption for pre-paid gas meters.

1.5 Other direct benefits for consumers include:

- being charged accurately for their energy usage, rather relying on energy companies' estimates (which can lead to under-payment or over-payment issues, and put a strain on household finances, if inaccurate)

- not having to let meter readers into the house, which can be a concern particularly for older people and some vulnerable groups

- easier switching of suppliers, to take advantage of more attractive services and prices, as accurate and reliable data flows will facilitate the switch

- ability to use time-of-use pricing, thereby further reducing the household's energy bills by shifting some consumption to low-cost times of the day

- easier top-up methods for pre-payment meters (e.g. over the phone or the internet), and easier switching between credit and pre-payment meters (which would traditionally require the installation of a different meter)

- supporting the installation of micro-generation, such as solar panels and micro wind turbines, by avoiding the need for an extra meter to measure the export of electricity from the home.

1.6 Furthermore, consumers can expect to benefit indirectly from suppliers incurring reduced operational costs, which – in a competitive market – should result in lower bills over time than would otherwise be the case. These operational savings will include those from: avoided site visits (e.g. of meter readers), reduced costs of handling inbound calls, reduced costs of installing and maintaining pre-paid meters, reduced bad debt, reduced theft, and reduced switching costs.

1.7 More widely, by enabling a shift to a smarter grid, smart meters should mean that consumers will benefit from improved quality and reduced costs from the 'network benefits', including enabling suppliers to reduce losses in their distribution networks, faster fault repair (e.g. through automated outage notifications), load shifting and system optimisation.

1.8 In terms of the direct consumer benefits, though, the key point is that smart metering provides consumers with *information* which helps them to reduce their energy consumption – thereby helping to reduce households' energy bills (versus what they would otherwise pay).

1.9 This can raise issues for Blind and Partially Sighted (BPS) consumers, who face particular challenges in accessing information in visual formats. However, energy suppliers have a duty under the Equality Act 2010 to ensure that BPS consumers can access the functionality of smart meters and that measures are taken to remove any barriers to this access. Specifically, the Act, which applies to all service providers and those providing goods and facilities in Great Britain, states that: "*where a provision, criterion, practice [or physical feature] (from 'A') puts a disabled person at a substantial disadvantage in relation to a relevant matter in comparison with persons who are not disabled, 'A' has a duty to take such steps as it is reasonable to have to take to avoid the disadvantage. […] Where the requirement relates to the provision of information, the steps which it is reasonable to take include steps for ensuring that in the circumstances concerned, the information is provided in an accessible format. […] 'A's' duty to make reasonable adjustments is not*

(subject to express provision to the contrary) entitled to require a disabled person, in relation to whom 'A' is required to comply with the duty, to pay to any extent the costs of complying with the duty.[4]*"*

1.10 The needs of many consumers with impairments will be met through the Smart Metering Equipment Technical Specifications (SMETS) requiring "inclusively designed" standard in-home displays. More specifically, the SMETS document notes that[5]: "*an IHD shall be designed to enable the information displayed on it to be easily accessed and presented in a form that is clear and easy to understand including by Consumers with impaired:*

- *sight*
- *memory and learning ability*
- *perception and attention*
- *dexterity."*

Purpose of this study

1.11 The Government recognises that the current minimum specifications for IHDs do not provide accessibility for consumers who are blind or who have severe sight impairments. It identified a need to understand the options for ensuring that this group of consumers are able to access the benefits from smart meter roll-out. DECC therefore commissioned SQW, in partnership with i2 media research and industry expert Rob Morland of Astutim, to undertake a study on *Access to Smart Meter Benefits for Blind and Partially Sighted Consumers.* The findings will inform any future regulatory decisions, and will provide evidence to assist suppliers in meeting the Equality Act requirements.

1.12 The overall purpose of the study was to identify and recommend **feasible options for ensuring that blind and partially sighted consumers are able to access the benefits from smart meter installation.** Within this, the more detailed aims of the study were to:

- discern how different segments of the blind/partially sighted population currently view energy use, and what are their priorities for understanding and managing it

[4] Adapted from: Equality Act 2012. Part 2 Equality: Key concepts, Chapter 1, Protected characteristics http://www.legislation.gov.uk/ukpga/2010/15/part/2

[5] Smart Metering Implementation Programme, Smart Metering Equipment Technical Specifications, Draft provided to Parliament's libraries September 2012, DECC: http://www.decc.gov.uk/assets/decc/11/consultation/smart-metering-imp-prog/6425-smart-metering-equipment-technical-specifications-.pdf

- understand how blind/partially sighted people currently access information about a) energy use and b) electronic information more widely e.g. Internet banking

- articulate the views of different segments of the blind/partially sighted populations on the benefits of smart meters and their preferences for receiving information about smart meters and accessing the data from them

- understand the benefits of smart metering which blind consumers would face the greatest disadvantage in accessing and therefore be less likely to benefit from

- set out the likely technical and other options for removing barriers to accessing the benefits

- recommend the optional set of actions that could be undertaken by Government, suppliers and others to remove/reduce barriers that blind and partially sighted consumers would face in accessing the benefits from smart meters.

Structure of the report

1.13 This document presents the findings from our study. It is structured as follows:

- section 2 summarises our methodology

- section 3 presents findings on the current experience of BPS consumers in managing energy use

- section 4 presents findings on the potential benefits of smart metering for BPS consumers

- section 5 presents findings on the difficulties for BPS consumers in accessing smart metering benefits

- section 6 summarises our options assessment

- section 7 presents our overall conclusions and recommendations.

1.14 There are four annexes:

- Annex A lists the organisations consulted in the course of the study

- Annex B summarises the key relevant messages from the previous literature reviewed

- Annex C contains the more detailed assessments of each of the eight options considered

- Annex D provides the discussion guide used with BPS consumers and the aides-memoire used to undertake the stakeholder consultations.

2. Methodology

2.1 In order to answer the research questions set out in Section 1, we adopted a mixed-method approach involving:

- a review of existing evidence
- stakeholder consultations
- in-depth interviews with BPS consumers
- options analysis.

Review of existing evidence

2.2 Conscious that research already exists regarding BPS consumer issues associated with smart metering and more widely in terms of BPS consumers' experience of other devices and services, we sought to incorporate, and build upon, this evidence as part of the study. The sources reviewed are set out in Table 2-1 below.

2.3 The evidence from these sources was used to shape the research tools used for the research with stakeholders and the BPS consumer interviews. It has also been used to augment our primary research findings and is referred to throughout the report. A summary of our document review can be found in Annex B.

Table 2-1: Papers considered as part of the study

Reference	Evidence base
RNIB, Are You Really Listening? 2008	Survey with 325 DAB radio users, of which 100 were BPS, and interviews with 38 DAB radio users, of which 28 were BPS
Ofcom, People with Visual Impairments and Communication Services, 2008	In-depth interviews with 40 BPS people
RNIB, The Needs of Blind and Partially Sighted People from ebooks, 2010	Semi-structured interviews with 12 BPS consumers
RNIB, Tackling Digital Exclusion, 2012	Survey of BPS consumers, n=150 blind plus 150 partially sighted, sample all aged 65+ non-users of the internet

Reference	Evidence base
RNIB, The Banking Experience, Internet Banking 2012	Based upon consultation with industry experts and third sector stakeholders
Ofgem & FDS, Consumers' Views of Smart Metering, 2010	Ofcom, Consumers' Views of Smart Metering, 2010 (based upon 12 focus groups and 10 smaller 'household' groups)
DECC & Ofgem, Consumer Protection: Supporting documentation, Smart Metering Implementation Programme Prospectus, 2010	The issues identified from responses received by DECC/Ofgem in response to consultation Question 4: Do you think that there is a case for a supply licence obligation around the need for appropriately designed IHDs to be provided to customers with special requirements, and/or for best practice to be identified and shared once suppliers start to roll out IHDs?
Ofgem, Information Request on Inclusivity by Design, 2010	The issues identified from responses received by Ofgem in response to their request for information. Interested parties were asked to identify the features which would assist different groups in accessing smart metering technology.
Consumer Focus, Getting to Grips with Smart Displays, 2011	Usability experts commissioned to analyse the performance of eight IHDs
Ofgem, Smart Consumer Protections Package, 2011	A summary of consultation responses
DECC, Equality Assessment, Smart Metering Impact Assessment, 2012	Document sets out to identify the issues regarding the Equality Act 2010 and smart meters and how they can be addressed

Source: SQW

Stakeholder consultations

2.4 There are a number of public and private sector stakeholders involved in the design and roll-out of smart meters. There are also a number of stakeholders specifically concerned with ensuring that those with impairments, including BPS people, are able to access the benefits of smart metering. With this in mind, over the summer and early Autumn of 2012 we conducted a mix of face to face and telephone consultations with these stakeholders in order to understand:

- their involvement to date in helping to make smart metering benefits accessible to BPS consumers

- the extent to which the various expected consumer benefits of smart metering will be accessible (or inaccessible) to different segments of BPS consumers

- any known forthcoming technology/service developments which will improve the accessibility of smart metering services for BPS consumers

- their views on the feasibility and approximate incremental costs of various options for improving the access to smart meter benefits for BPS consumers.

2.5 Through our initial review of the existing evidence and discussion with DECC, we identified a number of relevant expert stakeholders. Consultees were as follows (see list in Annex A):

- four "strategic stakeholders": Ofgem, the Royal National Institute for the Blind (RNIB), Consumer Focus, and the British Computer Association of the Blind (BCAB)

- five energy suppliers

- eight "vendors", of IHDs and related technologies.

Discussions with BPS consumers

2.6 Building upon the research covered in Table 2-1, i2 media research conducted in-depth face-to-face interviews with 36 BPS individuals to understand:

- BPS consumer views on energy use, and priorities for understanding and managing it

- views (by BPS segments) on the relative appeal of different expected smart meter benefits, preferences for receiving information about smart meters, and preferences for accessing smart meter data

- where BPS people might be most disadvantaged in relation to smart meter benefits

- the most likely options for removing barriers to accessing benefits, considering:

  - usability

  - potential to offer additional benefits

- efficacy (partial versus equivalent access).

2.7 Following best practice in previous qualitative research studies involving BPS people, the study adopted a matrix which was intentionally skewed towards older people (i.e. so as to be broadly representative of the blind and partially sighted population, consistent with the age profile reported in Network 1000[6]). The breakdown of our sample, by age and by extent of sight loss, is provided below in Table 2-2.

Table 2-2: Numbers of in-depth interviews, by age group and extent of sight loss

Age group	Mild	Moderate	Severe	Total
18 – 30	4	3	2	**9**
31 – 60	3	2	4	**9**
61 - 74	2	2	4	**8**
75+	3	3	4	**10**
Total	**12**	**10**	**14**	**36**

Source: i2 media research

2.8 Across our sample, 56% (20) lived outside London, 33% (12) were computer users, 50% (18) lived alone, and 8% (3) used pre-payment meters (and a further 14% (5) had had previous experience of using pre-payment meters).

2.9 Interviewees were recruited through community groups and associations known to i2 media research across the UK. The interviews, which were conducted by i2 media research between September and early October 2012, were undertaken face to face in various community settings in Cardiff, Cumbria, Kent, Essex and a number of locations across London. In order to assist the interview process, i2 researchers brought along a range of IHDs for participants to try out.

Options analysis

2.10 By synthesising the evidence from the literature review, stakeholder consultations and BPS interviews, we arrived at a shortlist of eight options for making the benefits of smart metering accessible to BPS consumers. These options were discussed and agreed with the study steering group.

2.11 Given the scope of this study, and the resources available for it, we did not attempt to conduct a full feasibility assessment on each option identified. Rather, we relied on the findings from our discussions with vendors and

[6] Douglas, G., Corcoran, C., Pavey, S., 2006, Network 1000 Opinions and circumstances of visually impaired people in Great Britain: report based on over 1,000 interviews. University of Birmingham, Visual Impairment Centre for Teaching and Research, School of Education.

consumers, combined with our own analysis and the technical expertise of Rob Morland of Astutim, to provide a view on the benefits and *indicative* costs of the options.

2.12 Our options analysis considered each of the options in its own right, including consideration of: indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change; commercial model(s); incremental technical complexity and timescales; incremental operational implications; indicative incremental costs; and risks and opportunities.

2.13 In order to inform our assessment, we developed a simple model of the *approximate* number of Great Britain households including BPS adults, broken down by various segments, including extent of sight loss, whether the BPS adult is living with a sighted adult, and whether they have access to various technologies.

2.14 The assessment of indicative costs drew on very approximate indications of unit cost from some of the vendors we consulted, combined with our own professional judgement, bearing in mind the uncertainties involved. The unit costs suggested by vendors were informed by the consultees' industry experience, but not based on any detailed costing work. The costings in this report should therefore be regarded as 'indicative' rather than 'robust at this stage.

3. Current experience of BPS consumers in managing energy usage

Some BPS people are relatively intensive users of energy, as a result of their impairment

3.1 In our interviews with BPS consumers, it became apparent that a number of participants were relatively intensive users of energy at home. There were a number of factors that influenced this usage:

- being home for much of the day, since many BPS people are retired
- difficulties in managing energy usage

  "[Interviewer: How much do you think about the energy you use?] Not so much in summer but in winter I do, obviously, because I'm most affected because I need the heat. The flat always gets cold and I'm heating all day, I can't turn it off-on-off-on because I can't see the controls, so I leave it on. I don't have an alternative. I cannot turn it off and on, well I can but I can't see what I'm doing."

  (male, 65-74, mild sight loss, no PC, lives alone, no pre-pay)
- additional lighting needs

  "Because of my eyesight I like static light so the curtains are closed, the blinds are down and I use the household lights because with the sun moving through the sky and [...] if the light changes too much my eyes go blurry and it takes a little while to refocus so with using internal lighting, it's always a static constant light across the property – all the bulbs are the same wattage; all the lightshades are similar so they disperse the same amount of light around the room, so I don't have to worry about brightness variations. So […]we probably use a lot more energy than other people do because of that, because in the height of summer, we've still got the lights on indoors, so that drains a bit of electric."

  (male, 18-30, moderate sight loss, PC, lives with partner, no pre-pay)
- the need for information and company

"I try to be careful but when I get up I switch the TV on […] it's on the whole day and [...] it's a source of information and company."

(female, 75+, severe sight loss, no PC, lives as family with daughter, no pre-pay)

Energy costs are an important consideration for many – especially older households…

3.2 Through the interviews with BPS consumers, participants were asked the extent to which cost and the environment acted as the motivation for managing their energy usage levels more efficiently. Overall, cost was clearly the more important of the two motivating factors.

3.3 Older participants tended to lean towards savings in cost as a motivation for reducing energy consumption, with younger participants (who, as explained in Section 2, made up a smaller proportion of the sample) tending to cite environmental reasons.

"Some people can't afford to think of the environment. Unfortunately environmental things usually cost a bit more, at least initially. [...] it's often not a choice, they're forced into it"

(male, 45-54 years, mild sight loss, PC, lives alone, no pre-pay)

"I would say, both cost and environment because I like to think that I do my bit and if I'm doing my bit, then I feel like it's helping on a big scale"

(male, 18-30, severe, PC user, shared household, previously pre-pay)

3.4 Cost reasons were perceived as being less relevant where the consumer was renting premises with utility costs bundled into the rent/service charge, and this tended to result in lower concern about 'energy management'. This was more prevalent amongst younger participants.

3.5 In shared households, energy management can be complicated by different people having different levels of concern over cost and the environment.

"[re other people in house] I don't think they care about the cost because they rarely pay. I know one of them is a green activist and probably thinks I'm bad. They tend to switch the lights off and things, same as I do, they don't leave the TV on. But it's not something I've really spoken to them about."

(male, 18-30, mild sight loss, PC, lives in shared household, no pre-pay)

3.6 More generally, energy saving was perceived as more relevant to larger households, with the prevalent view of older participants being that they already only use the energy they need, with little room for further reductions.

3.7 Examples given of how BPS consumers currently seek to manage their energy consumption and costs included (in roughly descending order of prevalence):

- switching the TV off rather than using 'standby'
- using energy saving light bulbs
- putting on extra clothing to keep warm
- switching off lights and mobile phone chargers when not in use
- home insulation
- renewing gas boilers
- using appliances at a lower tariff time of day/week (Economy 7)
- putting a lid on cooking pots
- switching supplier
- using pre-pay to control use
- using dishwashers and washing machines when full
- keeping fridge doors/windows shut

> *"We all turn the appliances off when we're not using them, we turn off the plugs when they're not in use, we turn off the oven, washing machine, dryer... we don't have a plug to turn off the hot water but if we did, we would as well."*
>
> *(male, 18-30, mild, PC user, shared household, not pre-pay)*

…but many currently struggle with accessing energy-related information

3.8 A number of participants reported that they currently struggle with accessing energy related information to better manage their use. These participants reported poor current accessibility of bills and devices to manage energy. For instance, some with limited or no sight would prefer eBilling in order to use the built-in accessibility features on their computers, but reported that this was not offered by their energy suppliers. Large print was not always large enough to be helpful, and under a magnifier, can be difficult to access. Other

participants, particularly older people with moderate or severe sight loss, reported receiving their bill in formats such as audio CD, and - to a lesser extent - Braille.

3.9 However, regardless of being able to access bill information, almost all participants struggled to *understand* the energy related information provided to them (an issue not restricted to BPS consumers).

> *"I try to understand them [energy bills] but to be honest with you I find they make them very complicated, very difficult to read. I think they could simplify them but that's one of those problems. The way they work it out could be simpler so it's easier to work out what you're paying and when, and it would be interesting to have some kind of knowing how much it's costing to use specific items."*
>
> *(male, 31-60, mild sight loss, PC, lives alone, no pre-pay)*
>
> *"[Would you like to be able to access more information about your energy usage?] Yeah I mean I used to sort of, I think this is partly why I lost interest because I used to sort of try to make sure I was using sort of a sensible amount of energy but it's not really obvious when you look at the documents whether what you're using is reasonable or not. And going to look for the information is a lot more difficult than you'd expect."*
>
> *(male, 18-30, mild sight loss, PC, lives in share household, no pre-pay)*
>
> *"I don't understand this, gas and electric, it's very confusing. They say that themselves and they won't do anything about it. I think they just confuse people if you ask me. My son can understand it."*
>
> *(female, 31-64, mild, PC, lives with son, no pre-pay)*

3.10 Views were split between those who were motivated to access and engage with energy related information and those who were less interested in being able to do this. Those who were interested in accessing information about their energy use did not expect it to be a 'full time job'.

> *"...[energy use is] not a particular topic of conversation. I don't usually take my energy bill out with me to show off or compare!"*
>
> *(male, 18-30, mild sight loss, PC, lives in shared household, no pre-pay)*

3.11 Participants who were less motivated to access and engage with energy related information generally showed a degree of apathy towards understanding bills and switching supplier, due to the poor transparency of information, as well a desire to avoid the hassle of switching supplier.

3.12 More broadly, a number of participants also pointed out just how difficult it can be to access information from their current meter. Issues cited related to the impractical location of current meters and difficulties associated with their display, as well as a perceived lack of appreciation from customer service staff of the issues facing BPS consumers.

> *"Often I move into a place, and I can't find the meter, I can't see it, and then I tell the person on the phone,' I'm registered blind I don't know where the meter is, give me some pointers' – 'Go look there', I look there – but then again you've got the same problem where when I do eventually find it I can't see the display. I can take my magnifying glass but it might be in a corner so I'm not getting my magnifying glass nicely there. It might be at the bottom and you can't get down there [...] I have to go back to the phone and say 'look I've tried, I've found it, can't see it, you'll have to send someone round' and then it could also be inconvenient because you need to […] go to work ..."*
>
> *(male, 18-30, severe sight loss, PC, lives in shared household, no pre-pay)*
>
> *"…[re energy management] the only thing I can't do is read the meter – every now and then the meter reader comes out and does it, but I have no way of verifying if the account is accurate but it's one of those. I don't really mind that to be fair – if I could read it, fantastic - happy days, then I might pay a bit more attention to it, but I can't"*
>
> *(male, 18-30, severe sight loss, PC, lives with partner, no pre-pay)*

Pre-payment meters are used by some, and can pose particular issues

3.13 The BPS interviews included three participants with pre-pay meters, and an additional five with previous experience of pre-payment meters. With respect to these consumers' experiences of pre-payment meters, it was reported that:

- they can have difficulty locating the meter and the slot for inserting the pre-pay card to top up the meter

> *"[Are there some things with regard to managing your household's energy use that you'd like to do but don't think you can on your own?] If I was on my own, it [the pre-payment meter] wouldn't be accessible. If there was a way that was gonna make me more independent so I don't have to rely on my dad. For example, my dad is on holiday this week so obviously I have enough electric and gas for the week so I don't have to put any on [as his dad tops up the meter], because I don't know how to do it"*

(male, 18-30, moderate sight loss, PC, lives alone, pre-pay)

- it can be inconvenient and uncomfortable to go out (especially late at night) to top up the meter if the credit runs out.

  "...[pre-pay meter customers] have to leave the 'safety environment' of their home to get to a shop to top it up and then only to come back home to top it up and hope. There's no, 'yes confirmation £10 received you have now £11.53 of electricity'. You stick it in the machine and you hope for the best."

  (male, 18-30, severe, PC user, shared household, previously pre-pay)

3.14 However, on a more positive note, these participants also reported:

- liking the increased confidence that there isn't a spiralling bill in the system (i.e. the consumer knows where they are with their account with pre-pay)

- liking that they are charged for what they use, with no need for estimated bills.

Energy suppliers currently have incomplete information on which of their customers are visually impaired

3.15 Through the consultations undertaken with strategic consultees two particular areas of concern were raised regarding the energy suppliers' services for their BPS customers.

3.16 Firstly, concern was expressed that the Priority Services Registers (PSR) used by energy suppliers - and the requirements that surround the PSR - are inadequate as a tool for identifying and supporting BPS consumers. It was explained that whilst energy suppliers have an obligation to communicate the existence of the PSR once a year to their consumers, and provide tailored services to those that are on the register, the only way that someone can get onto the PSR is by them proactively contacting the supplier. As a result, it was estimated by some stakeholders that energy suppliers' PSRs are likely to hold the details of only 30% to 50% of all BPS consumers. It was also reported that a number of BPS consumers, particularly older people with gradually deteriorating sight, do not necessarily consider themselves to be visually impaired, and would therefore not get themselves registered on the PSR.

3.17 Secondly, strategic stakeholders raised the point that energy suppliers need to invest in training customer service staff, so that they can identify and effectively deal with BPS consumers. The need for appropriate training was also recognised by a number of the energy supplier consultees. Looking forward to the roll-out of smart meters, one supplier confirmed that they would be training the staff that will call consumers to arrange for smart meter

installation, so that they can effectively identify and provide appropriate support for BPS consumers at the start of the smart meter installation process.

3.18 BPS interviewees also believed that many partially sighted consumers are not registered as being visually impaired (and may well also not be on the PSR, and not provided with a password system for meter reader visits[7]).

> *" …a lot of people are not registered as visually impaired. Just because you're getting older your eyes are getting worse so many people would never think they were visually impaired but they're screwing up their eyes and getting very near."*
>
> *(female, 61-74, moderate sight loss, PC, lives with partner, no pre-pay)*
>
> *"[re meter readers] Anyone can flash a card, and we can't see what's on it"*
>
> *(female, 75+, moderate sight loss, no PC, lives alone, no pre-pay)*

[7] Blind and partially sighted consumers can arrange for energy suppliers' meter readers to use an agreed password to prove their identity.

4. Potential benefits of smart metering for BPS consumers

Awareness and understanding of smart meters amongst BPS consumers is variable

4.1 Levels of awareness of smart meters varied amongst BPS interview participants. Some had never heard of smart meters whereas others had a basic understanding that they would allow the householder to receive information regarding their energy use. One participant reported having had a smart meter installed for an energy supplier trial and some reported knowing others who purportedly had them installed (although this was not verifiable). Participants who responded positively to the idea of smart meters (after being informed by researchers of the range of potential benefits that smart meters could bring about), cited the potential to increase their independence and choice through having access to energy usage information themselves, rather than having to rely on others.

> *"Yes, I can't wait! It will give me back my independency again. And interest. In other words, yes, I'm keen about energy and stuff, but if I don't know what's going on I'm not concerned. But if I knew what was going on, I'd be far more interested…It would give me control of making it a choice which at the moment I don't have, or I'm too scared to make a choice 'cause I don't know enough about, I can't see the outcomes of my change."*
>
> *(male, 31-60, severe sight loss, PC, lives with partner, no pre-pay)*
>
> *"I think there is a great benefit in knowing [a smart meter] is being trialled and tested as it also gives independence to blind and partially sighted people – you're not having to run to the neighbour and ask questions, or ask a friend or family member to read you things, it's about you being able to do it yourself – more control in your life – is a benefit on its own really. Just being able to do it on your own."*
>
> *(male, 18-30, severe sight loss, PC user, shared household, previously pre-pay)*

4.2 A small number of participants who were less positive and/or less aware of smart meters, confused smart meters with pre-payment meters.

> *"[Interviewer: What, if anything have you heard about smart meters before today?] Is that the one where you pay for how much you use? I know people who have that. I go to visit them and it's freezing, they don't have any heating. They say*

'it's cheaper, it's cheaper', it is cheap but that's because they're not using anything to keep the money [...]. I also heard that once you have this meter you can't change it. So if you buy a house and it has a meter, you can't have it any other way."

(female, 61-74, mild sight loss, PC, lives as family with children, no pre-pay)

4.3 Others questioned what they would do with information regarding their energy usage unless there was some means of comparing their usage against that of others.

"Consumption feedback on its own is somewhat unhelpful I've found, but if it was coupled with an average of what other people are using and how I compared then it may motivate me to do something about it."

(male, 18-30, mild sight loss, PC, lives in shared household, no pre-pay)

There are different phases of consumer engagement/interest once the consumer receives smart metering

4.4 Through the stakeholder consultations it was suggested by an IHD vendor and strategic stakeholder consultees that there are generally two phases with respect to consumers' engagement with an IHD:

- **Early interest:** the new display encourages the consumer to turn things on and off, to understand the relationship between devices and what they consume. It was suggested that this phase usually lasts less than a month, sometimes much shorter.

- **On-going use:** the consumer and the device 'settle down together' for the long-term. For a sighted person this is where glancing at the display or catching sight of the device out of the corner of the eye is a useful reminder to turn things off. Traffic light displays are considered a good stimulus for this.

4.5 For a BPS person, particularly those with severe sight loss, it is less obvious what the on-going 'ambient' stimulus can be. Stakeholders reported that audio equivalents could be annoying and unnecessarily alarming (e.g. warning whenever a kettle is put on), but it was also suggested that 'intelligent' audio which, for example, sounds at intervals set by the consumer, could partly mitigate against this. It was reported that some existing IHD devices have an audible buzzer, which can be turned on if required, but IHD vendors felt that relatively few people use this as they find it annoying very quickly.

4.6 Our BPS interviewees noted that:

- for those with some useable sight, traffic light-type information was seen to be accessible and preferred

- colour blindness will be an issue for some (not just BPS people), with difficulties distinguishing between red and green

- audio based ambient information could become annoying, but was perceived to be useful to indicate products that are accidentally left on, or that daily limits have been reached.

Smart meters have the potential to offer a number of specific benefits for BPS consumers…

4.7 Strategic stakeholders identified a number of specific potential benefits for BPS consumers:

- For many BPS consumers, a standard IHD could potentially be considerably more accessible than their current traditional meters, given the difficulties previously highlighted re accessing existing meters.

- Some stakeholders reported that many BPS consumers are amongst the less well-off members of society, and therefore likely to be particularly vulnerable to fuel poverty (i.e. more so than the population as a whole)[8] – and so the ability to reduce energy consumption and bills through smart metering is particularly important.

- Alerting consumers if a device is left on unintentionally was considered to be particularly useful for BPS consumers (e.g. raising an alert if an oven or hob is on for an unusually long period).

- Being charged accurately for usage was considered to be an important benefit. It was reported by some stakeholders that BPS consumers are currently worried that their inability to provide accurate own-readings means that they pay more than they should do. It was also suggested by stakeholders that BPS consumers feel unable to challenge their provider, even when they felt they were being over-charged.

- Stakeholders also reported that some BPS people feel vulnerable letting a stranger into their home for a meter reading - however, avoiding meter reader visits is not necessarily a universal net *benefit* for BPS people: others feel that they benefit from being able to talk face to face with a representative from their provider.

[8] DECC's Report on Fuel Poverty Statistics 2012 shows that, in 2010, households containing someone with a disability or a long-term illness had a higher rate of fuel poverty than other households

4.8 In our interviews with BPS people, participants tended to be either optimistic or neutral towards smart meter benefits. These views appeared to be less related to sight loss per se, and more related to self-efficacy with technology, their motivation to engage and need for independence, and their tolerance to learning to use products using limited or no vision.

4.9 When presented to participants, the benefits deemed most relevant and appealing were:

- the ability of smart meters to provide accurate information regarding energy usage, giving peace of mind that they were not being over-charged through estimated bills
- the ability to use the information to help save energy costs
- the ability to save costs through time-of-use tariffs.

4.10 Participants were particularly sensitive to and positive regarding the prospect of smart meters leading to more accurate bills.

> *"Yes, it would be great to give me peace of mind [..] if I knew that they [meters] were read correctly"*
>
> *(female, 61-74, mild sight loss, PC, lives in shared household, pre-pay)*

4.11 The potential to cut down on energy usage and costs, through better information on consumption was also welcomed by most.

> *"Yes; 'full marks! I live on a limited budget so that would really be an enormous help."*
>
> *(female, 61-74, mild sight loss, PC, lives in shared household, pre-pay)*
>
> *"I would always like to know how much [energy] I'm actually using, if there was a way of having all this data together so I can find out how much we're using and how we can cut that down. Also, when you have multiple plugs, three or four, if you have something on are you using all of them or just that one that is in use?"*
>
> *(male, 18-30, mild, PC user, shared household, no pre-pay)*

4.12 After being informed of the potential benefits associated with smart meters, interviewees with pre-pay meters also recognised that smart meters would help to address existing issues with pre-pay meters (e.g. topping up over the phone and not needing to access the meter directly) whilst maintaining the benefits (e.g. being able to monitor and manage expenditure on energy).

4.13 Many participants were indifferent to the benefit of easier switching of suppliers due to past-experience and perceptions regarding the hassle

involved, and linked to this, the fact that, as reported in section 3, a number of BPS consumers see the cost of energy from different suppliers as being broadly the same over the long term.

> *"When you're visually impaired, it's difficult to keep changing suppliers for anything, whether its energy suppliers, anything, because you get used to the way they provide your statements and the relationship you build up with them. If you keep chopping and changing just to save a few 'p', you've then got to build up another relationship and then you have problems in getting your bills in the right format."*
>
> *(male, 31-60, mild sight loss, PC, lives alone, no pre-pay)*
>
> *"The last thing I would want is to change to a company that wouldn't provide what we are used to."*
>
> *(male, 31-60, severe sight loss, PC, lives with partner, no pre-pay)*

4.14 Participants were largely unenthusiastic regarding the potential for smart meters to support the installation of micro-generation, with participants citing that this was not seen as being relevant (e.g. they live in a flat), or they were cynical about how this would work in practice.

4.15 Perceptions regarding the benefit of removing the need for letting meter readers enter the home were mixed: whilst a number saw this as a positive benefit, others expressed concern that it would lead to job losses (i.e. of meter readers) and a few gave the impression that they welcomed the opportunity for a chat, when meter readers visited – a point also made by some strategic consultees, as noted above.

…but there are also some potential concerns

4.16 Over and above the issues highlighted by stakeholders regarding the PSR and the training of energy supplier staff to identify support for BPS consumers (noted in section 3), stakeholders also highlighted other potential concerns:

- It was stressed that energy suppliers need to invest in appropriate training for IHD installation engineers, in order for them to identify a potentially vulnerable customer even if they are not registered on the PSR, and to understand the extra time and consideration that is required during IHD installation in terms of where it is positioned, and how its use is explained.

- There was some scepticism as to whether energy suppliers would have sufficient after-care support staff who know how to deal with and resolve concerns and questions raised by BPS consumers regarding smart meters.

- Stakeholders also noted that dis-benefits may actually be experienced before the intended benefits are realised – e.g. early smart meter installations and perhaps subsequent upgrades/fixes could lead to the number of home visits from utilities increasing rather than reducing, at least initially (an issue that may be more of a concern for vulnerable groups).

- Regarding pre-payment meters, some stakeholders highlighted that top-up issues could potentially become more complex for BPS consumers in some situations. It was reported that the smart meter pre-payment system will allow customers to top-up online or in shops with credits loaded up automatically. However, if this system fails consumers will need to type a 20 digit code into their IHDs; for some BPS consumers inputting this code accurately may prove very difficult.

4.17 Some of our younger BPS interviewees were also very concerned to ensure that any IHD would be an aesthetically pleasing addition to the home.

> *"As I was saying before, it's got to be pretty before its functional so if you could sort of make nice colourful display and maybe it could turn one set of colours when your energy usage is good relative to other peoples, and when its bad, but sort of done in a way that it looks nice rather than sort of just a big red light."*
>
> *(male, 18-30, mild sight loss, PC, lives in shared household, no pre-pay)*

5. Difficulties for BPS consumers in accessing smart metering benefits

There are a number of generic issues associated with BPS consumers' use of electronic devices…

5.1 There have been various studies commissioned by RNIB and other organisations to assess the extent to which BPS consumers access and use electronic devices, and the difficulties they commonly face. Our review of this material, which includes consideration of ebooks, internet banking, DAB radio users, TV, fixed-line and mobile telephone, computer and internet, revealed the following themes:

- Button layout and design is one of the most often cited accessibility issues of BPS consumers. Issues highlighted through the research commonly related to button size, configuration and placement on a device. Where touchscreen technology was used, BPS consumers were felt to be disadvantaged, particularly where there is no tactile (or audio) feedback.

- The incorporation of audio feedback can be extremely beneficial for BPS consumers, particularly those with a severe impairment.

- BPS users often rely on their memory (and expectations) to navigate the menus of their devices. As a result, products can be difficult for them to use if they are not set out in an intuitive way, or if software updates lead to changes in the user interface.

- BPS users find it difficult to use displays when information cannot be manipulated, and when it contrasts poorly against its background, and/or where the contrast cannot be adjusted.

- Providing information online can be a good way to make information accessible to BPS consumers who have access to screen reader or electronic magnification technologies. However, evidence suggests that many websites remain poorly designed: BPS users have difficulty in manipulating text size and sites are often not compatible with assistive technologies such as screen readers. The array of security information and personal codes required on some sites present a number of hurdles for BPS users: functionality is often limited and BPS users have difficulty manipulating the textual information, some secure portals do not support adaptive software, and some security codes are supplied in inaccessible formats.

5.2 Several BPS interviewees reported already spending a lot of money on expensive accessories to make mainstream products accessible to them, which they felt was unfair. However, BPS consumers also reported a number of good examples of mainstream products with integrated accessibility solutions. Apple's mobile operating system, iOS, was frequently mentioned as an example of good practice.

> *"I think a lot can be learned like this from devices like Apple so if you get the context similar to Apple, I don't think you'd be going wrong."*
>
> *(male, 18-30, severe sight loss, PC user, shared household, previously pre-pay)*

5.3 There were positive descriptions of devices which included built-in speech output, but some implementations were regarded less positively than others:

> *"Panasonic TV, 42 inches or above. They have text-to-speech technology across their entire range for no extra price. Apple has iPhones (I personally don't use an iPhone because I don't like touchscreens but that's a personal preference), and Mac. For other phones I need to buy extra software and it costs money. For example [brand] has some kind of software but it's very poor."*
>
> *(male, 31-60, severe sight loss, PC user, lives alone, no pre-pay)*

…and some specific concerns around accessing smart metering information

5.4 The main piece of research conducted to date regarding the accessibility of IHDs for those with impairments was commissioned by Consumer Focus, *Getting to Grips with Smart Displays* (2011). Through this research, it was concluded that there were a number of accessibility concerns surrounding IHDs:

- There were issues around the physical design of IHDs:
  - battery covers were difficult to remove
  - where adaptors are required (i.e. to allow connection to an AC power supply), these need to be easy to access and remove
- Issues were identified around the IHD button design and configuration:
  - too high a degree of dexterity is required to effectively use buttons on the IHD

- IHDs which featured touch screen functions but not tactile feedback (i.e. a confirmation such as a click or beep) were also deemed to be difficult to use

- Issues related to the IHD display were also highlighted:
  - IHD displays that contain several types of information at the same time could be difficult to interpret
  - some IHD displays contrast poorly with their background, which again could lead to difficulties for BPS consumers.

5.5 In our interviews with BPS consumers, participants echoed the findings above that devices with small text sizes, very small buttons, poor contrast and no speech output would be difficult or impossible to access. Some were concerned that IHDs would be mislaid in the home and difficult to find.

5.6 Participants also highlighted a number of broader information needs regarding smart meters:

- 'need to knows' such as costs incurred by the consumer, maintenance, how to use, and how many meters and displays are required if more than one supplier is used
- implications for switching suppliers
- and practical information such as how can two existing meters 'become one', what does installation involve and how disruptive will it be, what happens when you move house, and how does it help to reduce costs?

5.7 There was a suggestion from consumer representative groups that, whilst undesirable, BPS consumers could be left out of early rollout while the processes and technology mature.

There was a clear message that BPS consumers should not be expected to have to take additional steps in order to access information

5.8 Consumer representative groups were keen to emphasise that whilst some BPS consumers may want to access smart meter information via different technological platforms, as a default position BPS consumers should not need, or be expected, to undertake additional steps to access information.

5.9 When BPS interview participants were presented with solutions to accessing smart meter information, there was a clear distinction between what participants could access and whether they would actually use that method to access energy related information. For example, all could theoretically access information through another person but in practice most would not do this as they want to be as independent as possible.

5.10 Some of our BPS interviewees who lived with sighted family members perceived themselves to be the more conscientious person about saving energy and costs, and it was a source of frustration that they were reliant on others for energy management.

> *"I can't use the controls at home to set the clocks and timers. I can set the temperature control on the dial, turn it down, turn it up, but I can't turn the timers on or off or set the main functions. We recently had a change-over to a computerised system but to me it's useless, I can't do it at all.' 'She [wife] does it but I would like to do it because I'm more disciplined than she is."*
>
> *(male, 31-60, severe sight loss, PC, lives with partner, no pre-pay)*

5.11 Most BPS interviewees did not want to feel different to sighted others, and would prefer a mainstream product that in itself was accessible. It was reported that this would also improve their ability to seek help with a product (i.e. since more people will be familiar with the device). In general, partially sighted consumers were keen to try and use the vision they have to access information (so a visually accessible display is important), before resorting to other means such as speech output.

> *"Speech output would be useful to me. Personally I rather read it, I'd rather it be reasonable size letters and lit up, 'cause it's easier to see then."*
>
> *(female, 55-64, moderate sight loss, PC, lives with partner, no pre-pay)*

There is a consensus over the desirability of being 'inclusive by design' in mass markets…,

5.12 Good practice for IHD usability design has been set out in recent guidance from Consumer Focus[9], published in November 2012. The good practice guide, which built upon the 2011 *Getting to Grips with Smart Displays* study and is referenced in the SMETS, provided, in summary, the following recommendations:

- IHDs should be well balanced and support one handed operation. If designed for wall mounting or use with a cradle should be easy to remove and use.

- Adapters, if required, should not require a specific orientation. If they do, tactile markings should be provided. The adapter itself should be

[9] http://www.consumerfocus.org.uk/files/2012/11/Industry-Usability-Good-Practice-Guidance.pdf

easy to use and support one handed operation. Provision of a rechargeable battery should be considered.

- Batteries, if used, should be easy to change. The cover should contain tactile markings and its removal should require the minimum of force. Tactile feedback should be provided to help users orientate their batteries correctly.

- Careful consideration should be given to the size, configuration and purpose of individual buttons. They should also contrast well against their background. Dual functionality should be avoided where possible and dual operation should be minimised.

- Buttons work best when they provide tactile feedback. Buttons level with the surround should be avoided. There should be no observable delay between the operation of a button and the response of the device.

- Capacitive rather than resistive touch screens work best. If a stylus is provided it should contrast well against the device's display.

- Labels/icons should contrast well against their background and be close enough to a button (if used) to indicate clear association. Abbreviations or icons should be in common usage. Fonts should be clear and legible.

- Consideration should be given to audible alarms.

- Consideration should be given to text to speech functionality.

- Consideration should be given to speech recognition software.

5.13 Our strategic stakeholders noted that inclusivity by design is now a well-established good practice requirement of most new products, and improves the 'customer experience' for all consumers.

5.14 IHD vendors were all, to greater or lesser extents, working under inclusivity by design principles. Common design features included:

- large, well-spaced buttons, which contrast with their background, and with the most common features/functions having the largest and most distinctive buttons

- tactile/basic audio feedback from buttons (such as a click or a beep)

- large display screens

- limited amount of information on the display at any one time, to avoid 'clutter'

- some limited audio output (for example, a buzzer to alert users when they are using a lot of energy, or to alert pre-payment consumers when their credit is low).

…but there are differing perspectives on the inclusion of text-to-speech in IHDs…

5.15 Previous research provided evidence that, for those with more severe sight loss, audio output can be an important function for enabling BPS consumers to access information from, and interact with, technological devices. Evidence from a study commissioned by Ofcom, *People with Visual Impairments and Communication Services* (2008) showed that audio output is most useful for those with a severe visual impairment. However, this research also noted that for those with a more moderate impairment, audio can become an annoyance.

5.16 The stakeholder consultations revealed differing perspectives on the inclusion of text-to-speech in IHDs:

- Consumer representative groups argued that text-to-speech functionality should be included in IHDs. These stakeholders considered that it is vital for making smart metering accessible to those with severe sight impairment. One view was that it was only a matter of time before text to-speech would have to be mandated in IHDs.

- Energy suppliers and IHD vendors were wary of the additional complexity and cost involved in providing text-to-speech functionality. IHD vendors suggested that the additional costs associated with incorporating text-to-speech in a standard mainstream IHD (including the additional processing power and memory) would make this option highly unlikely. Indeed, it was reported by some that IHD vendors are currently finding it difficult to meet the £15 unit price estimated in the programme's Impact Assessment.[10]

- Whilst IHD vendors noted that the SMETS isn't specific about text-to-speech, there were strongly-held views from some in this group that the specification is already too prescriptive – potentially adding unnecessarily to the complexity of the consumer experience (and so reducing the real benefits), and stifling the scope for innovation and product differentiation.

- One IHD vendor also noted that, paradoxically, the adoption of inclusive by design principles for the mainstream products will tend to reduce the addressable market for BPS-specific devices with text-to-

[10] The Impact Assessment cost assumption is based on an IHD meeting the minimum specifications and when produced at volume. Current IHDs are likely to exceed the minimum specifications and are produced at relatively low volumes."

speech (as IHDs that meet inclusive principles but without text-to-speech would be accessible for a large proportion of those with only mild or moderate sight loss).

- Energy suppliers reported that given the scale of the national rollout, they are focusing on getting the systems and processes right for the mainstream before they turn their attention to meeting the needs of vulnerable consumers. As a result there had been very little conversation between IHD vendors and energy suppliers on the feasibility of incorporating text-to-speech functionality.

…and IHD vendors tended to see other solutions as the better approach for BPS consumers

5.17 Almost all of the IHD vendors we talked to had also been working on delivering smart metering information to platforms other than IHDs, and were of the view that these would be a good solution for BPS consumers:

- Vendors were developing web-based and smartphone interfaces for accessing smart metering information. These can offer text-to-speech output via computers' screen readers, or via equivalent text-to-speech features on smartphones. Rather than focus on enabling text-to-speech in mainstream IHDs, it was suggested that advantage should be taken of the considerably greater processing power and memory available via these platforms. It was argued that this would avoid adding additional functionality (and cost) into mainstream IHDs, which vendors suggested the vast majority of consumers would not use.

- For consumers without smartphones but with mobile phones, it was suggested that a basic SMS service could be appropriate (i.e. providing text messages with usage information), which has been an important technology for increasing the accessibility of some other consumer devices.

- For consumers with severe sight loss, one suggestion was for a separate basic accessory which could receive information from a standard IHD over the Home Area Network, and then deliver a text-to-speech output. The supplier suggesting this option considered that such a device would: require minimal functionality (e.g. no screen); be reasonably low cost; avoid the need for extra functionality in the mainstream IHD devices; and address the demand from those without computers or mobile phones.

BPS consumer preferences for accessing smart meter information appear to be largely dependent on age and severity of sight loss

5.18 Unlike most devices which have evolved over time, smart meters and IHDs are completely new propositions to most consumers, including BPS people.

As a result, preferences for accessing information are still rather theoretical. The primary research undertaken with BPS consumers addressed this by asking a series of questions regarding participants' current interaction with technological devices, and by taking a sample of working IHDs for interview participants to try out and test for themselves.

5.19 Mirroring previous research and the views of stakeholders, the BPS interviews demonstrated that BPS consumers are a heterogeneous group, and so a range of solutions is likely to be needed to provide acceptable access to smart meter information. The appropriateness of different solutions for different households will depend on:

- severity of visual impairment
- living situation (i.e. living alone or with someone)
- age (as this tends to be correlated with propensity to adopt and engage with new technology)
- whether they have access to:
  - a computer and the internet
  - a smartphone, or other mobile phone
- how at ease they are with technology generally, with or without accompanying assistive technologies.

5.20 Overall, severity of sight loss and age were the two dominant variables that appeared to be associated with different preferences for accessing smart meter information.

5.21 For those with more severe sight loss, text-to-speech functionality was seen as 'a must' for IHDs, in order to access smart meter information.

> *"I'm just disappointed that speech hasn't been incorporated into the technology because speech readers have been around for 30 years"*
>
> *(female, 61-74, severe sight loss, PC, lives alone, no pre-pay)*
>
> *"If there is a combination of both [audio feedback and access through computer] that would cover all [...], as long as the display is able to read everything that is on it and selects what you want, either of them are totally accessible. There could be slight areas that are not readable by the screen reader, same on the computer.[...] What I'm trying to say is to make it 100% for 100% of people, would be a combination of several accessible formats."*

(male, 31-60, severe sight loss, PC, lives with partner, no pre-pay)

"It would be marvellous if you could just press a button and it'd talk to you [...] I have a scale in the kitchen that talks to me, a microwave that talks to me so…why not?"

(female, 75+, severe sight loss, no PC, lives as family with daughter, no pre-pay)

"There are no excuses for making it so that it doesn't talk. Other devices offer it for free..."

(male, 31-60, severe sight loss, PC, lives alone, no pre-pay)

"Well if you make it with a speech software in it, yeah, because Apple would do that straight away, wouldn't they. I mean any apps I get – I'm so glad I've got an iPhone – I can't see it, I've got Voice Over. I would use it [a smart meter], I would be interested"

(female, 61-74, moderate sight loss, PC, lives with partner, no pre-pay)

5.22 There were also some clear preferences amongst participants for how information should be displayed and accessed on IHDs:

- Regarding the on-screen display:
  - there should be a large screen (especially if no audio output)
  - text should be large in size and ideally adjustable in size, consistent in terms of subheadings etc., and lower case, whilst background colour should be contrasted, text clearly defined from different view angles, and displays should avoid the use of superfluous markers such as 'boxed' text
  - a number of participants also stated a preference for backlit displays (but it should be noted that this could potentially impair use for other BPS consumers)
- Regarding the IHD buttons:
  - buttons need to be raised, large and distinct (e.g., coloured), non-fade with good contrast labels (lower case letters), tactile markers/labels, and tactile feedback when pressed
  - consideration should be given to button location on an IHD: if wall mounted, it may be difficult to access buttons on top with a magnifier

- there was a preference for audio labels (e.g. where there is an audible play out function name when a button is pressed).

- With respect to overall design, there was a clear demand for the design to be kept as simple as possible with minimal functions and controls, one piece of information per screen, a reset button, and ideally consistency across IHD models. There was also concern raised with regards to the lifetime of batteries and how these would be replaced.

- Ambient information (as reported in section 4) was noted as useful for those with some useable sight, and 'traffic light' information was generally seen to be accessible and helpful.

5.23 Even where some parts of IHD displays were too small, some partially sighted interviewees pointed out that they could overcome this with practice.

> *"I can read this number here but I can't read any of the indicators [apart from the zeros] but I mean with things like that we sort of very quickly learn – I can read that number and I know what that means so the text is unimportant. You know I only need to look at it once with a magnifier and I'd know what it meant."*
>
> *(male, 18-30, mild sight loss, PC, lives in shared household, no pre-pay)*

5.24 BPS interview participants were also asked about other options for accessing smart meter information:

- Indirect access (e.g. through a telephone helpline) was generally not welcomed and unlikely to be used.

> *"I would feel comfortable doing that, that's fine, but that defeats the object of that. What is the point of having this [the display], which is brilliant. I think to be honest, if you have to make a phone call to find out what its saying, if that's what you have to do then I don't think I would do it."*
>
> *(male, 18-30, moderate sight loss, PC, lives alone, pre-pay)*
>
> *"[An automated system] would be a second choice, a very poor second. Not everyone has a phone at home so it wouldn't be ideal. Also it would probably be an 0800 number, and mobiles charge these, and I don't think it's fair to make people pay additionally just to check their meters."*
>
> *(male, 31-60, severe sight loss, PC, lives alone, no pre-pay)*
>
> *"It's difficult when we can't see, you know, if you're on the phone, you've got the pen and paper, you try to write things down and you try to decipher what you've written, and if you can't see you forget it."*

(female, 75+, mild/moderate sight loss, no PC, lives alone, no pre-pay)

"If someone's got to do it for me, then I ain't gonna do it. We don't have any assistance from anybody in the household. Everything in the household is done by us two and that's it. We don't have anyone come in to do anything for us and if I've got to have someone start coming in to tell me my meter and how much my balance is, then it ain't gonna happen"

(male, 18-30, moderate sight loss, PC, lives with partner, no pre-pay)

- Access via a smartphone/tablet was deemed more acceptable to younger or more technically able participants. Indeed, some of the IHD models presented to participants were perceived as 'dated' by younger participants who were more comfortable with touchscreens.

  "If this ever had to go to the market I think a lot could be learned from Apple and Apple devices because like I say Apple device on its own is accessible, but going to apps, not all apps are accessible but that's like webmakers, not everyone is making that accessible, but I'd like to think eventually down the line someone like Apple would say 'you want your apps sold in our app store, you have to meet these standards: standard 1 accessibility, standard 2, precise and clear displays'. I'd like to think we live in a society which is striving for perfection, so I think a lot can be learned like this from devices like Apple so if you get the context similar to Apple, I don't think you'd be going wrong"

  (male, 18-30, severe sight loss, PC, lives in shared household, no pre-pay)

- Online access to smart metering information was generally welcomed by those who already use computers and the internet, as it would benefit from the assistive technology available on computers (e.g. with screen reader, magnification). It was, however, suggested that these options should be tested for accessibility with consumers and their adaptive technologies prior to rollout.

  "Or if you could access it from your computer, if you had an account and you could log in [...] and see it on your computer or phone through an application or whatever. That would be very useful."

  (male, 18-30, mild, PC, lives in shared household, no pre-pay)

  "If they're gonna use websites and things like that, get in touch with people who are visually impaired to test them for you, listen to what they say."

  (male, 31-60, mild sight loss, PC, lives alone, no pre-pay)

6. Summary options assessment

6.1 In this section we set out our summary options assessment, identifying the options considered, providing estimates of the indicative volumes of households per option, and summarising the pros and cons of each option. Further detail is provided in the options assessments in Annex C.

Potential options

6.2 In the light of our discussions with stakeholders and consumers, we identified eight options for addressing the barriers to BPS consumers accessing smart metering benefits, which were agreed with the study steering group:

- Text-to-speech (TTS) functionality in mainstream IHDs
- Niche IHDs, targeted at BPS consumers
- Separate TTS device, linked to standard IHDs
- Accessible smartphone apps, using data provided via the Wide Area Network (WAN)/internet
- Accessible web-based apps, using data provided via the WAN/internet
- Push-SMS text messaging of smart meter info to (BPS-friendly) mobile phones
- Telephone-based information line
- Tailored face-to-face support for those unable to access smart meter information directly.

6.3 Annex C contains our analysis of each of these options, including a brief description, and consideration of: indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change; commercial model(s); incremental technical complexity and timescales; incremental operational implications; indicative incremental costs; and risks and opportunities.

Potential volumes, by segment and option

6.4 Our research has reinforced the need to consider BPS consumers as a *heterogeneous* group: needs and preferences for accessing smart metering benefits vary considerably, depending on the extent and nature of sight loss,

age, household composition, and whether the consumer already uses various technologies.

6.5 In order to inform our options assessment, we developed a simple model of the *approximate* number of Great Britain households including BPS adults, broken down by various segments, including extent of sight loss, whether the BPS adult is living with a sighted adult, and whether they have access to various technologies. The assumptions for this model are primarily informed by: the Access Economics *Future Sight Loss UK* study in 2009 for RNIB; the *Network 1000* study; the RNIB's *Sight Loss UK 2012* report; the RNIB's *Update on inclusive society* 2012 report; the NFER study for RNIB, *Educational provision for blind and partially sighted children and young people in Britain: 2007*; and Ofcom's *Communications Market Report 2012*.

6.6 Bearing in mind that the roll-out of smart meters will be phased over a number of years, and that other variables will be changing over that period (including the numbers of BPS people, and the penetration of technologies such as the internet and smartphones), we have taken a single reference year (2017) as the basis for our analysis of volumes: effectively a simplifying assumption that all BPS consumers would be provided with smart meters in that year. In reality BPS consumers will receive their smart metering equipment at some point before the end of 2019. We chose 2017 as the rough mid-point of the main smart meter roll-out, and the year when maximum installation volumes are expected.

6.7 The indicative volumes are shown below.

Table 6-1: Estimated numbers of GB households with BPS adults in 2017, by segment

Thousands	Total	With access to the web	With mobile phone	With smart-phone	Without web or smart-phone	Without mobile phone
GB households with BPS adults with severe sight loss, not living with a sighted adult (2017), 000s	**123**	34	52	6	89	71
GB households with BPS adults with severe sight loss, living with a sighted adult (2017), 000s	**129**	48	66	11	80	63
GB households with BPS adults	**793**	283	389	64	510	403

Thousands	Total	With access to the web	With mobile phone	With smart-phone	Without web or smart-phone	Without mobile phone
with mild or moderate sight loss, not living with a sighted adult (2017), 000s						
GB households with BPS adults with mild or moderate sight loss, living with a sighted adult (2017), 000s	**1,009**	498	619	140	511	389
Total GB households with BPS adults (2017), 000s	**2,053**	**863**	**1,126**	**220**	**1,190**	**927**

Source: SQW estimates

6.8 Considering the potential volumes per option, we then developed high, low and mid-range estimates informed by these segment volumes (see Table 6-2). For the purposes of our indicative cost analysis, we have used mid-range volumes for estimating unit costs.

Table 6-2: Potential volumes per option

	Lower (000s)	Mid-range (000s)	Upper (000s)	Rounded mid-range	Notes
Option 1: Text-to-speech (TTS) functionality in mainstream IHDs	23,667	25,333	26,200	25 million	Assumes 28m total households; Foundation Stage roll-out of 2.7m to 6.5m meters (and assumes 1.5 meters/household in Foundation Stage)

	Lower (000s)	Mid-range (000s)	Upper (000s)	Rounded mid-range	Notes
Option 2: Niche IHDs, targeted at BPS consumers	89	1,071	2,053	1 million	Lower estimate is just severe sight loss BPS not living with sighted adult, and without web or smartphone; upper is all BPS households
Option 3: Separate TTS device, linked to standard IHDs	89	352	616	350k	Lower estimate is just severe sight loss BPS not living with sighted adult, and without web or smartphone; upper is 30% of all BPS households (as most relevant to those with moderate or severe sight loss)
Option 4: Accessible smartphone apps, using data provided via the WAN/internet	73	147	220	150k	Upper estimate is all BPS households with smartphone; lower is a third of this
Option 5: Accessible web-based apps, using data provided via the WAN/internet	288	576	863	600k	Upper estimate is all BPS households with web access; lower is a third of this
Option 6: Push-SMS text messaging of smart meter info to (BPS-friendly) mobile phones	375	751	1,126	750k	Upper estimate is all BPS households with mobile phone; lower is a third of this

	Lower (000s)	Mid-range (000s)	Upper (000s)	Rounded mid-range	Notes
Option 7: Telephone-based information line	13	31	50	30k	Lower estimate is 5% of households with severe sight loss BPS adults; upper is 20% of households with severe sight loss BPS adults
Option 8: Tailored face-to-face support for those unable to access smart meter information directly	27	44	62	40k	30% to 70% of those severe sight loss BPS not living with sighted adult, and without web or smartphone

Source: SQW estimates

Summary option assessment

6.9 A broad indication of the information which we expect could realistically be provided through each option is given in the table below.

Table 6-3: Information provided to BPS consumers under each option

Option	Broad indication of the information made available to BPS consumers
Option 1: Text-to-speech (TTS) functionality in mainstream IHDs	• Any text and numbers on the IHD display should be available via TTS, though the process of 'reading' the display via TTS will require the consumer to actively select that option (e.g. through pressing buttons), and will be slower than it would be for a sighted person glancing at the display. • Any graphical information (e.g. charts of consumption) and colour-coded information on the display, would not be readily interpreted by TTS, and may be difficult for those with severe sight loss to access.
Option 2: Niche IHDs, targeted at BPS consumers	• Any text and numbers on the IHD display should be available via TTS, though the process of 'reading' the display via TTS will require the consumer to actively select that option (e.g. through pressing buttons), and will be slower than it would be for a sighted person glancing at the display.

Option	Broad indication of the information made available to BPS consumers
	• Minimum requirements on text size etc may lead to less information being displayed on the screen at one time, so additional interaction with the device (e.g. through pressing buttons) may be required to access the full range of information provided 'at a glance' to a sighted person • Any graphical information (e.g. charts of consumption) and colour-coded information on the display, would not be readily interpreted by TTS, and may be difficult for those with severe sight loss to access
Option 3: Separate TTS device, linked to standard IHDs	• Any text and numbers on the IHD display should be available via TTS, though the process of 'reading' the display via TTS will require the consumer actively to select that option (e.g. through pressing buttons), and will be slower than it would be for a sighted person glancing at the display. • Any graphical information (e.g. charts of consumption) and colour-coded information on the display, would not be readily interpreted by TTS, and may be difficult for those with severe sight loss to access
Option 4: Accessible smartphone apps, using data provided via the WAN/internet	• The extent of information available to a smartphone app will depend on the data permissions granted to the service provider by the consumer (e.g. whether they consent to their half-hourly data to be obtained, or only daily or monthly data) • In principle, almost any information displayed on the IHD could potentially be available, on demand through a smartphone app (e.g. electricity/gas consumption 'now' (over the previous 30 minutes)/ over the last day/over the last week etc., whether consumption over each period is up or down from the previous period, cost of consumption over each period etc.) • In-built accessibility features on smartphones, such as magnification and TTS, will assist the BPS consumer in accessing the information – though this will be dependent on the design of the app • Any graphical information (e.g. charts of consumption) and colour-coded information provided by the app, would not be readily interpreted by TTS, and may be difficult for those with severe sight loss to access • The higher processing power and memory available in a smartphone and the cloud (cf an IHD) could lead to more sophisticated analysis of energy consumption/cost information being made available through this device – and third party applications, granted access to the consumer's

Option	Broad indication of the information made available to BPS consumers
	data, could potentially assess which energy suppliers' tariffs would currently be best for that household's consumption patterns
Option 5: Accessible web-based apps, using data provided via the WAN/internet	• Again, the extent of information available to a web-based application will depend on the data permissions granted to the service provider by the consumer (e.g. whether they consent to their half-hourly data to be obtained, or only daily or monthly data) • As with option 4, in principle, almost any information displayed on the IHD could potentially be available on demand through an online web portal (e.g. electricity/gas consumption 'now' (over the previous 30 minutes)/ over the last day/over the last week etc., whether consumption over each period is up or down from the previous period, cost of consumption over each period etc.) • Assistive technologies on computers/tablets/smartphones, such as magnification and TTS, will assist the BPS consumer in accessing the information – though this will be dependent on the design of the online portal • Any graphical information (e.g. charts of consumption) and colour-coded information provided on the website would not be readily interpreted by TTS, and may be difficult for those with severe sight loss to access • The higher processing power and memory available in computers/tablets/smartphones and the cloud (cf an IHD) could lead to more sophisticated analysis of energy consumption/cost information being made available through this channel – and third party applications, granted access to the consumer's data, could potentially assess which energy suppliers' tariffs would currently be best for that household's consumption patterns
Option 6: Push-SMS text messaging of smart meter info to (BPS-friendly) mobile phones	• While half-hourly texts with consumption information would be technically feasible (given the appropriate permissions), we would not envisage this being an attractive service. Daily, weekly or monthly texts would be more likely scenarios – i.e. providing information on electricity/gas consumption over the previous day/week/month, compared to the previous period, and the associated costs • The design of the text messages could ensure that they are easily read-out by TTS applications (on the users' mobile phones) and easily understood (e.g. 'Your electricity usage over the last week was x kilowatt-hours' rather than 'Electricity: x kWh') • Graphical information would not be provided under this

Option	Broad indication of the information made available to BPS consumers
	option
Option 7: Telephone-based information line	• Conveying half-hourly consumption information over the phone would not be realistic (whether via a human or via an automated voice service). We would not expect daily calls to be common, and weekly or monthly calls would be more likely scenarios – i.e. providing information on electricity/gas consumption over the previous week/month, compared to the previous period, and the associated costs • Graphical information would not be provided under this option
Option 8: Tailored face-to-face support for those unable to access smart meter information directly	• Conveying half-hourly, daily or weekly consumption information would not be realistic through this option. We would expect such support to be provided through annual or perhaps monthly visits. • However, if the support provider is equipped with appropriate background information and training, they could potentially give the BPS consumer informed advice on how their electricity/gas consumption compares with the average for similar households, and take the consumer through various options for reducing their usage

Source: SQW

6.10 Our summary of the pros and cons of each of the options is presented in the table below. Further details are provided in the individual assessments of Annex C, which are based on our own analysis, informed by our discussions with energy suppliers, IHD vendors and BPS consumers for this research.

Table 6-4: Summary of the pros and cons of each option

Option	Pros	Cons	Indicative additional costs
Option 1: Text-to-speech (TTS) functionality in mainstream IHDs	• Significantly improved accessibility for those BPS consumers unable to read standard IHDs, through incorporation of TTS (BPS interviewees were particularly keen on the inclusion of TTS in devices)	• Highest cost option • Very unlikely to happen unless mandated • Doesn't address the visual/tactile accessibility of the IHD display and buttons etc, which was also important for our BPS interviewees • Potential for	£220 million to £350 million

Option	Pros	Cons	Indicative additional costs
	• TTS-by-default may encourage some BPS consumers to engage in better energy management, who would not otherwise proactively choose other options • Potential spillover benefits for consumers with dyslexia or literacy issues	reducing the scope for device innovation • Potential for increasing barriers to market entry • Large majority of households would not use/benefit from the additional functionality	
Option 2: Niche IHDs, targeted at BPS consumers	• Much improved accessibility for BPS consumers, including those with mild/moderate sight loss, through a combination of TTS *and* display etc. meeting certain minimum accessibility requirements (BPS interviewees were keen on the inclusion of TTS in devices; but those with some sight were also seeking improved visual accessibility of displays) • Provides the best accessibility of the options considered (closest to the level of accessibility for sighted consumers, for the widest range of BPS households)	• Relatively low volumes could lead to relatively high unit costs (potentially mitigated through joint procurement by energy suppliers) • High levels of uncertainty over the actual take-up of such a device, when offered as an option • Potential difficulties for energy suppliers in identifying their BPS customers, given the incomplete nature of the Priority Services Register (which may constrain take-up)	£11 million to £21 million

Option	Pros	Cons	Indicative additional costs
Option 3: Separate TTS device, linked to standard IHDs	• Significantly improved accessibility for those BPS consumers unable to read standard IHDs, through incorporation of TTS	• Relatively low volumes could lead to relatively high unit costs (potentially mitigated through joint procurement by energy suppliers) • Doesn't address the visual/tactile accessibility of the IHD display and buttons etc, which is also important • High levels of uncertainty over the actual take-up of such a device, when offered as an option • Potential difficulties for energy suppliers in identifying their BPS customers, given the incomplete nature of the Priority Services Register (which may constrain take-up) • Potential for these small devices to get lost	£4 million to £5 million
Option 4: Accessible smartphone apps, using data provided via the WAN/internet	• Brings smart metering information to a personal device used by the consumer for various purposes throughout the day, with a familiar interface (our	• Only relevant for about a tenth of BPS households, who have smartphones (some of our BPS interviewees reported not liking touchscreen phones)	Approximately zero, assuming that these apps will be developed anyway, and offered for free by

Option	Pros	Cons	Indicative additional costs
	smartphone-using BPS interviewees were very positive about the usefulness and accessibility of their smartphones) • Leverages the processing power, memory and assistive technologies available through the cloud and consumers' smartphones • Smart metering apps already available • Joint lowest cost option	• Less immediate consumption feedback than is provided via an always-on IHD display • Risk of apps being inaccessible (not working well with assistive technologies) – a risk noted by our smartphone-using BPS interviewees	energy suppliers to their customers
Option 5: Accessible web-based apps, using data provided via the WAN/ internet	• Brings smart metering information to a personal device used by the consumer for various purposes throughout the day, with a familiar interface (computer-using BPS interviewees were very positive about accessing information via their computers) • Leverages the processing power, memory, assistive technologies and larger screen size available through the cloud and	• Only relevant for about half of BPS households, who have access to the web • Having to log on to the web to obtain the information was perceived by some BPS interviewees as an unwelcome additional step ("why should we have to do that when others don't?") • Less immediate consumption feedback than is provided via an always-on IHD display • Risk of online	Approximately zero, assuming that these online services will be developed anyway, and offered for free by energy suppliers to their customers

Option	Pros	Cons	Indicative additional costs
	consumers' computers • Smart metering online services already available • Joint lowest cost option	services being inaccessible (not working well with assistive technologies) – a risk noted by our computer-using BPS interviewees	
Option 6: Push-SMS text messaging of smart meter info to (BPS-friendly) mobile phones	• Brings smart metering information to a personal device used by the consumer for various purposes throughout the day, with a familiar interface • Leverages the processing power, memory and assistive technologies available through the cloud and consumers' mobile phones • Energy usage text alert services already available • Straightforward text format for mobile phone TTS applications to read out • Pushes information to consumers, rather than requiring them actively to pull it, which is more analogous to the always-on nature of IHD displays	• Only relevant to about half of BPS households, who use mobile phones • Less immediate consumption feedback than is provided via an always-on IHD display • Potential for consumers to be become annoyed by frequent energy-related texts, and to unsubscribe from this information	£1 million to £8 million p.a.

Option	Pros	Cons	Indicative additional costs
Option 7: Telephone-based information line	• Near universal availability (only about 1% of UK households do not have a mobile or landline phone) • Potential for basic usage information to be interpreted by informed customer service advisers, who could also suggest energy saving ideas • Energy saving/efficiency helplines already offered by energy suppliers (some, but not all, of which are free)	• By shifting the onus on the consumer to actively pick up the phone and call a number, this option is likely to be infrequently used • Potential resentment by BPS consumers of the need to do something 'extra', rather than the mainstream service being accessible by design (this option was disliked by the majority of our BPS interviewees)	£1 million to £5 million p.a.
Option 8: Tailored face-to-face support for those unable to access smart meter information directly	• More in-depth support, which could actively help the most vulnerable consumers save energy and money through helping them to understand and act on their smart metering information • Could potentially be integrated into existing support services, such as those offered through the independent Living aspects of RNIB's Action for Blind People	• Resource-intensive option, only relevant for relatively low numbers of BPS consumers - those living alone with severe sight loss • BPS interviewees generally preferred to be able to access the information themselves, rather than relying on others • In the absence of accessible digital information (e.g. through IHDs or other channels), these consumers would lack real-	£1 million to £2 million p.a.

Option	Pros	Cons	Indicative additional costs
		time feedback on changes in their consumption patterns, in between visits	

Source: SQW and Astutim

6.11 On balance, we consider that the most appropriate approach would be a combination of option 2 (niche IHD targeted at BPS people) with actions to ensure that applications developed through normal market forces for the web (option 5) and smartphones (option 4) are designed to be accessible to BPS consumers.

- As well as incorporating text-to-speech functionality, the targeted approach of option 2 would allow much greater opportunity (than options 1 or 3) to ensure that other important IHD features (the display, buttons and menus) are designed with BPS consumers more specifically in mind. It provides the best accessibility of the options considered (closest to the level of accessibility for sighted consumers, for the widest range of BPS households), and comes closest to providing a 'reasonable adjustment' of smart metering services for BPS consumers in our view.

- We envisage that the web and smartphones will become increasingly important channels for accessing smart metering information over time. While these may only be options for a minority of BPS consumers initially (given the profile of technology ownership), it will be important to ensure that such applications adopt good accessibility practice from the outset.

6.12 We suggest that the integration of Text to Speech – TTS - functionality in mainstream IHDs (option 1) would be an unnecessarily costly solution – adding a feature into the basic device which in practice would only be used by a minority of consumers. Neither option 1 nor option 3 (an accessory TTS device, to interface with standard IHDs) would do anything to improve the visual accessibility of IHD displays – which is a particularly important consideration for those with partial sight.

6.13 Option 6 (SMS messages to mobile phones), 7 (telephone helpline) and 8 (face-to-face support) may develop to an extent through 'business as usual' – for example: energy usage SMS alerts may be introduced as an additional service for energy consumers; energy efficiency helplines may be enhanced by advisors pulling up the caller's recent energy consumption information, with permission; and organisations already supporting BPS people may develop their services to take account of the introduction of smart metering. Such developments would be welcome, as they would provide additional means for

BPS people (and others) to understand their energy consumption better. However, we would not see any of these three measures as providing, on its own, sufficiently equivalent access to smart metering information for BPS consumers.

7. Conclusions and recommendations

Conclusions

7.1 Here we pull together the overall conclusions of our study, in the light of the findings summarised in the previous section of this report (and the supporting annexes).

Smart metering will offer various benefits to BPS consumers

7.2 It was noted by some of our stakeholder consultees that blind and partially sighted people tended to be amongst the less well-off groups in society, and therefore particularly vulnerable to fuel poverty. Moreover, as we found in our interviews with BPS consumers, some are relatively high users of household energy (for example, as a result of staying at home for much of the day, through difficulty in accessing heating controls, or through the need for more lighting than would be used in a sighted household). As outlined in the Smart Metering Impact Assessment, smart metering is expected to help consumers understand and reduce their energy consumption and costs, and this benefit will be welcomed by many households with BPS people.

7.3 Furthermore, our interviews with BPS consumers highlighted that the *current* situation with 'dumb meters' was far from accessible in many cases. Such meters are frequently in awkward positions in or outside the home, and have relatively small dials/numbers, which can make it particularly difficult for BPS consumers to take their own meter readings, or check those provided by energy suppliers. A small IHD device that can sit somewhere convenient in the house (e.g. in the kitchen or sitting room), and with relatively large numbers on the display, would represent a step forward for many in making their energy consumption information more accessible.

7.4 There was a fair degree of scepticism amongst our BPS interviewees over some of the expected benefits of smart metering (for example, switching energy suppliers was seen by many as being more hassle than it is worth, and facilitating the installation of micro-generation was seen as being irrelevant to most – especially those living in flats). However, other benefits were more readily accepted and welcomed: peace of mind in knowing that you are only being billed for what you use, the ability to know how much energy you're using, the potential for time-of-use tariffs to reduce costs, and easier top-up methods for pre-payment meters. An alert to warn of appliances (such as ovens or hobs) being left on for an unusually long time would also be welcomed.

Many BPS consumers will be able to access smart metering information through standard IHDs, and/or through energy suppliers' websites, and/or through smartphone apps

7.5 Most BPS people are partially sighted[11], and these interviewees were generally keen to make as much use as possible of their remaining sight (holding a display up close, and/or using a magnifier), before resorting to other methods of accessing information such as speech output.

7.6 Amongst the current models of IHDs, some are relatively accessible to partially sighted people – though this also varies *within* displays (with some text being relatively large, but some text quite small and difficult to read).

7.7 Furthermore, several of our interviewees were proficient users of computers and the internet, and saw this as a good way of accessing smart metering information, provided that the online service was designed to be accessible (indeed eBilling was seen as a preferred method of receiving bills by many in this group, in preference to large print paper bills for example, as it provided instant access to assistive technologies available on the computer, such as zooming and screen readers). Smartphone users were typically enthusiastic about the built-in accessibility features of these devices, and saw smartphone apps as an obvious 'way to go' for accessing smart metering information.

7.8 Our interviews with energy suppliers and IHD vendors suggested that it is highly likely that energy suppliers will be providing their customers with access to their smart metering information through online web portals and through smartphone apps, as part of their core service offering.

However, for others (especially older people with severe sight loss), existing developments are not sufficient to ensure accessibility

7.9 With about 78% of BPS adults in Great Britain being 65 or older, most BPS people do not use the web, and only a small minority have smartphones (and we anticipate that this will continue to be the case by our reference year of 2017)[12]. These channels cannot therefore be regarded as a sufficient solution for BPS people.

7.10 None of the IHD vendors we spoke to for this research had firm plans, at the time of the interviews, to integrate text-to-speech functionality into their IHDs. This poses a particular problem for older people with severe sight loss – unlikely to be users of the web or smartphone apps, and unable to read a standard IHD display.

[11] Access Economics estimated that 88% of BPS people in the UK have mild or moderate sight loss, and 12% severe sight loss (http://www.rnib.org.uk/aboutus/Research/reports/2009andearlier/FSUK_Report.pdf)
[12] Source: SQW analysis, using data from Access Economics research for RNIB, 2009 (http://www.rnib.org.uk/aboutus/Research/reports/2009andearlier/FSUK_Report.pdf) and Ofcom's Communications Market Report 2012 (http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr12/CMR_UK_2012.pdf)

Some form of text-to-speech output from IHDs would address those at highest risk of exclusion, but would also benefit many other BPS consumers

7.11 There was a clear and consistent message from our interviews with BPS consumers (as well as from our discussions with consumer representative groups), that text-to-speech functionality would be particularly helpful in IHDs.

7.12 This was especially the case for those with severe sight loss, for whom text-to-speech would be essential in order to access the information on a display at all.

7.13 However, it was also relevant for a wider group – assisting those with moderate sight loss to interact with the IHD more easily, by complementing and confirming the information obtained by these people using their remaining sight.

Our options analysis indicates that an approach addressing multiple information channels would be appropriate

7.14 On balance, we consider that the most appropriate approach would be a combination of option 2 (niche IHD targeted at BPS people) with actions to ensure that applications developed through normal market forces for the web (option 5) and smartphones (option 4) are designed to be accessible to BPS consumers.

7.15 We suggest that the integration of Text to Speech – TTS - functionality in mainstream IHDs (option 1) would be an unnecessarily costly solution – adding a feature into the basic device which in practice would only be used by a minority of consumers. Moreover, a targeted approach would allow much greater opportunity to ensure that other important IHD features (the display, buttons and menus) are designed with BPS consumers more specifically in mind. Neither option 1 nor option 3 (an accessory TTS device, to interface with standard IHDs) would do anything to improve the visual accessibility of IHD displays – which is a particularly important consideration for those with partial sight.

7.16 Option 6 (SMS messages to mobile phones), 7 (telephone helpline) and 8 (face-to-face support) may develop to an extent through 'business as usual' – for example: energy usage SMS alerts may be introduced as an additional service for energy consumers; energy efficiency helplines may be enhanced by advisors pulling up the caller's recent energy consumption information, with permission; and organisations already supporting BPS people may develop their services to take account of the introduction of smart metering. Such developments would be welcome, as they would provide additional means for BPS people (and others) to understand their energy consumption better. However, we would not see any of these three measures as providing, on its own, sufficiently equivalent access to smart metering information for BPS consumers.

Recommendations

7.17 Given the findings from our research, we offer the following recommendations for consideration by DECC, energy suppliers, IHD vendors, and other stakeholders:

- **Recommendation 1. Increase industry awareness of good practice in making products and services usable by BPS consumers.**

  - Our research found that energy suppliers and IHD vendors were at an early stage in considering the specific needs of vulnerable groups such as BPS people. The emphasis is currently on getting the technology, costs and processes right for the mainstream.

  - While some existing IHD designs incorporate helpful accessibility features, others do not, and there appears to be considerable scope for raising awareness of the issues faced by BPS people in using IHDs, so that designers can bear these in mind when developing new products.

  - Similar arguments apply to online and smartphone apps, for which different design approaches can have significant impacts on the extent to which these are accessible to BPS people, using assistive technologies.

  - Consumer Focus's guidance on good practice in IHD usability design has recently been published, and we suggest that it would be beneficial to follow this up with an additional event with energy suppliers, IHD vendors, and developers of smart metering related online services and smartphone apps, to highlight the particular needs of BPS consumers – preferably with the direct involvement of BPS people. With device/service designers not necessarily having had much, if any, first-hand exposure to the issues facing BPS consumers in using their products and services, we feel that this would be a helpful (and low cost) means of increasing industry understanding of the accessibility issues for BPS consumers.

- **Recommendation 2. Energy suppliers should offer IHDs tailored specifically for BPS consumers.**

  - Our options analysis indicated that option 2 would come closest to providing a 'reasonable adjustment' of smart metering services for BPS consumers. However, we noted that such a device may involve relatively low volumes, and that the demand will be uncertain, at least initially.

  - We suggest that this option should be developed further in discussions between energy suppliers, IHD vendors and other

stakeholders, seeking to establish the commercial model (e.g. whether a joint procurement approach would be appropriate, and permissible under competition law).

- A specification of minimum requirements for such a device should then be developed in collaboration with consumer representative groups and usability experts, and with direct input from BPS consumers of various ages and with a variety of sight loss conditions.

- **Recommendation 3. Regular published accessibility audits should be established of major energy suppliers' online and smartphone apps for smart metering.**

  - Our interviews with consumers, energy suppliers and IHD vendors indicated that online and smartphone apps will become increasingly common and helpful means through which BPS can access and analyse their energy consumption information.

  - However, it was frequently noted by consumers that some websites and some apps are still poorly designed for accessibility.

  - Although *charts* are particularly helpful in conveying energy consumption information to sighted consumers, these can be problematic for some BPS consumers, as they are not readily interpreted by screen readers.

  - As a minimum, we suggest that any online or smartphone apps offered by the major energy suppliers for smart metering should be accessible to BPS people using readily available assistive technologies on their computers and smartphones.

  - We suggest that there is a role for one or more trusted organisations in assessing accessibility as these applications become commercially available, and making that information publicly available, in order to encourage energy suppliers (and their suppliers) to use good accessibility design, and to provide information to BPS consumers as to which energy suppliers' services are most accessible.

- **Recommendation 4. Organisations supporting BPS people should prepare to adapt existing support services, with appropriate support from energy suppliers, to take account of the introduction of smart metering.**

  - The advent of smart metering will bring a new technology into homes (the IHD) and will make new information available which could potentially help BPS consumers save money on an area of significant household expenditure – their energy bills.

- The onus is on individual *energy suppliers* to ensure that their BPS consumers are appropriately supported in accessing the benefits of smart metering. The Central Delivery Body (CDB), which will be established by suppliers, will be responsible for carrying out a programme of centralised consumer engagement. A key objective of the CDB will be to assist vulnerable consumers, who may face additional barriers, to realise the benefits of smart metering systems. The CDB will also need to tailor engagement material for vulnerable consumers such as those with sight, hearing or speech impairments. It is envisaged that the CDB and suppliers will work with third parties, such as those that support consumers with disabilities.

- We suggest that organisations supporting BPS people should also consider, in consultation with suppliers and the Central Delivery Body, how their own existing services should be adapted, to help raise awareness amongst BPS consumers of: the benefits of smart metering; the practicalities of the installation process; what support they can expect from installing suppliers; and of the options available to them for accessing and benefitting from their smart metering information. These supporting organisations were seen as key sources of information by many of our BPS interviewees, when we asked them who they would look to for information about smart metering.

- **Recommendation 5. Options should be considered for energy suppliers to develop more comprehensive knowledge of which of their customers are blind or partially sighted.**

  - The smart metering roll-out will introduce various new interfaces between energy suppliers and their customers, and between customers and their energy consumption information. It will also involve visits to people's homes, for the installation of smart meters and associated equipment, and these can cause particular concerns for some blind or partially sighted consumers. It is likely that tailored approaches to the installation process, and to the provision of ongoing support, will be necessary for BPS households, in order to allow for the issues caused by their impairment, and the installation code of practice will require energy suppliers to identify and meet the needs of domestic vulnerable consumers. This may include, for example, offering a more appropriate IHD, if our recommended option 2 is implemented.

  - In order to provide the appropriate level of service, it would clearly be helpful for the energy suppliers to have better knowledge of which of their customers have a visual impairment.

- Our discussions with stakeholders suggest that the current Priority Services Registers of energy suppliers provide only very partial information on which of their customers have a visual impairment, with some suppliers' registers worse than others. We also note that Ofgem's recent consultation on a new vulnerable consumer strategy includes a proposal to *"review the effectiveness and awareness of suppliers' and distributors' PSRs with the aim of sharing best practice and where possible making tangible improvements. This includes considering how PSR data can be better co-ordinated and utilised across the industry."*

- The PSRs could potentially be complemented with other sources of information, such as which households have requested accessible format (e.g. large print, braille) bills. However, this is also likely to exclude many BPS consumers (some of whom find regular print bills easier to use with magnifying equipment, for example).

- Suppliers need not be restricted to their existing information and processes, however; the smart metering roll-out itself provides an opportunity to identify households with special needs, when arranging appointments for the installation. Indeed, the installation code of practice[13] states that *"When arranging an appointment for an Installation Visit, all reasonable endeavours will be used (by checking records and through discussion with the Customer), to identify whether the Customer: has specific needs –such as the visually impaired…"*

13 http://www.ofgem.gov.uk/Sustainability/SocAction/Publications/Documents1/Smart_Metering_Installation_Code_of_Practice_v1%2000.pdf

Annex A: Consultees

A.1 We are very grateful to the following organisations, consulted in the course of this study.

Table A-1: Consultee List

Organisation
2 Save Energy
AlertMe
Anvil Mobile
British Computer Association of the Blind
British Gas
Consumer Focus
Current Cost
EDF Energy
E.ON
Green Energy Options
IVONA
Landis+Gyr
npower
Ofgem
Onzo
RNIB
ScottishPower

Source: SQW

Annex B: Key relevant messages from previous literature

Key accessibility issues of relevance to this study

Button design is one of the most often cited accessibility issue. Issues commonly related to button size, configuration and placement on a device. Where touchscreen technology was used, BPS consumers were felt to be disadvantaged.

The incorporation of audio feedback can be extremely beneficial for BPS consumers, particularly those with a severe impairment.

BPS users often rely on their memory to navigate the menus of their devices. It is difficult for them to use if these are not set out in an intuitive way.

BPS users find it difficult to use displays when information cannot be manipulated, and it contrasts poorly against its background.

Providing information online can be a good way to make information accessible to BPS consumers who are proficient with computers and adaptive technologies . However, it is vital that information throughout a site is made accessible to adaptive software. This is particularly important where users are asked to input information.

Implications for improving the accessibility of smart metering for BPS users

Buttons, where they are used, should be large, well-spaced and contrast well against their background. Individual buttons should be differentiated through their physical characteristics or through tactile (or audio) feedback.

Many vulnerable users benefit through audio feedback. This can be provided in a number of ways, requiring both high-tech and low-tech solutions, from the inclusion of a buzzer, to a talking menu. It is important to recognise that different users may require different solutions.

Menus should be designed in an intuitive way. Key buttons should be clearly marked, and the number of functions attached to each button should be kept to a minimum. BPS consumers find it frustrating

when, if they lose their way, they are forced to return to the start of a menu of options. Menus should be designed in a way that allows users to easily retrace their steps.

Displays work best when their contents can be manipulated by the user to meet their needs. Many BPS users also benefit where displays are back-lit and content contrasts well against their background.

Websites should be designed in a way that enables their contents to be understood by consumers using adaptive software.

Introduction

B.1 This review examines the key literature on the issues for blind and partially sighted (BPS) people relating to the introduction of smart metering, and consumer devices and services more generally. The review was approached with reference to two research questions:

- What accessibility issues are BPS people likely to encounter through the introduction of smart meters?
- What implications do these have for improving the accessibility of smart metering?

B.2 The papers considered as part of the review are listed below:

Table B-1: Papers considered as part of the review

Reference
RNIB, Are You Really Listening?[14] 2008
Ofcom, People with Visual Impairments and Communication Services[15], 2008
RNIB, The Needs of Blind and Partially Sighted People from ebooks[16], 2010
RNIB, Tackling Digital Exclusion[17], 2012
RNIB, The Banking Experience, Internet Banking[18] 2012
Ofgem & FDS, Consumers' Views of Smart Metering[19], 2010

[14] http://www.rnib.org.uk/livingwithsightloss/Documents/Are%20you%20really%20listening-%20DAB%20radio.pdf
[15] http://stakeholders.ofcom.org.uk/binaries/research/tv-research/visual.pdf
[16] http://www.rnib.org.uk/professionals/accessibilitydocs/i2_ebooks_report.pdf
[17] http://www.rnib.org.uk/aboutus/Research/reports/2012/digital_exclusion.pdf
[18] http://www.rnib.org.uk/aboutus/Research/reports/2012/Banking_Experience_CP.pdf

Reference
DECC & Ofgem, Consumer Protection: Supporting documentation, Smart Metering Implementation Programme Prospectus[20], 2010
Ofgem, Information Request on Inclusivity by Design, 2010
Consumer Focus, Getting to Grips with Smart Displays[21], 2011
Ofgem, Smart Consumer Protections Package: A Summary of Consultation Responses, 2011
DECC, Equality Assessment, Smart Metering Impact Assessment[22], 2012

Source: SQW

RNIB, Are You Really Listening? 2008

B.3 This report from the RNIB explores whether existing digital radio equipment is meeting the needs of BPS consumers. Consideration is also given to how this compared with the performance of this technology for people with limited dexterity or dyslexia. Research was undertaken through interviews with 38 DAB radio consumers (28 were BPS people, three were dyslexic, three had reduced dexterity, and eight formed part of a small control group), six interviews with six senior representatives of manufacturers (or other entities in the supply chain), and a telephone survey of 325 DAB users (100 were BPS people, 225 made up a nationally representative control sample).

Key accessibility issues of relevance to this study

- Button design and feedback were considered to be important for both BPS and fully sighted users.
- The location and tilt of the visual display were considered important for BPS users.
- Some BPS users struggled where multiple sockets were available, and there was no clear steer about which one powered the device. Others struggled if components were fiddly to put together.
- BPS users are twice as likely to report needing help in the use of their radio if there is no voice output. Frustration was expressed where voice output software was not updated, and failed to respond to other changes in the layout of the device.

[19] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42732/227-consumer-views-smart-metering.pdf
[20] http://www.ofgem.gov.uk/e-serve/sm/Documentation/Documents1/Smart%20metering%20-%20Consumer%20Protection.pdf
[21] http://www.consumerfocus.org.uk/files/2011/08/Getting-to-grips-with-smart-displays.pdf
[22] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48803/4906-smart-meter-rollout-domestic-ia-response.pdf

- Where there is no text to speech functionality, BPS users report a number of strategies that help them to operate the device. Key amongst these is memory. Devices work best where the layout of switches/buttons/dials is stable and intuitive.

- BPS users were found to be twice more likely to get lost in a menu, or have difficulty with the settings. The default response to this was to turn the device off and 'start again'. Frustration was expressed where this caused their personal settings to be lost.

- Industry representatives noted a range of commercial barriers to addressing accessibility issues including the difficulty in evidencing a return on investment, and concerns that by building in accessibility features into all their products, they could put off their core market.

Implications for improving the accessibility of smart metering for BPS users

- Individual buttons should be identifiable either through their physical characteristics or through tactile feedback. Simply changing the colour of different buttons should be avoided. BPS users find it easier where the most commonly used buttons are bigger and more distinctive. If buttons are elevated, the device must not be rendered unstable when they are used. Touch sensitive buttons can also be useful, but only if accompanied by a 'lock' function in the case of inadvertent contact.

- Button labels should contrast well against their background. Devices work best if they are backlit. Readability can be improved through a good choice of text style, size and colour contrast. Button labels are easier to read if presented in a sans serif font.

- Sockets should be easily accessible, and tactile cues should be provided where the user is required to align particular components prior to use.

- Text on displays should be open to manipulation. It is important to recognise that some BPS users will benefit from a small - as opposed to a large - font.

- Large screens are welcomed by all users.

- User demands should be kept to a minimum, for example the need to auto-tune on first use. Where users are able to set their own personal settings these should be retained if the device is turned off.

Ofcom, People with Visual Impairments and Communication Services, 2008

B.4 This report from Ofcom seeks to evaluate the impact of visual impairment on people's use of communication services. Research was conducted through

forty, two hour interviews with visually impaired people. Interviews took place in the participants' homes.

Key accessibility issues of relevance to this study

- Visually impaired users are often reliant on their memory. Changes to services were often found to be a source of frustration.

- Visually impaired users are often reluctant to tell service providers of their impairment, and were reluctant to seek out information that might help them access technology. Older users were particularly reluctant to seek assistance. Where users sought help from energy suppliers, support staff were often perceived as ill-equipped to help them.

- Audio description is most useful for those with a severe visual impairment. If content was abridged, it was found to be of annoyance to many users with a more moderate impairment. Speech recognition software was considered useful, but often did not live up to expectations.

- Some users found devices hard to use if buttons were small, poorly spaced or contrasted poorly against their background. Small buttons which were required to access a number of functions, were considered a major source of frustration.

- Users found devices difficult to use when text was small and could not be magnified.

Implications for improving the accessibility of smart metering for BPS users

- Devices work best where their layout is intuitive. Software and other such updates should be kept to a minimum, where this alters the user experience. If a consumer moves house or changes supplier, they should be able to keep using the IHD they've become familiar with using.

- Where visually impaired users are offered a specialist device, effort should be made to make sure that while it meets their needs it is aesthetically pleasing and does not act to mark them out.

- Interfaces worked best where they had buttons which were large, well-spaced and contrasted well against their background. The number of buttons used to access a number of functions should be kept to a minimum.

- Displays worked best when they were uncluttered and clear (colours were sharp and text was clear). There is a clear preference for devices where the appearance of displays can be customised.

- Talking menus work well for users with a severe impairment.

- Suppliers must work harder to gain the trust of consumers, particularly those with an impairment.

RNIB, The Needs of Blind and Partially Sighted People from ebooks, 2010

B.5 This report from the RNIB evaluates the needs of blind and partially sighted people in relation to ebooks. Research was undertaken through a series of twelve semi-structured telephone interviews with BPS people.

Key accessibility issues of relevance to this study

- Aside from access to a wider range of reading material, a key reason why many BPS users were attracted to ebook readers was the potential for text manipulation, and the ability to customise the display to meet their needs. Users were frustrated when they couldn't manipulate text size, font style, colour contrast, column formatting, character spacing, or screen size.

- Non-ebook users indicated a preference for audiobooks. Cost and accessibility were noted as key reasons why users had decided not to buy an ebook reader.

Implications for improving the accessibility of smart metering for BPS users

- Devices were easiest to use where they had large buttons.

- Control over the properties of the display was considered crucial, particularly the ability to alter the size of text.

- Displays were more accessible when they were low glare, high resolution, high contrast, and did not flicker during use.

- Inclusion of, or compatibility with, 'text to speech' software was considered to make a huge difference. Devices worked best where they produced minimal ambient sound.

- Compatibility with a range of file formats was seen to be of major importance as this allowed users to use assistive software that they were already familiar with.

- Good technical support was considered key. The feeling that they might be unable to use a device without initial training was a frequently cited reason why BPS people had decided not to purchase one.

RNIB, Tackling Digital Exclusion, 2012

B.6 This report from the RNIB explores the barriers preventing older people with sight loss from using the internet, and sets out some changes that, if made, could allow more people to get online. The study was conducted through 70 face-to-face, 300 telephone interviews with non-users (150 blind and 150 partially sighted), and seven focus groups. These were made up of BPS people aged 65 and over. There were also six telephone interviews with professionals who provide support and training to BPS clients.

Key accessibility issues of relevance to this study

- One of the greatest challenges facing those promoting the use of the internet amongst BPS people was the perception amongst the group that they couldn't. Of those surveyed, 82% reported that their eyesight was the reason why they were not using the internet.

- BPS users are put off using the internet by the number of websites incompatible with mainstream assistive technologies.

- Many BPS people simply don't want to use the internet (51% of those surveyed). There may be no way to persuade some of these to get involved. For other users, looking at an electronic display aggravated existing health conditions.

Implications for improving the accessibility of smart metering for BPS users

- Raising awareness about free to access solutions is crucial to encouraging BPS people to access the internet. Free access to good quality training will be invaluable in educating BPS people in the use of assistive technologies such as 'Screen Reader'.

- Financial assistance is required to help BPS people develop their capabilities and meet the cost of assistive technologies.

- Developers should follow existing technical guidance in the design of platforms accessible to BPS users.

- Users frequently recommended abridged software solutions that simplify the process of accessing the internet. Software solutions like this could be used in other settings.

RNIB, The Banking Experience, Internet Banking 2012

B.7 This paper analyses the challenges facing BPS consumers in interacting with the banking industry, be that through trying to use an ATM, or trying to access their accounts online. Developed in partnership with the industry, the paper identifies ways in which banks can improve the accessibility and usability of their products.

Key accessibility issues of relevance to this study

- Many websites remain poorly designed; BPS users have difficulty in manipulating text size and sites are often not compatible with adaptive software.

- Many sites rely on the user submitting an array of security information and personal codes. These provide a number of hurdles to BPS users: Functionality is often limited and BPS users have difficulty in manipulating textual information into a useable format. Secure portals often do not support adaptive software. Security codes are often supplied to service users in an inaccessible format.

Implications for improving the accessibility of smart metering for BPS users

- Websites should be designed in an accessible way, and support the use of assistive technologies such as 'Screen Reader'.

- Ensure that passwords or any security related information sent out to customers is available in a range of formats suitable to BPS consumers, for example in Braille or on a CD.

- Ensure that secure portals support the use of adaptive technologies.

- Make sure that security or anti-virus software works with the online banking service and does not interfere with accessibility software.

- Training packages should be made available online in branch in a format accessible to BPS consumers outlining how they can make use of sites and any shortcuts that might be available to them.

Ofgem & FDS, Consumers' Views of Smart Metering, 2010

B.8 This paper, commissioned by Ofgem from FDS International, seeks to provide a 'state of the nation' report into customers' views on smart meters. The research was conducted using a mixture of traditional focus groups (12 in total), and 'household' groups (10 in total). These were chosen to be representative of the population as a whole.

Key accessibility issues of relevance to this study

- Consumers were generally positive about smart meters, and thought that by providing users with more information about their energy usage, they had the potential to help users reduce their energy bills.

- Consumers liked that smart meters could allow energy companies to read meters remotely, removing the need for on-site visits. If faults could also be easily identified, this was felt to be a positive development. However, there was concern that meters might prove

unreliable, and with a reduction in the frequency of on-site visits any issues might be more difficult to resolve.

- The majority of consumers felt that an In-Home Display (IHD), particularly where it provided the user with ambient feedback such as 'traffic lights', could be useful in helping them reduce their energy bills. However, there was concern that at a time at which vulnerable people were being encouraged to keep themselves warm during the winter, the introduction of IHDs, aimed at reducing energy consumption, may lead some consumers to put themselves at risk.

- A small number of customers were concerned that smart meters may give energy companies a platform to actively interfere in their energy usage, contrary to their interests. It was felt that vulnerable users may be particularly susceptible to this.

Implications for improving the accessibility of smart metering for BPS users

- Consumers felt that it was important that installers were able to provide a user with training on the use of an IHD. Just as important would be the provision of clear and concise written instructions. For those that used a traffic light system, users should be told what 'red' meant. There was a clear preference for displays that provided information on expenditure in pounds/pence. Suppliers should consider carefully how many staff they will require to provide customer support during the roll-out phase.

- For those unable to read a visual display, it was felt that IHDs should be equipped with a buzzer. This would alert BPS users when they were using a lot of energy.

- Customers felt they would benefit from the opportunity to review their energy usage with their energy company on a regular basis. This might also improve the confidence of users who are suspicious of the motives of their provider.

DECC & Ofgem, Consumer Protection: Supporting documentation, Smart Metering Implementation Programme Prospectus, 2010

B.9 The issues identified below come from responses received by DECC/Ofgem in response to their consultation of July 2010. Question 4 asked: Do you think that there is a case for a supply licence obligation around the need for appropriately designed IHDs to be provided to customers with special requirements, and/or for best practice to be identified and shared once suppliers start to roll out IHDs?

Key accessibility issues of relevance to this study

- Traditional IHDs have proved inaccessible for disabled and vulnerable users.

Implications for improving the accessibility of smart metering for BPS users

- Consultees felt that Ofgem should make provision of accessible IHDs a supply licence obligation. However, some felt that this would stifle innovation, and that some users would benefit more from access to this type of information via other means. Others felt that existing licence conditions already protected vulnerable groups to a sufficient degree.

- Some consultees felt that manufacturers should recognise the importance of 'inclusive design'.

- IHDs work best when they follow a number of general design principles: Displays are as large as possible and possess a strong colour contrast, buttons are large/protruding and are distinctive enough to be identified by touch, and the device can be affixed to a wall. Suppliers should be encouraged to follow these principles. Steps should be taken to help them share best-practice.

- Instructions governing the operation of IHDs should we written in plain English and be presented in an accessible way.

Ofgem, Information Request on Inclusivity by Design, 2010

B.10 The issues identified below come from responses received by Ofgem in response to their request for information in July 2010. Interested parties were asked to identify the features which would assist different groups in accessing smart metering technology.

Key accessibility issues of relevance to this study

- Large and tactile buttons have been identified as helpful in making IHDs easier to use for vulnerable groups. However, one supplier noted that touch-screen technology was increasingly being incorporated into new IHDs. This poses a range of different challenges.

- Small screens are seen to pose a particular challenge for BPS users.

Implications for improving the accessibility of smart metering for BPS users

- Touch screens were seen to pose a number of challenges for some user groups. It was felt that accessibility could be ensured in a number of ways, for example, the provision for audible feedback and presenting data in a large font.

- Many suppliers have already committed to developing IHDs with a range of screen sizes. This work should continue.

Consumer Focus, Getting to Grips with Smart Displays, 2011

B.11 This report from Consumer Focus seeks to build on the existing body of research exploring issues of accessibility and inclusivity, in the design of In-Home Displays (IHDs), This is targeted at users with a physical or cognitive impairment. Using the general design principles set out in Ofgem's recent publication: Smart Metering Implementation Programme: Response to Prospectus Consultation, four usability experts were commissioned to analyse the performance of eight IHDs and energy monitors (hereafter referred to as IHDs).

Key accessibility issues of relevance to this study

- Battery covers on all of the IHDs within the sample were found to be difficult to remove or replace. Where adapters are required, manufacturers were encouraged to ensure that sockets were easy to access. If free-standing, manufacturers should ensure that stands are robust and easy to deploy.

- Use of some buttons on the IHDs was found to require a high degree of dexterity. This could be problematic for BPS users, and for older users with age-related dexterity impairment such as arthritis. Some IHDs had a touch-screen display. Where these did not provide tactile feedback, they were felt to pose a major difficulty for BPS users.

- Some displays were found to contrast poorly against their background.

- Some displays were found to contain too much information. This made them difficult for some users to interpret.

Implications for improving the accessibility of smart metering for BPS users

- IHDs worked best when they could be powered via the mains.

- Buttons should be large and widely spaced. Buttons designed to access multiple functions should be kept to a minimum, and used only where user pathways are intuitive. If IHDs use a touch-screen display, users should be provided with tactile(and audio) feedback.

- Displays should contrast against their background. Backlights were found to be useful in helping with this. IHDs were easiest to use when the backlight was triggered without recourse to an individual button. Anti-reflective coatings were also considered helpful.

- Devices were most accessible where they provided ambient feedback. Colour coding could improve the accessibility of technical information.

Audible alarms also proved useful. It was noted that none of the devices within the sample contained text to speech functionality.

- Displays work best when they are uncluttered, and contain the minimum amount of 'essential' information. Usability was improved where individual users could choose the format of their home display from a menu of options.

Ofgem, Smart Consumer Protections Package: A Summary of Consultation Responses, 2011

B.12 The issues identified below come from responses received by Ofgem in response to their consultation of April 2011. This looked into how consumers can, and should be, protected from issues likely to arise from the roll-out of smart metering. This had a particular focus on the challenges emerging around remote switching to prepayment, remote disconnection, and the possibility of commercial interoperability.

Key accessibility issues of relevance to this study

- It was felt important that steps were taken to ensure that vulnerable users were not encouraged, via the roll-out of smart meters, to reduce their energy usage in ways that put them at risk.

- It was suggested that smart meters might allow for the partial disconnection of households if bills were unpaid. There was concern that steps need to be taken to ensure that vulnerable households are not put at risk.

- The existing market was felt to be bewildering to many customers, particularly the most vulnerable. If the introduction of smart meters was to add an additional layer of tariffs, this would be highly undesirable.

- Throughout the installation process, suppliers should be mindful of the need for smart meters to be installed in an accessible location. This is particularly important where the user has restricted mobility.

- If 'load limiting' is introduced, consideration must be given to the needs of vulnerable users who might have greater energy needs than those of the average consumer. This would be particularly important where that user is also at risk of fuel poverty.

Implications for improving the accessibility of smart metering for BPS users

- Smart meters have the potential to improve the information available to consumers in making decisions about what energy tariff is most appropriate for them. Ofgem should use the opportunity created by the introduction of smart meters to reform their existing Standards of Conduct and ensure that where a supplier claims to deliver a cheaper

tariff, this is evidenced. Where a customer expresses an interest in a particular tariff, a supplier should be responsible for ensuring that they are made aware of any other options that may help them to reduce their bill. This would be particularly beneficial to vulnerable users, less able to use tools such as comparison websites.

- Suppliers should provide information about smart meters in a variety of formats, including British Sign Language (for deaf or hard of hearing consumers). Training should be provided to users, who wish to receive it, in the use of a smart meter, this should be made accessible for vulnerable users.

- Open standards for IHDs should be developed as these will make energy efficiency and savings easier to make in the first instance, and then ensure that consumers are able to switch tariffs with the minimum of disruption. This is particularly important for vulnerable users which require adaptations to their IHD. Where any costs are incurred due to these adaptations, it was felt these should be borne by the supplier, not an individual consumer.

- An emergency credit (EC) facility was felt to be extremely beneficial for vulnerable households, as long as thresholds are appropriate and do not encourage indebtedness. EC should continue to be offered through prepayment smart meters. However, where this requires additional functionality on IHDs, this should be designed mindful of the challenges faced by many vulnerable users in using this.

- Prior to limiting a user's access to energy, suppliers must be made responsible for assessing the needs of that user, and making appropriate efforts to contact them, and make them aware of the impact of any changes they decide to make.

DECC, Equality Assessment, Smart Metering Impact Assessment, 2012

B.13 The Government is subject to the public sector Equality Duty set out in the Equality Act 2010. This requires public bodies to have due regard to the need to advance equality of opportunity. The roll-out of domestic smart meters has the potential to impact on a range of groups including people with a visual impairment. This document sets out to identify these issues and how they can be addressed.

Key accessibility issues of relevance to this study

- The physical design and location of smart meters must be accessible for those with a visual impairment.

- Additional information may be required for disabled consumers on how to make use of an IHD. This may require on-site visits to help users install their devices.

- Steps may be required to prevent IHDs having a greater impact on disabled users. Protections may be required to present suppliers from abusing vulnerable users, for example, through remote disconnection.

- Steps may be required to ensure that IHDs/smart meters present information in a way that is accessible for disabled users.

Implications for improving the accessibility of smart metering for BPS users

- The Equality Act 2010 places a duty on suppliers to ensure that reasonable adjustments are made to ensure that disabled users are not placed at a 'substantial disadvantage' due to the roll-out of smart meters.

- The Act also stipulates that information on the use of smart meters should be provided in an accessible format. Additional regulatory requirements will be put in place as required.

- IHDs should be designed/installed in a physically accessible location, where they can be accessed easily by a consumer.

- There is concern that vulnerable people will need protection from criminals seeking to capitalise on the roll out of the meters. Suppliers are asked to liaise closely with local authorities and police to minimise these risks.

B.14 Consideration is being given to what additional regulation may be required to protect disabled consumers from the cost of adapting a smart meter/IHD to their requirements.

Annex C: Options assessments

C.1 In this annex we present the individual assessments for each of the options considered:

- Text-to-speech (TTS) functionality in mainstream IHDs
- Niche IHDs, targeted at BPS consumers
- Separate TTS device, linked to standard IHDs
- Accessible smartphone apps, using data provided via the WAN/internet
- Accessible web-based apps, using data provided via the WAN/internet
- Push-SMS text messaging of smart meter info to (BPS-friendly) mobile phones
- Telephone-based information line
- Tailored face-to-face support for those unable to access smart meter information directly.

C.2 For each option we provide a brief description, then consider:

- indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change
- commercial model(s)
- incremental technical complexity and timescales
- incremental operational implications
- indicative incremental costs
- risks and opportunities.

C.3 Note that each of our assessments assume that accessible smartphone and web apps will be available to consumers who own the necessary devices (which are considered under options 4 and 5). If such smart metering applications were *not* made widely available, then the benefits of the other options would be greater than stated here, for those segments.

Option 1: Text-to-speech functionality in mainstream IHDs

C.4 Under this option, text-to-speech (TTS) functionality is included in all IHDs provided, free, to domestic consumers for the mass roll-out of smart metering.

Table C-1: Assessment of option 1

	Assessment
Indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change	The potential inclusion of TTS functionality in IHDs was universally supported in our interviews with BPS consumers – making the information provided by the IHD much more accessible, especially for those with severe sight loss. The following analysis is based on the study team's judgement of the likely effects of this option on accessibility and behavioural change, in the light of those interviews. For c. 90k households (with a BPS adult with severe sight impairment, not living with a sighted adult, and not having access to the web or smartphone), this option makes energy consumption information available which would otherwise not be accessible, without calling on the assistance of a friend or other visitor. While there is no (acceptable) audio equivalent of visual always-on 'ambient indicator, the option still gives these households the opportunity to understand their energy usage patterns and costs better through interaction with the IHD. Combined with other information (on alternative tariffs), the householder can then make more informed decisions on energy saving measures, and whether to move to Time Of Use tariffs that reward shifting to off-peak usage, in the light of their own circumstances. Almost none of the energy saving benefits of smart metering would accrue to these households otherwise (i.e. with a standard non-TTS IHD). **Very significant positive impact for these households.** For c. 80k households (with a BPS adult with severe sight impairment living with a sighted adult, but not having access to the web or smartphone), the option provides the BPS consumer with greater independence and the opportunity for a more active involvement in the household's discussions and actions on saving energy costs. The majority of these households' smart metering benefits would probably be realised through the sighted adult reading the IHD, but the more active participation of the BPS adults would contribute to somewhat greater benefits than would otherwise be achieved. **Significant positive impact for these households.** For c. 30k households (with a BPS adult with severe sight impairment not living with a sighted adult, but having access to the web or smartphone), the option complements the information they could access via their computer or smartphone – providing a more real-time view of energy

	Assessment
	usage than is expected to be available through these other platforms (for example, allowing more immediate checking of the power consumption impact of switching on the washing machine). Some of these households will take advantage of accessible web-based and smartphone apps for analysing their energy usage, but some will just use the IHD. Our interviews with BPS consumers with access to the web or smartphones suggested that the majority of these households' smart metering benefits would probably be realised through householders accessing information via the web or smartphone (if these options are promoted to them) but the more real-time information, and the greater engagement of those who have access to the web/smartphone but don't use it for energy monitoring, could be expected to lead to more extensive behavioural change and somewhat greater benefits than would otherwise be achieved. **Significant positive impact for these households.** For c. 50k households (with a BPS adult with severe sight impairment living with a sighted adult, and having access to the web or smartphone), the option complements the information they could access via their computer or smartphone – providing a more real-time view of energy usage than is expected to be available through these other platforms. Some of these households could be expected to take advantage of the web-based and smartphone apps for analysing their energy usage, but some may just use the IHD. The majority of these households' smart metering benefits could probably be realised through a combination of the sighted adult reading the IHD and the householders accessing information via the web or smartphone (if these options are promoted to them) but the more real-time information for the BPS consumers could be expected to lead to more extensive behavioural change and somewhat greater benefits than would otherwise be achieved. **Minor positive impact for these households**. For c. 510k households (with a BPS adult with moderate or mild sight impairment, not living with a sighted adult, and not having access to the web or smartphone), this option makes energy consumption information more accessible than it would be otherwise. Our interviews with BPS consumers suggested that these consumers may be able to read all or parts of the IHD display, when holding it up close and/or using a magnifier, but this will depend on the design of IHD display (some will be more accessible than others) as well on the extent and nature of their visual impairment. By making it easier for these consumers to interact with their IHD

	Assessment
	(including those IHDs with relatively inaccessible displays), the extent of behaviour change is likely to be significantly greater than it would otherwise be, and so the benefits would be expected to be significantly closer to those achieved in equivalent sighted households. **Significant positive impact for these households.** For c. 510k households (with a BPS adult with moderate or mild sight impairment living with a sighted adult, but not having access to the web or smartphone), the option provides the BPS consumer with somewhat enhanced independence and the opportunity for somewhat more active involvement in the household's discussions and actions on saving energy costs. The large majority of these households' smart metering benefits would probably be realised through the sighted adult reading the IHD, and through the BPS consumers themselves reading all or parts of the IHD display when holding it up close and/or using a magnifier, but the easier interaction with the IHD for the BPS consumers will enable them to have more active participation, and would contribute to somewhat greater benefits than would otherwise be achieved. **Minor positive impact for these households**. For c. 500k households (with a BPS adult with moderate or mild sight impairment living with a sighted adult, and having access to the web or smartphone), the option complements the information they could access via their computer or smartphone – providing the BPS consumer with a more real-time view of energy usage than is available through the half-hourly readings available through these other platforms. Some of these households will take advantage of the web-based and smartphone apps for analysing their energy usage, but some will just use the IHD. The large majority of these households' smart metering benefits would probably be realised through a combination of the sighted adult reading the IHD and the householders accessing information via the web or smartphone (if these options are promoted to them) but the easier interaction with the IHD for the BPS consumers will enable them to have more active participation, and could be expected to lead to more extensive behavioural change and somewhat greater benefits than would otherwise be achieved. **Minor positive impact for these households**. For c. 26 million households (with no BPS adults), the TTS functionality on the IHDs arguably makes the IHDs slightly more accessible (there may be benefits, for example, for people with dyslexia or literacy problems) – though many will choose to disable (or not enable) the TTS feature. If disabled

	Assessment
	by default, the TTS is only likely to be used by a minority of these households. **Very minor positive impact for these households.**
Commercial model(s)	Our discussions with energy suppliers and IHD vendors indicated that there is very little prospect of this option happening in practice, unless the energy suppliers were obliged to include TTS functionality in their IHDs, by the Government. The emphasis is on minimising the costs of standard IHDs, while still conforming to the SMETS requirements. If this option happened, then the additional costs incurred would be passed onto all consumers via their energy bills over time. The requirement on energy suppliers to provide one IHD per household only extends to the initial smart metering roll-out, and it is then left to the market to determine what IHDs will be provided to consumers, and at what price.
Incremental technical complexity and timescales	This option would require addition of TTS software, additional memory, extra processing power, higher quality speakers, and additional menu options (to enable/disable TTS) into standard IHDs. Vendor consultees suggested that such a product would best be developed as a variant on their typical mid-range IHDs (i.e. a device with more functionality than that required just to meet SMETS requirements, but less fully-featured than top-of-the range models), which already possess much of the additional processing power and memory required to implement TTS. This approach would minimise development costs and timescales. One vendor noted that this would include a 7" full colour display with backlight capability, which would also significantly improve usability for BPS consumers, when compared to a cost-engineered IHD (usually with a smaller display) meeting the minimum requirements. We anticipate that this option would in practice involve extensive discussions with industry. Our discussions with IHD vendors suggest that it is unlikely to happen without a mandatory approach. If an amendment to SMETS is then required, it is unlikely that this would be possible until beyond the end of 2013. Development, testing and procurement would take a further 12-18 months; so market-ready products would be available mid 2015 if a specification and requirement could be agreed with industry by the end of 2013.
Incremental operational	The TTS functionality will inevitably increase the complexity of setting up the device to get the best out of it. Installation

	Assessment
implications	teams, customer helplines of energy suppliers and their IHD providers will need to be trained – and provided with the appropriate scripts/tools – for helping customers who are having difficulty with the TTS feature on their IHD. However, the improved usability and larger display of this IHD could reduce customer support costs in the longer term as consumers should find it easier to understand and operate. BPS consumers may be able to access support from others more easily if their sighted friends and relatives are using similar IHDs.
Indicative incremental costs	The cost estimates here assume that mainstream IHDs are purchased by energy companies in average volumes of about 2 million units per IHD supplier, delivered over a number of years. If the product were built as a variant of a mid-range IHD that includes a 7" colour display we estimate that this option would add hardware costs in the order of £12 to £17 to standard IHDs (over and above the £15 unit cost price point assumed in the Impact Assessment), given the volumes associated with the full roll-out, based on our discussions with some vendors, combined with our own professional judgement. A licence to high quality TTS software would cost around £2. This implies a total unit cost of £29 to £34. With a smaller monochrome display the likely hardware incremental cost would be £7 to £12, so with TTS this suggests total additional costs of £9 to £14, and a total unit cost of £24 to £29. Assuming the smaller monochrome display, this option would incur additional total costs in the order of £220 million to £350 million over the course of the main rollout to about 25 million households (assuming 3 million of the 28 million households are rolled out in the Foundation Stage, prior to the main roll-out), in comparison to the £15 unit cost currently assumed for a standard IHD. Hence we estimate a total additional cost in the order of **£220 million to £350 million** for this option[23].
Risks and opportunities	In the light of our discussions with IHD vendors, we anticipate strong resistance from industry to this option, and there would be a significant risk to the overall smart metering roll-out schedule if this led to protracted debate on an amendment to SMETS. Requiring the incorporation of TTS functionality into IHDs

[23] Note that none of the costs cited in this report have been discounted; i.e. they are not 'Present Values'

	Assessment
	could potentially stifle the scope for innovation somewhat (through 'crowding out' other potential features which could otherwise be incorporated within a given price point). By raising the costs per unit, this may also increase barriers to market entry –for IHD vendors, energy suppliers and third party energy management service providers. Opportunities include the potential that this option could engage some BPS consumers in better energy management, who would not otherwise choose to take a niche IHD (option 2) or other potential means of accessing their consumption information.

Source: SQW and Astutim

Option 2: Niche IHDs, targeted at BPS consumers

C.5 Under this option, energy suppliers would offer households with BPS consumers a (free) IHD designed specifically for visually impaired people. These IHDs meet certain minimum legibility guidelines for the displays; meet certain button size, labelling and spacing guidelines; and also include TTS functionality.

Table C-2: Assessment of option 2

	Assessment
Indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change	As noted under option 1, the potential inclusion of TTS functionality in IHDs was universally supported in our interviews with BPS consumers – making the information provided by the IHD much more accessible, especially for those with severe sight loss. Our interviewees also pointed out a number of ways in which the visual/physical accessibility of IHDs could be improved (larger text, backlighting, larger buttons etc.), so this option 2 would go further than option 1 in making the IHD accessible to BPS people with a variety of sight loss conditions. The following analysis is based on the study team's judgement of the likely effects of this option on accessibility and behavioural change, in the light of those interviews. For c. 90k households (with a BPS adult with severe sight impairment, not living with a sighted adult, and not having access to the web or smartphone), this option makes energy consumption information available which would otherwise not be accessible, without calling on the assistance of a friend or other visitor. While there is no (acceptable) audio equivalent of visual always-on 'ambient indicator, the option still gives these households the opportunity to understand their energy usage patterns and costs better through interaction with the IHD. Combined with other information (on alternative tariffs), the householder can then make more informed decisions on energy saving measures, and whether to move to Time Of Use tariffs that reward shifting to off-peak usage, in the light of their own circumstances. Almost none of the energy saving benefits of smart metering would be expected to accrue to these households otherwise (i.e. with a standard non-TTS IHD). **Very significant positive impact for these households.** For c. 80k households (with a BPS adult with severe sight impairment living with a sighted adult, but not having access to the web or smartphone), the option provides the BPS consumer with greater independence and the opportunity for a more active involvement in the household's discussions and actions on saving energy costs. The majority of these households' smart metering benefits would probably be

	Assessment
	realised through the sighted adult reading the IHD, but the more active participation of the BPS adults could be expected to contribute to somewhat greater benefits than would otherwise be achieved. **Significant positive impact for these households.** For c. 30k households (with a BPS adult with severe sight impairment not living with a sighted adult, but having access to the web or smartphone), the option complements the information they could access via their computer or smartphone – providing a more real-time view of energy usage than is expected to be available through these other platforms (for example, allowing more immediate checking of the power consumption impact of switching on the washing machine). Some of these households will take advantage of accessible web-based and smartphone apps for analysing their energy usage, but some will just use the IHD. The majority of these households' smart metering benefits would probably be realised through householders accessing information via the web or smartphone (if these options are promoted to them) but the more real-time information, and the greater engagement of those who have access to the web/smartphone but don't use it for energy monitoring, could be expected to lead to more extensive behavioural change and somewhat greater benefits than would otherwise be achieved. **Significant positive impact for these households.** For c. 50k households (with a BPS adult with severe sight impairment living with a sighted adult, and having access to the web or smartphone), the option complements the information they could access via their computer or smartphone – providing a more real-time view of energy usage than is available through these other platforms. Some of these households will take advantage of accessible web-based and smartphone apps for analysing their energy usage, but some will just use the IHD. The majority of these households' smart metering benefits would probably be realised through a combination of the sighted adult reading the IHD and the householders accessing information via the web or smartphone (if these options are promoted to them) but the more real-time information for the BPS consumers could be expected to lead to more extensive behavioural change and somewhat greater benefits than would otherwise be achieved. **Minor positive impact for these households**. For c. 510k households (with a BPS adult with moderate or mild sight impairment, not living with a sighted adult, and not having access to the web or smartphone), this option makes energy consumption information much more accessible than

	Assessment
	it would be otherwise. As the device will meet certain minimum requirements for the display (as well as offering TTS functionality), many more of these consumers will be able to use their remaining vision to read the IHD (possibly holding it up close and/or using a magnifier). By making it easier for these consumers to interact with their IHD, the extent of behaviour change is likely to be significantly greater than it would otherwise be, and so the benefits would be significantly closer to those achieved in equivalent sighted households. **Very significant positive impact for these households.** For c. 510k households (with a BPS adult with moderate or mild sight impairment living with a sighted adult, but not having access to the web or smartphone), the option provides the BPS consumer with somewhat enhanced independence and the opportunity for somewhat more active involvement in the household's discussions and actions on saving energy costs. The easier interaction with the IHD for the BPS consumers would be expected to enable them to have more active participation, and would therefore be expected to contribute to somewhat greater benefits than would otherwise be achieved. **Significant positive impact for these households**. For c. 500k households (with a BPS adult with moderate or mild sight impairment living with a sighted adult, and having access to the web or smartphone), the option complements the information they could access via their computer or smartphone – providing the BPS consumer with a more real-time view of energy usage than is available through the half-hourly readings available through these other platforms. Some of these households will take advantage of the web-based and smartphone apps for analysing their energy usage, but some will just use the IHD. The large majority of these households' smart metering benefits would probably be realised through a combination of the sighted adult reading the IHD and the householders accessing information via the web or smartphone (if these options are promoted to them) but the easier interaction with the IHD for the BPS consumers will enable them to have more active participation, and could be expected to lead to more extensive behavioural change and somewhat greater benefits than would otherwise be achieved. **Minor positive impact for these households**. For c. 26 million households (with no BPS adults), there is no impact, as they will continue to be provided with the energy suppliers' standard IHDs. **No impact for these households.**
Commercial	Under this option the energy suppliers would provide the

	Assessment
model(s)	option of an IHD designed to meet certain minimum requirements to assist BPS consumers, to any household with a visually impaired adult. The minimum requirements for such devices would need to be developed by energy suppliers and IHD vendors in liaison with other stakeholders, and with the involvement of BPS people of various ages and sight conditions. This would presumably need to be 'signed off' by an organisation with an appropriate and recognised remit – possibly the new Central Delivery Body, as its proposed objectives include assisting vulnerable consumers to realise the benefits of smart metering . The energy suppliers would be responsible for obtaining the equipment through their normal procurement processes, including the development of their own specifications (compliant with the agreed minimum requirements). The equipment may or may not be procured from the same supplier(s) as the standard IHDs. In order to maximise volume and reduce costs there may be advantage in energy suppliers getting together and making a joint procurement of one or perhaps two niche IHD devices, rather than each energy supplier individually procuring much smaller quantities of different designs. These devices are likely to have higher unit costs than standard IHDs (see below), but they are a replacement for, rather than an addition to, the standard IHD (so the total cost to energy suppliers will be limited to the difference in cost of the niche IHD compared to the standard times the number of consumers who request it) Any additional costs incurred may be passed onto all consumers (not just the BPS consumers) via their energy bills over time. There would be significant uncertainties as to the actual level of demand for these devices. Although these uncertainties will be reduced after the first year or two of the roll-out, the suppliers of these niche IHDs will need to be confident of recouping their development costs even if actual demand turns out to be low. Pricing may therefore need to combine funding for the development as well as unit prices for the equipment (which are likely to be relatively high initially, for relatively low volumes in the initial orders).
Incremental technical complexity and timescales	Compared with standard IHDs this is likely to involve larger minimum font sizes (and hence less information per screen), anti-reflective screens, backlighting, the ability to increase/reduce font size, higher contrast, the option to reverse the display (to white-on-black), the addition of TTS

	Assessment
	software, additional memory, extra processing power, a higher quality speaker, and additional menu options (to enable/disable TTS). As for Option 1, vendor consultees suggested that such a product would be best developed as a variant on their typical mid-range IHDs, which already possess much of the additional processing power and memory required to implement TTS. This approach would minimise development costs and timescales. One vendor noted that this would include a 7" full colour display with backlight capability, which would also significantly improve usability for BPS consumers, when compared to a cost-engineered IHD (usually with a smaller display) that meets the minimum requirements. Our discussions with energy suppliers and IHD vendors did not find any evidence of any firm plans, at the time of the interviews, to develop such a product tailored for BPS consumers. We therefore anticipate that this option would in practice involve extensive discussions with industry, and it is unlikely that an agreed specification of minimum requirements could be issued before the end of 2013. Note that in this case, however, there would be no impact on the remainder of the Smart Metering rollout as this niche IHD would simply be an additional product added to the range of each energy supplier, the specification of their other IHDs remaining unchanged. Development, testing and procurement would take a further 12-18 months; so market-ready products would be available by mid 2015 if a specification of minimum requirements could be agreed with industry by the end of 2013.
Incremental operational implications	As with Option 1, the TTS functionality will inevitably increase the complexity of setting up the device to get the best out of it. Installation teams, customer helplines of energy suppliers and their IHD providers will need to be trained – and provided with the appropriate scripts/tools – for helping customers who are having difficulty with the TTS feature on their IHD. Since this product will be shipped in lower quantities than under Option 1 (where all IHDs would have the additional functionality) then this complexity will apply to fewer installations. However, lack of product familiarity by installers might require special attention in terms of training, to ensure that when they do supply one of these IHDs the consumer receives the best level of assistance in setting it up. However, the improved usability and larger display of this IHD could reduce customer support costs in the longer term

	Assessment
	as consumers who ask for it should find it easier to understand and operate.
Indicative incremental costs	The lower volume requirement for this product means there would be a useful cost advantage if energy suppliers got together and made a joint procurement of a suitable niche IHD product – provided, of course, that this is permissible under competition law. The cost estimates here assume that a single supply contract is entered into covering a total of 1 million niche IHDs delivered over a three year period (about half all households with a BPS adult). If the product were built as a variant of a mid-range IHD that includes a 7" colour display we estimate that this option would add hardware costs in the order of £14 to £19 to standard IHDs (versus the £15 total unit cost price point assumed in the Impact Assessment). As in Option 1 a licence to high quality TTS software would cost around £2, bringing the total additional cost to £16 to £21, and a total unit cost of £31 to £36. With a smaller monochrome display the likely hardware incremental cost would be £9 to £14, so with TTS this suggests total additional costs of £11 to £16, and a total unit cost of £26 to £31. Assuming that 1 million niche IHDs are installed by energy companies then the additional cost spread across all energy companies would therefore be in the order of £11 million to £21 million.. Hence we estimate a total additional cost in the order of **£11 million to £21 million** for this option.
Risks and opportunities	A key risk for this option is that actual demand for the niche IHD turns out to be low, leading to relatively high unit costs. However, smaller shipments would also result in correspondingly lower overall costs to energy companies. An opportunity is that the process of engaging energy providers and IHD vendors in the development of the minimum requirements specification for this niche IHD could lead to certain accessibility features being incorporated more commonly into standard IHDs – thereby making smart metering information somewhat more accessible to all (including those people suffering gradual loss of sight). If energy suppliers see the value (e.g. in terms of customer satisfaction and engagement) in supplying more than the most basic IHD then they may decide to increase the performance of their mainstream devices, which would benefit many more consumers and support innovation and diversity in the IHD supply market.

Source: SQW and Astutim

Option 3: Separate TTS device, linked to standard IHDs

C.6 Under this option, energy suppliers offer BPS consumers a (free) device designed to link to the household's IHD, providing an audio read-out of the IHD display through TTS functionality. These devices are required to link to SMETS-compatible IHDs either wirelessly over the Home Area Network, or by plugging into a USB port (not required under SMETS, but included in various commercial IHDs).

Table C-3: Assessment of option 3

	Assessment
Indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change	This option was not explicitly tested with BPS consumers in our research, but as noted in option 1, the potential addition of TTS functionality to IHDs was universally supported in these interviews– making the information provided by the IHD much more accessible, especially for those with severe sight loss. The following analysis is based on the study team's judgement of the likely effects of this option on accessibility and behavioural change, in the light of those interviews. For c. 90k households (with a BPS adult with severe sight impairment, not living with a sighted adult, and not having access to the web or smartphone), this option makes energy consumption information available which would otherwise not be accessible, without calling on the assistance of a friend or other visitor. While there is no (acceptable) audio equivalent of visual always-on 'ambient indicator, the option still gives these households the opportunity to understand their energy usage patterns and costs better through interaction with the IHD. Combined with other information (on alternative tariffs), the householder can then make more informed decisions on energy saving measures, and whether to move to Time Of Use tariffs that reward shifting to off-peak usage, in the light of their own circumstances. Almost none of the energy saving benefits of smart metering would accrue to these households otherwise (i.e. with just a standard non-TTS IHD). **Very significant positive impact for these households.** For c. 80k households (with a BPS adult with severe sight impairment living with a sighted adult, but not having access to the web or smartphone), the option provides the BPS consumer with greater independence and the opportunity for a more active involvement in the household's discussions and actions on saving energy costs. The majority of these households' smart metering benefits would probably be realised through the sighted adult reading the IHD, but the more active participation of the BPS adults could be expected to contribute to somewhat greater benefits than

	Assessment
	would otherwise be achieved. **Significant positive impact for these households.** For c. 30k households (with a BPS adult with severe sight impairment not living with a sighted adult, but having access to the web or smartphone), the option complements the information they could access via their computer or smartphone – providing a more real-time view of energy usage than is expected to be available through these other platforms (for example, allowing more immediate checking of the power consumption impact of switching on the washing machine). Some of these households will take advantage of accessible web-based and smartphone apps for analysing their energy usage, but some will just use the IHD. The majority of these households' smart metering benefits would probably be realised through householders accessing information via the web or smartphone (if these options are promoted to them) but the more real-time information, and the greater engagement of those who have access to the web/smartphone but don't use it for energy monitoring, could be expected to lead to more extensive behavioural change and somewhat greater benefits than would otherwise be achieved. **Significant positive impact for these households.** For c. 50k households (with a BPS adult with severe sight impairment living with a sighted adult, and having access to the web or smartphone), the option complements the information they could access via their computer or smartphone – providing a more real-time view of energy usage than is expected to be available through these other platforms. Some of these households will take advantage of accessible web-based and smartphone apps for analysing their energy usage, but some will just use the IHD. The majority of these households' smart metering benefits would probably be realised through a combination of the sighted adult reading the IHD and the householders accessing information via the web or smartphone (if these options are promoted to them) but the more real-time information for the BPS consumers could be expected to lead to more extensive behavioural change and somewhat greater benefits than would otherwise be achieved. **Minor positive impact for these households**. For c. 510k households (with a BPS adult with moderate or mild sight impairment, not living with a sighted adult, and not having access to the web or smartphone), this option makes energy consumption information more accessible than it would be otherwise. These consumers may be able to read all or parts of the IHD display, when holding it up close

	Assessment
	and/or using a magnifier, but this will depend on the design of IHD display (some will be more accessible than others) as well on the extent and nature of their visual impairment. By making it easier for these consumers to interact with their IHD (including those IHDs with relatively inaccessible displays), the extent of behaviour change is likely to be significantly greater than it would otherwise be, and so the benefits could be significantly closer to those achieved in equivalent sighted households. **Significant positive impact for these households.** For c. 510k households (with a BPS adult with moderate or mild sight impairment living with a sighted adult, but not having access to the web or smartphone), the option provides the BPS consumer with somewhat enhanced independence and the opportunity for somewhat more active involvement in the household's discussions and actions on saving energy costs. The large majority of these households' smart metering benefits would probably be realised through the sighted adult reading the IHD, and through the BPS consumers themselves reading all or parts of the IHD display when holding it up close and/or using a magnifier, but the easier interaction with the IHD for the BPS consumers will enable them to have more active participation, and could contribute to somewhat greater benefits than would otherwise be achieved. **Minor positive impact for these households**. For c. 500k households (with a BPS adult with moderate or mild sight impairment living with a sighted adult, and having access to the web or smartphone), the option complements the information they could access via their computer or smartphone – providing the BPS consumer with a more real-time view of energy usage than is available through these other platforms. Some of these households will take advantage of accessible web-based and smartphone apps for analysing their energy usage, but some will just use the IHD. The large majority of these households' smart metering benefits would probably be realised through a combination of the sighted adult reading the IHD and the householders accessing information via the web or smartphone (if these options are promoted to them) but the easier interaction with the IHD for the BPS consumers will enable them to have more active participation, and could be expected to lead to more extensive behavioural change and somewhat greater benefits than would otherwise be achieved. **Minor positive impact for these households**. For c. 24 million households (with no BPS adults), there is no impact, as they will not be provided with additional TTS

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	device. **No impact for these households.**
Commercial model(s)	Under this option the energy suppliers provide the option of separate TTS device, which interfaces with the standard IHD, to any household with a visually impaired adult. Given the differences between IHDs it is likely that such a device would need to be tailored to a specific IHD (or for accessories to be available for several different makes of IHD). The energy suppliers will be responsible for obtaining the equipment through their normal procurement processes, including the development of their own specifications. The equipment may or may not be procured from the same supplier(s) as the standard IHDs. These devices are in addition to, rather than a replacement for, the standard IHD (so they will not reduce the number of standard IHDs required). Additional costs incurred may be passed onto all consumers (not just the BPS consumers) via their energy bills over time. As with option 2, there will be significant uncertainties as to the actual level of demand for these devices. Although these uncertainties will be reduced after the first year or two of the roll-out, the suppliers of these TTS devices will need to be confident of recouping their development costs even if actual demand turns out to be low. Pricing may therefore need to combine funding for the development as well as unit prices for the equipment (which are likely to be relatively high initially, for relatively low volumes in the initial orders).
Incremental technical complexity and timescales	The proposal here would be to develop a bespoke separate 'accessory' device which could be supplied on request to BPS consumers. This would be an approved Smart Metering HAN device, connecting by radio just like an IHD. It would be able to query the Comms Hub (or mimic the user interface of the IHD) to obtain energy usage information as would be displayed on the screen of the IHD. It would have no display, but would have buttons for navigation and built-in TTS capability for all its output functions, menu navigation guidance, etc. More detailed discussion would be required with industry to determine whether the most cost-effective solution would be for the accessory to be linked to a specific IHD (thus acting as an additional UI for this device) or supplied as a stand-alone product (thus incorporating all the functions of an IHD, except the display). For the purposes of this assessment we assume that the accessory is wirelessly linked to a specific IHD and therefore

	Assessment
	needs only to mimic that device's UI but using voice output rather than a display. Such a device would be straightforward to develop and we estimate could be available within 9-12 months of agreeing a specification with an IHD supplier.
Incremental operational implications	Unlike Options 1 and 2, the accessory device would only be used by people with little or no sight, so the TTS functionality would be required all the time. This could be used to simplify the setup procedure as it could be pre-configured with the help of BPS users advising the design team in order to provide an optimum initial interface for its target BPS consumers. As with Option 2, this product will apply to a relatively small number of installations so lack of product familiarity by installers might require special attention in terms of training, to ensure that when they do supply one of these accessories the consumer receives the best level of assistance in setting it up. Customer helplines of energy suppliers and their IHD providers would also need to be trained to support consumers who use the accessory.
Indicative incremental costs	For this option, we assume volumes in the order of 350k (all those households with severe sight loss BPS adults, plus about a quarter of households with moderate sight loss). We estimate that an accessory device of this type that links wirelessly to and mimics the user interface of an IHD could be procured in quantities of 350k over three years for £12 to £15 per unit, including the cost of TTS software. This would be in addition to the costs of the standard IHD to which it interfaces, hence total additional costs for this option are in the order of **£4 million to £5 million**.
Risks and opportunities	A key risk for this option is that actual demand for the TTS device turns out to be low, leading to relatively high unit costs. A further risk is that a small separate device could easily get lost, leading to some BPS consumers losing access to their smart metering information altogether. This would perhaps be an argument in favour of a device that stays plugged into a standard IHD via a USB port, rather than a wireless device.

Source: SQW and Astutim

Option 4: Accessible smartphone apps, using data provided via the WAN/internet

C.7 Under this option, BPS consumers access their smart meter information through accessible smartphone apps, taking advantage of the smartphone's inbuilt ability to zoom/magnify text, and also readily-available TTS functionality such as the iPhone's VoiceOver screen reader, or IVONA's Text-to-Speech HQ for Android.

Table C-4: Assessment of option 4

	Assessment
Indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change	Our interviews with BPS consumers found that those with smartphones were very positive towards this option, and considered smartphones to be leading the way in terms of accessibility for BPS people (including built-in or free accessibility features) – though they noted that some apps are more accessible than others. However, many of our interviewees did not have (and did not intend to get) a smartphone. Furthermore, touchscreens were found to be difficult for many. The following analysis is based on the study team's judgement of the likely effects of this option on accessibility and behavioural change, in the light of those interviews. For many of the c. 220k households with a BPS adult who has a smartphone (whether or not they live with a sighted adult), this option provides an excellent means of accessing smart metering information. Apple's incorporation of accessibility features, including TTS, by default into the iPhone (and other products) was highlighted as 'the way to go' by a number of our BPS interviewees, including some older people. With the smartphone being a personal device and used for a variety of purposes throughout the day, this option could potentially lead to some BPS consumers interacting more with their smart metering information than they would through an accessible IHD. A proportion of these households will not download/use smartphone apps for smart metering; however, they are highly likely also to be computer/web users, and some may choose to access smart metering information through that means (option 5) rather than via their smartphone. **Very significant positive impact for these households.** For c. 1.8 million households with BPS adults who do not have smartphones, this option has no impact, as the required device is not available to them (Note that 78% of GB adults with sight loss are aged 65+, so the take-up of smartphones will be much lower on average among BPS people than the population as a whole; we also found that many of our interviewees had considerable difficulty using

	Assessment
	touchscreens). **No impact for these households.** This option will, of course, be available to smartphone users who are not visually impaired. We anticipate that it will be a popular means of accessing smart metering information, especially amongst younger consumers – though we have not explored this for non-BPS consumers in our research.
Commercial model(s)	This option is highly likely to happen through normal market forces. Energy suppliers and third party service providers will develop smartphone apps for smart metering information (some are already providing consumption information via smartphone apps for 'dumb metering' such as the British Gas app[24], and the E.ON Energy app[25]; and IHD vendors/service providers are already offering smart equivalents, such as the AlertMe app[26], and the OWL Intuition app[27]). We anticipate that smart metering apps will typically be offered free of charge by energy suppliers to their customers (though the consumer will pay for the data downloaded, and/or this will count in their bundled data usage allowance). iPhones now include VoiceOver TTS functionality by default, and various TTS apps are available for Android[28] phones, many of which are free to install.
Incremental technical complexity and timescales	This option is appropriate to BPS consumers who possess smartphones, so it is assumed that they are comfortable with technology and used to making use of assistive software designed for BPS users. This option requires a portal to be made available for consumers to log into. The portal requires strong security as it gives access to consumption data for every consumer. An application is required on the phone. This queries the portal and requests the information that the consumer has asked for. The information is acquired from the consumer's Smart Metering System via the WAN and delivered via the portal to the consumer's smartphone, where it is displayed on the screen. A TTS system (resident on the smartphone) would be included in the system so that BPS consumers could simply select this as a preference and all their information, and

[24] http://www.britishgas.co.uk/youraccount/discover/app.html
[25] https://www.eonenergy.com/for-your-home/your-account/Smartphone-app
[26] https://www.alertme.com/how-we-do-it/products-and-services/smart-energy/
[27] https://itunes.apple.com/gb/app/owl-intuition/id554157784?mt=8
[28] https://play.google.com/store/search?q=text+to+speech&c=apps

	Assessment
	navigation of the portal, would be converted into speech for them. Smartphone energy monitoring apps are already available from a number of service providers, TTS functionality is available built-in or free on smartphones, and we anticipate that the energy suppliers will be developing smartphone apps for mainstream use anyway – hence the *additional* technical complexity associated with this option will be close to zero. We estimate that it should be possible for each of the energy suppliers to be able to develop accessible smartphone apps within about 6 to 12 months of defining the requirement. Note that there is a potential variant on Option 4 whereby a Smart Metering HAN gateway device is installed in the consumer's home. This has a WiFi transceiver built-in and a consumer can connect directly to the gateway and use this to request energy usage information as if it was an IHD. However, as it involves additional equipment in the home, this option involves substantially more cost than a standard smartphone app (operating over the WAN).
Incremental operational implications	For minimum cost the web portal(s) should be managed as part of the energy companies' or the DCC's main systems. If owned by energy companies they could be part of their existing consumer web portals, and could use their existing security and login systems (which would be accessed by the smartphone app), and their existing call centres for customer support.
Indicative incremental costs	This option requires a smartphone app and a portal giving access to the consumer's Smart Metering System. In practice, we envisage that the *additional* costs for this option will be approximately **zero**, as it is highly likely that energy suppliers will develop smartphone apps for smart metering information anyway, and it should be relatively straightforward to influence the design of these apps to be accessible to BPS consumers.
Risks and opportunities	One significant risk around this option is that some of the smartphone apps developed by major players for the mass market could turn out to have poor accessibility (i.e. not working well with smartphones' built-in accessibility features). Our interviews with BPS consumers highlighted that some smartphone apps are more accessible than others to BPS people; charts can be a particular problem for screen readers, for example. There may be a role for DECC and other interested stakeholders in raising awareness of good accessibility design practices for such

	Assessment
	apps, and in assessing the accessibility of commercially available apps. Over the longer term (over the next 20 years, say) the use of smartphones is likely to become much more prevalent amongst BPS people than we are expecting will be the case by 2017. This will therefore become an increasingly relevant and important platform through which BPS consumers access their smart metering information.

Source: SQW and Astutim

Option 5: Accessible web-based apps, using data provided via the WAN/internet

C.8 Under this option, BPS consumers access their smart meter information through the websites of energy suppliers or third party service providers (via computer, tablet or smartphones), taking advantage of the magnification and screen reader assistive technologies available for these devices.

Table C-5: Assessment of option 5

	Assessment
Indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change	Our interviews with BPS consumers found that those with access to the web were very positive towards this option, especially as many had invested in assistive technologies for their computers such as screen readers. They also noted that some websites are more accessible than others, and had some concerns that smart metering consumption information lends itself to being displayed through charts, which are not readily interpreted by screen readers. Furthermore, many of our interviewees did not have (and did not intend to get) access to the internet. The following analysis is based on the study team's judgement of the likely effects of this option on accessibility and behavioural change, in the light of those interviews. For many of the c. 860k households with a BPS adult who has access to the web (whether or not they live with a sighted adult), this option provides a helpful means of accessing smart metering information, using the assistive technologies already built-into or installed on their computers, such as screen readers and magnification functionality – provided that these websites are designed to be compatible with these technologies. A proportion of these households will not go online to access their smart metering information; however, a minority will also be smartphone users, and may choose to access smart metering information through smartphone apps (option 4) rather than via the web. For c. 30k of these households (with severe sight loss, not living with a sighted adult, but with access to the web), this would be the only realistic means of accessing their smart meter information, in the absence of a TTS-enabled IHD. This option has the advantages of having considerably more processing power, memory and screen available via the cloud and consumers' computers (compared with IHDs), and we anticipate that this channel will become increasingly sophisticated in helping consumers understand and manage their energy consumption and their choice of suppliers and tariffs – albeit that the information provided through this channel will not be as 'real-time' (and 'always on') as that provided by IHDs. **Very significant positive impact for**

	Assessment
	these households. For c. 1.2 million households with BPS adults who do not have access to the web, this option has no impact, as the required channel is not available to them (Note that 78% of GB adults with sight loss are aged 65+, so the take-up of computers and internet access will be much lower on average among BPS people than the population as a whole). **No impact for these households.** This option will, of course, be available to internet users who are not visually impaired. We anticipate that it will be a popular means of accessing smart metering information, especially amongst younger consumers – though we have not explored this for non-BPS consumers in our research.
Commercial model(s)	This option is highly likely to happen through normal market forces. Energy suppliers and third party service providers will develop online access for smart metering information, and we anticipate that these will typically be offered free of charge to customers (of energy and/or of energy management systems). Some are already providing consumption information online for 'dumb metering' such as British Gas's EnergySmart service[29], and E.ON's Energy Tracker[30]; IHD vendors/service providers are already offering smart equivalents, such as Current Cost[31], and GEO's MyEnergy online service[32]; some of the energy suppliers we consulted confirmed that they are seeking to make smart metering information available through online portals – as is already the case for energy suppliers in a number of overseas markets (see, for example, Contact Energy[33] in New Zealand).
Incremental technical complexity and timescales	This option requires energy suppliers to develop portals for their customers to log into, to access their smart metering information. The portal requires strong security as it will hold consumption data for every consumer. Smart energy monitoring apps are already available online from a number of providers, TTS functionality and other assistive technology is already widely used by BPS people on their computers, and we anticipate that the energy suppliers will be developing online smart metering applications for mainstream use anyway – hence the

[29] http://www.britishgas.co.uk/products-and-services/gas-and-electricity/energysmart.html?bglink_id=imm10005
[30] https://www.eonenergy.com/for-your-home/your-account/Energy-tracker-Information
[31] http://my.currentcost.com/
[32] http://www.greenenergyoptions.co.uk/what-we-do/online-services/myenergy/
[33] http://www.contactenergy.co.nz/web/findoutabout/smartconnect?vert=fh

	Assessment
	additional technical complexity associated with this option will be close to zero.
Incremental operational implications	As for Option 4, for minimum cost the web portal should be managed as part of the energy companies' or the DCC's main systems. If owned by energy companies it could be part of their existing consumer web portals, and could use their existing security and login systems, and their existing call centres for customer support. If a centralised (DCC-operated) system is preferred then this would require a set of customer-facing services to be provided, including security management and customer support.
Indicative incremental costs	As with option 4, in practice we envisage that the *additional* costs for this option will be approximately **zero**, as it is highly likely that energy suppliers will develop online access for smart metering information anyway, and it should be relatively straightforward to influence the design of these services to be accessible to BPS consumers.
Risks and opportunities	One significant risk around this option is that some of the online applications developed by major players for the mass market could turn out to have poor accessibility (i.e. not working well with assistive technologies). Our interviews highlighted that some websites are more accessible than others to BPS people – charts can be a particular problem for screen readers, for example. There may be a role for DECC and other interested stakeholders in raising awareness of good accessibility design practices, and in assessing the accessibility of commercially available applications. Over the longer term (over the next 20 years, say) the use of the internet is likely to become much more prevalent amongst BPS people than we are expecting will be the case by 2017. This will therefore become an increasingly relevant and important platform through which BPS consumers access their smart metering information.

Source: SQW and Astutim

Option 6: Push-SMS text messaging of smart meter info to (BPS-friendly) mobile phones

C.9 Under this option, BPS consumers are provided with regular updates of their energy usage, via SMS text messaging services provided by energy suppliers and third party service providers. The phones for this service do not need to be smartphones, and a variety of BPS-friendly devices are commercially available (including those sold by the RNIB); features can include large buttons, large text and in-built TTS functionality.

Table C-6: Assessment of option 6

	Assessment
Indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change	This option was not explicitly tested with consumers, as the suggestion emerged later on in the process. The following analysis is based on the project team's judgement of the likely effects of this option on accessibility and behavioural change, in the light of the general feedback from BPS consumers, and our understanding of what level of information an SMS-based service could realistically convey. For c. 50k households (with a BPS adult with severe sight impairment, not living with a sighted adult, and having a mobile phone), this is a potentially useful option for accessing smart metering information. Drawing on data from RNIB and Ofcom, we estimate that about half of these households will also have access to the web, which would provide more functional access to the information than would be feasible through SMS. However, for the remainder, this may be the only means of the BPS adult personally gaining independent access to the smart metering information, in the absence of TTS-enabled IHDs, and while it would not provide real-time always-on information (as an IHD does for a sighted person), the option still gives these households the opportunity to understand their energy usage patterns and costs better. **Very significant positive impact for these households**. For c. 70k households (with a BPS adult with severe sight impairment, living with a sighted adult, and having a mobile phone), this option provides the BPS consumer with greater independence and the opportunity for a more active involvement in the household's discussions and actions on saving energy costs. The majority of these households' smart metering benefits could probably be realised through the sighted adult reading the IHD, but the more active participation of the BPS adults could be expected to contribute to somewhat greater benefits than would otherwise be achieved. **Significant positive impact for these households.** For c. 390k households (with a BPS adult with mild or

	Assessment
	moderate sight impairment, not living with a sighted adult, and having a mobile phone), this option makes energy consumption information more accessible than it would be otherwise. These consumers may be able to read all or parts of the IHD display, when holding it up close and/or using a magnifier, but this will depend on the design of IHD display (some will be more accessible than others) as well on the extent and nature of their visual impairment. Being provided with an alternative means of accessing the information, through a device with which they are already familiar, these consumers' behaviour change is likely to be significantly greater than it would otherwise be, and so the benefits could be expected to be significantly closer to those achieved in equivalent sighted households. **Significant positive impact for these households.** For c. 620k households (with a BPS adult with mild or moderate sight impairment, living with a sighted adult, and having a mobile phone), this option provides the BPS consumer with somewhat enhanced independence and the opportunity for somewhat more active involvement in the household's discussions and actions on saving energy costs. The large majority of these households' smart metering benefits could probably be realised through the sighted adult reading the IHD, and through the BPS consumers themselves reading all or parts of the IHD display when holding it up close and/or using a magnifier, but the more active participation of the BPS adults could be expected to contribute to somewhat greater benefits than would otherwise be achieved. **Minor positive impact for these households**. For c. 1 million households (with a BPS adult who does not use a mobile phone), this option is not applicable, as they do not have access to the required device. **No impact for these households.**
Commercial model(s)	We envisage this option being provided free of charge to BPS consumers by their energy suppliers. Indeed, the market may well make these sort of services available to all smart metering consumers with mobile phones, as a means of supplementing the information provided through other channels such as IHDs, online portals and smartphone apps (analogous to the way in which banks such as NatWest[34] offer free text messages with information on bank balances). The energy suppliers are already using text messaging to

[34] http://www.natwest.com/personal/online-banking/g1/alerts/balance-alerts.ashx

	Assessment
	interact with their customers to some extent – e.g. First Utility is developing a high energy usage text alert service[35] based on an analysis of daily consumption, and British Gas is making their Remote Heating Control[36] application accessible via text message. The additional costs associated with setting up and operating the text messaging would be passed onto all consumers (not just the BPS consumers) via their energy bills over time. The consumers would, of course, own their own mobile phones, and a variety of BPS-friendly phones are available on the market (including those sold by the RNIB). Features can include large buttons, large text and in-built TTS functionality – such as the Nokia TALKS software.
Incremental technical complexity and timescales	This option would involve a call centre representative taking a call and setting up an SMS service to suit the requirements of the BPS consumer. The information contained in each message could be selected from a menu and the time interval between messages could also be customised. For example, a consumer might request that a text is sent to them at 6:00pm each day containing their electricity and gas usage in the last 24 hours. If a web portal is available (e.g. provided under Option 5 above) then it would be possible to include on the portal a facility to set up the SMS service. Like Option 5, this option requires access to consumer Smart Metering information, which means requesting and receiving this over the WAN. An appropriate security system would be required on initial setup, to ensure that the right consumer is sent the right energy consumption information. Security will also be needed to ensure the ongoing integrity of the software that interrogates the Smart Metering System to acquire the data, for example to prevent it being changed so it accesses the wrong data, or send the data to a mobile not belonging to the intended consumer. On the consumer's handset, the texts will be delivered and will be readable by the consumer if their sight is good enough to see their display. The texts will be formatted so that any text-to-voice converter will be able to read them in an intelligible way to the user. Consumers will need to have a mobile phone that supports text-to-voice conversion, but this is regularly used by mobile using BPS consumers, so many will have selected their phone with this in mind.

[35] http://www.first-utility.com/my-energy
[36] http://www.britishgas.co.uk/products-and-services/remote-heating-control/how-to-use.html

	Assessment
	Assuming that a third party is contracted to deliver the SMS service, and that setup is implemented via an additional facility on energy companies' call centre systems and web portals, then it should be possible for energy suppliers to develop and launch a system of this kind within 6-12 months. An alternative that could be available from some suppliers would be to use a centralised voice synthesis server to turn the text into speech and then send this via an ordinary call to a mobile or fixed phone line.
Incremental operational implications	Once the system is operational and set-up for the individual consumer there should be few operational issues. Consumers can ring the call centre (or log on) free of charge to change their preferences at any time. There will be a small additional load on call centres to support such changes, but as the system is likely only to be used by BPS users with little or no sight then the number of calls involved will be small.
Indicative incremental costs	In the absence of a full specification for the system it is difficult to estimate the cost of developing the cloud-based application. However, assuming this is a straightforward development from existing SMS applications then it is reasonable to estimate development costs of £250k to £500k. Communications links, hosting and support could cost between £500k and £1 million per annum. For volumes in the order of 100k texts per day, our discussions with vendors suggest a cost per text of around 3p. If 750k blind and partially sighted consumers take up this option (i.e. about 70% of those with a mobile phone), then the total operating cost of daily texts to these consumers would be approximately £7 million to £8 million p.a. If the frequency of update was reduced from daily to weekly (which may be preferred by many consumers), then the operating costs would reduce to about £1 million p.a., for 750k consumers. Hence we estimate indicative additional costs for the option in the order of **£1 million to £8 million p.a.**.
Risks and opportunities	The key risk associated with this option is the uncertainty over the level of demand from BPS people for such an application. However, we anticipate that such services may start to become a commonplace part of the service offering to energy customers, in which case any upfront costs associated with developing such applications would very likely be spread over much larger numbers of customers. Opportunities presented by this option include the potential for harnessing the greater processing/analysis capabilities

	Assessment
	available in the cloud (i.e. in utilities' central systems), rather than relying on the limited functionality of the IHD. So, rather than just presenting basic usage and cost information, the energy providers could enhance the information provided via text over time: for example, including tailored promotion of time-of-use tariffs, based on an analysis of the household's actual consumption patterns.

Source: SQW and Astutim

Option 7: Telephone-based information line

C.10 Under this option, BPS consumers access their energy consumption information via a telephone-based information line offered by energy suppliers. This may be through the consumer speaking to a customer service adviser with access to the household's smart metering information, or through them listening to an automated read-out of the household's energy usage over a selected period.

Table C-7: Assessment of option 7

	Assessment
Indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change	This option was not well-received by BPS interviewees, who generally saw it as an inferior solution for accessing their smart metering information. Automated voice systems were particularly disliked. The following analysis is based on the study team's judgement of the likely effects of this option on accessibility and behavioural change, in the light of those interviews. This option would be available to all BPS consumers with a fixed or mobile phone, which we can assume will be practically universal (Ofcom's Communication Market Report 2012 indicates that about 1% of UK households do not have either a fixed or mobile phone). If other options were not available (such as TTS-enabled IHDs), then we envisage this option being of most relevance to the c. 90k households with a BPS adult with severe sight loss, not living with a sighted adult, and not having access to the web or a smartphone. However, by shifting the onus on the consumer to pick up and phone and call a number (rather than information being 'pushed' to the consumer), this option is likely to be relatively infrequently used, and hence we anticipate it having little potential for impact on behavioural change. **Very minor positive impact for these households**. For the c. 30k households with a BPS adult with severe sight loss, not living with a sighted adult, but having access to the web or a smartphone, our interviews suggest that the these alternative channels (options 4 and 5) will be preferred to calling up a number for information on energy usage. **No impact for these households**. For c. 1.1 million households with a BPS adult living with a sighted adult, we anticipate that interaction with smart metering information will be primarily through the sighted adult reading the IHD, and/or through those BPS adults with mild or moderate sight loss reading all or parts of the IHD display when holding it up close and/or using a magnifier.

	Assessment
	We would anticipate there being relatively little incentive for these households to actively pick up the phone to get energy usage information on a frequent basis. **No impact for these households**. For c. 790k households with a BPS adult with mild or moderate sight loss, not living with a sighted adult, we anticipate that interaction with smart metering information will be primarily through the consumer reading all or parts of the IHD display when holding it up close and/or using a magnifier, or - for about 280k of these households - through the web or a smartphone. We would anticipate there being relatively little incentive for these households to actively pick up the phone to get energy usage information on a frequent basis. **No impact for these households**.
Commercial model(s)	We envisage this option being provided free of charge to BPS consumers by their energy suppliers, via a Freephone number. Energy suppliers already offer energy savings/efficiency advice lines – some, though not all, of which are free to call. The additional costs associated with setting up and operating the service would be passed onto all consumers (not just the BPS consumers) via their energy bills over time.
Incremental technical complexity and timescales	This option would probably be implemented as an extension to energy companies' existing call centre systems. Development of the additional facilities to handle this service should require little effort over what energy suppliers will be investing to equip their call centres for Smart Metering. Like Options 5 and 6, this option requires access to consumer Smart Metering information, which means requesting and receiving this over the WAN. An appropriate security system will be needed to ensure the integrity of the software that acts on the call centre operative's instruction and interrogates the Smart Metering System to acquire the data. Implementation of this option could be left to energy companies as each may have different call centre systems that will need to be upgraded. In view of the variation in systems between energy suppliers it is difficult to give firm timescales for implementation. However, assuming that the portal to the Smart Metering System is available at the DCC (or some other central point) then it ought to be possible for most energy suppliers to upgrade their systems to include this capability within 6 months of agreement to proceed.
Incremental	Once the system is set up as part of each energy supplier's

	Assessment
operational implications	call centre system there should be few operational implications. It should be included within the energy supplier's ongoing maintenance and support agreement with its supplier(s) and, provided that the interface with the Smart Metering System is reliable, it should operate smoothly.
Indicative incremental costs	Typical outsourced call centre costs range from £15 to £40 per hour for each representative. The cost variation reflects the differences in knowledge and skill required by call centre representatives. If 10% of consumers with little or no sight requested this option this would equate to around 30k consumers. If each of these consumers called the call centre once every week (i.e. every 5 working days) then this would result in 6k additional calls per day being generated. If a call centre representative can handle 6 calls per hour and works an 8 hour shift this would require 125 operators in total (across all energy suppliers). Assuming that a Freephone number is used and that a Smart Metering call centre representative costs £20 per hour then this would cost c. £5.2 million per annum for a 5-day per week single shift system. In time it is likely that consumers will call less frequently. If the 30k consumers on average only called once per month then the number of calls would drop to 1k per day on average. This could be handled by 21 operators and the cost would be £0.9 million per annum for a single shift, 5-day per week single shift system. Hence the indicative additional costs for this option are in the order of **£1 million to £5 million p.a**.
Risks and opportunities	Technically, this is a relatively low-risk option in that the only interface to the Smart Metering System required is through the energy companies' own systems, which will have the necessary security built-in to provide the companies' standard support service to consumers. The most significant risk is whether consumers would actually choose to use this option, in practice. In the light of our discussions with BPS consumers, we see this as being a very significant risk; so, although this option may *in theory* provide all BPS consumers with access to their smart metering information, in practice it may not be well-used, and therefore would not lead to the extent of behaviour change – and cost savings – which would be achieved in sighted households with standard IHDs. Opportunities presented by this option include the potential for the basic information on energy consumption to be interpreted by informed customer service advisers – perhaps advising the consumer on whether that is higher than might

	Assessment
	be expected for a household like theirs, and taking the consumer through potential energy saving options.

Source: SQW and Astutim

Option 8: Tailored face-to-face support for those unable to access smart meter information directly

C.11 Under this option, households unable to access their smart meter information themselves directly are provided with face-to-face support to understand their energy usage and to consider potential energy-saving options in the light of that information. This support could be provided through a variety of channels, including social care providers, specialist staff in energy suppliers, volunteers and charitable organisations with strong existing links with such consumers.

Table C-8: Assessment of option 8

	Assessment
Indicative potential beneficiary volumes and the impact on accessibility to smart meter benefits and on behavioural change	The reaction of BPS consumers to this option was mixed, with some welcoming the prospect of assistance in understanding their smart metering information, while others resented the idea of being reliant on others in order to access the information. The following analysis is based on the study team's judgement of the likely effects of this option on accessibility and behavioural change, in the light of those interviews. We envisage this option being most relevant to the c. 90k households with a BPS adult with severe sight loss, not living with a sighted adult, and without access to the web or a smartphone, if other options (such as TTS-enabled IHDs) are not available. This option has the drawback of not providing the consumer with independent access to their smart metering information, and this may well be resented by some. However, if the support provider is appropriately trained, then this face-to-face support could have a significant impact on energy savings in those households where savings are possible (though, clearly, less impact for those households already being cautious about and/or efficient in their energy usage). **Significant positive impact for these households**. Involving face-to-face visits, this is a resource-intensive option, which we assume would not be feasible to extend to those c. 1.9 million households able to access their smart metering information through other means – e.g. through a sighted adults in the household reading the IHD, through BPS adults with mild or moderate sight loss reading all or parts of the IHD display when holding it up close and/or using a magnifier, or through web or smartphone apps. **No impact for these households**.
Commercial model(s)	There are various commercial models for this option. The support could be provided through social care provision (i.e. funded by local authorities), through specialist advisers from energy suppliers (e.g. funded by the energy suppliers, and therefore ultimately through consumers' energy bills), or

	Assessment
	through charitable initiatives such as the Independent Living services of the RNIB's Action for Blind People.
Incremental technical complexity and timescales	This is not a technical solution, as such, and so there is no additional technical complexity associated with this option. We would expect it to be possible to develop and launch such a service within about 12 months of a decision to proceed.
Incremental operational implications	The operational implications for this option vary depending on which organisation(s) provide the support. If provided by specialist support staff in energy providers, then local/regional staff would need training in supporting visually impaired consumers, as well as in interpreting energy consumption data (from their IHDs and/or from previously downloaded data from the utility's systems), and in assessing potential energy saving options. If provided by organisations already experienced in supporting blind and partially sighted people (such as specialist social care teams or RNIB), then the training would need to focus on the interpretation of energy consumption data (from the consumer's IHD), and in assessing potential energy saving options.
Indicative incremental costs	If we assume that between 30% and 70% of the 90k households addressed by this option (BPS adults with severe sight loss not living with a sighted adult, and without access to the web or a smartphone) took up an option of an annual visit, then this would entail approximately 30k to 60k home visits p.a. The unit costs of these visits will depend on the skills level (and therefore salary costs) of the person providing the support, and also whether volunteers are used. For the sake of this analysis we assume that paid staff are used, and we assume a unit cost in the order of £30 for about an hour's visit (by way of comparison, the smart metering impact assessment assumes an average cost of £29 for an electricity-only installation, and a the mean hourly cost of local authority provided homecare is c. £32 according to the Unit Costs of Health and Social Care 2011 compiled by the University of Kent). Under these assumptions, the total costs would therefore be in the order of **£1 million to £2 million p.a.**
Risks and opportunities	A key risk associated with this option is that many of the BPS people targeted by this solution could resent the need to call on someone else in order to access and interpret their smart metering data – information that will be readily available to

	Assessment
	sighted consumers through IHDs. Opportunities, however, include the potential for energy-related support and advice to be integrated into services already provided to BPS people – for example, through the Independent Living services from RNIB's Action for Blind People. This could potentially extend the provision of such support, cost-effectively, to a much wider group of BPS households than those assumed in this analysis (e.g. to those who perhaps *do* have access to the web, but haven't tried using it to monitor their energy consumption).

Source: SQW and Astutim

Annex D: Research tools

Discussion Guide: DECC Smart Meters for BPS

Notes:

- This is the discussion guide for the 2012 SQW, i2 media research and Astutim project on access for Blind and Partially Sighted people to the benefits of smart meters.

- As a note of explanation, top level numbered headings in the discussion guide (e.g.,1-14) are not to be asked by interviewer, they are section headings.

1. Introduction

Hello, my name is [interviewer] and this is my colleague [XXX].

Before we start, I have a consent form which I will run through with you now. It explains the purpose of this research and who the research is for. The interview will take about 40 minutes.

[INTERVIEWER PROVIDE INTEREVIEWEE WITH INFORMED CONSENT FORM AND READ IT TO INTERVIEWEE IF INTERVIEWEE PREFERS] If you are still happy to participate, please sign consent form to participate.

Thanks for that [consent]. During the interview, I'd like to hear your views and opinions on a range of questions, so apologies up front if I have to interrupt or bring discussion back to main areas [lots to cover, limited time].

No right or wrong answers – interested in your real views.

My colleague, [XXX], will be taking notes of what is discussed today, and reminding me of things I may forget to ask.

2. Intros/ roles/ day to day

First, I'd like to ask you to introduce yourself and say a few words about your day to day life.

a. What's your living arrangement?

b. What do you do? What do you enjoy? Anything you try to avoid? Why's that?

c. How active a person would you say you are? Why's that?

3. How involved in household's energy management

Thanks for sharing a little about your day to day life. Now I want to turn to thinking about energy use.

a. What kind of energy do use you at home? (i) Electricity and/ or (ii) Gas. Which do you use for (i) heating, (ii) hot water, (iii) cooking?

b. Can you tell me in what ways, if any, and how you are involved in managing your household's energy supply?

   This might include buying it, paying for it, choosing which supplier you use, monitoring your bills, buying energy saving products and so on?

   i. Which of these steps would you say are your primary responsibility? Why is that?

   ii. Who else if anyone is involved? Why is that?

   iii. Do you discuss it with anyone? Who? What do you discuss? Why is that?

c. If you are involved, what do you take into consideration in selecting an energy supplier, or a tariff?

d. Are there some things with regard to managing your household's energy use that you'd like to do but don't think you can on your own?

   i. What? Why?

   ii. Have you tried?

   iii. In what ways can you imagine the challenge might be solved?

4. Views on energy use generally

Now I want to turn to thinking about energy use generally.

a. How much do you think about the energy you use?

b. Do you think that compared to other households you use about the same, more or less energy?

c. Do you/your household make any active attempts to control energy usage?

d. If so, what do you do?

e. How do you/your household currently access information about their energy usage?

f. What information do(es) your energy supplier(s) currently provide? In what format?

g. Would you like to be able to access more information about your energy usage?

h. Would you be interested in further ways to help you manage energy usage?

i. If so, what would be your priority?

5. Priorities for understanding and managing energy use

And now thinking about managing energy use...

a. Are there any tricks, tips or tools that you have heard about and/or thought about using and/or use to manage and understand your household energy use?

b. What are/would be the main motivators for you to use these?

   i. The environment or money?

   ii. Is that how you think most people think?

   iii. Why do you think that is?

   iv. Can you think of anything that might change the way you think?

6. Awareness of and attitudes towards smart meters

Now I want us to talk a little more explicitly about smart meters.

a. What, if anything, have you heard about smart meters before today?

b. Where from/ who from did you hear that/these things?

Smart meters are the next generation of gas and electricity meters which in conjunction with an in-home display will allow you to see how much energy you're using.

The energy monitor or display (a small device about the size of a smart phone) shows you how much energy you are using at different times of the day, week, month, year etc and how much this costs, which could help you to cut your energy usage and your bills by highlighting ways you can be more energy efficient.

Smart meters can send electronic meter readings to your energy supplier automatically so the company always has an accurate meter reading and there's no need for you to take a meter reading yourself ever again. Smart meters could also lead to the creating of innovative new energy tariffs, or personalised plans to fit your lifestyle and energy usage.

For people using prepayment meters smart metering will make it easier to top up, for example over the phone or online.

Smart meters could also lower bills and CO2 emissions by helping energy companies to run more efficiently. If energy companies have a more accurate picture of how much energy the country uses and when they use it, they will be able to make sure they have the right amount of energy at the right time.

You will have the option to replace your current gas and electricity meters with a smart meter. Existing meters have to be replaced at intervals anyway, roughly every 20 years.

Smart meters and energy monitors can be supplied and installed by energy companies or by approved independent suppliers and contractors.

c. Is this what you thought smart meters were?

There are various consumer benefits cited for smart metering and now I'd like to find out whether the benefits appeal to you, which you think would benefit you most personally and whether there are any that you think might need additional consideration of accessibility adaptations to make sure blind and partially sighted people could benefit from them. The cited benefits include:

i. being helped to reduce your energy consumption and bills, through the consumption feedback provided by smart meters

ii. being charged accurately for your energy usage, rather relying on energy companies' estimates (this one not relevant to people on prepayment meters)

iii. not having to let meter readers into your house

iv. easier switching of suppliers, so you can take advantage of more attractive services and prices

v. enabling you to use time-of-use pricing, thereby further reducing your household's energy bills by shifting some consumption to low-cost times of the day

vi. easier top-up methods for pre-payment meters (e.g. over the phone or the internet), and easier switching between credit and pre-payment meters (which would traditionally require the installation of a different meter)

vii. supporting the installation of micro-generation, such as solar panels and micro wind turbines, by avoiding the need for an extra meter to measure the export of electricity from the home.

7. Preferences of how to receive information about smart meters

As smart meters are only starting to be rolled out around the country there will probably be extensive communications about them to consumers.

a. From which organisations do you expect to hear about smart meters? Why is that? Would you prefer to hear from anyone else? [energy supplier, competing energy supplier, HMG, charity]

b. What sorts of information would you want? What do you want to know?

c. And what would be your preferred format or formats to receive information about smart meters? Why is that? Do you think your preference/ needs will be provided/ met? [large print, Braille, audio CD, audio stream, audio download, face to face, TV (programme, advert), radio (programme, advert).

8. Use and accessibility of technology generally

Now, I'd like to focus on how you engage with and use products and services that use digital technology. I mean products and services like digital TV, mobile phones, computers and the internet, internet banking and shopping, and other online services.

a. How accessible or otherwise would you say you find products and services that use digital technology?

   i. In what ways accessible?

   ii. Any particularly good examples?

   iii. In what ways not?

   iv. Any particularly bad examples?

   v. Why do you think that is?

b. Do you think your access to products and services that use digital technology has got better or worse over recent times? Can you give a few examples of when and how?

c. Do you find assistive technologies helpful (such as screen readers, magnifiers and so on)?

9. Optimising accessibility of information on IHDs

Smart meters are designed to provide information to consumers in different ways.

Most simply, the meters send information to an In Home Display – which is a visual display which can be conveniently located in the home to enable someone to look at the information displayed. This will provide information on both electric and gas usage (if you have mains gas). Different types of information can be displayed – for example:

- real time cost of energy consumption
- an indication of whether the household energy use is high or low at a point in time, and/ or
- how much energy has been used in the past day/ week/ month/year and/or
- how much that energy has cost and/or
- if you are a pre-payment customer, the amount of credit remaining, and alert if you are close to running out of credit.

a. Here is an example of a smart meter In Home Display – what do you think of it?

b. Thinking of this IHD and about the design of IHDs more generally, how important do you consider the following to be in terms of (a) accessibility and ease of use, (b) usefulness, and (c) your personal preference(s)?

   i. Button design, function, layout

      [size, contrast with their background, and with the most common features/functions having the largest and most distinctive buttons, easily distinguishable by touch, toggle/ multiple functions from one button]

   ii. Visual elements

      [large display screens, with backlighting and anti-reflective coatings, large font size for the display text, and/or the ability to change font size, ability to change contrast and white on black/ black on white, limited amount of information on the display at any one time, to avoid 'clutter']

   iii. Non-visual feedback

[tactile/basic audio feedback from buttons, (such as a click or a beep); speech feedback from buttons (such as saying "Electricity usage"), talking menus, some sort of ambient audible indication of energy usage (for example, to alert users when they are using a lot of energy), text to speech functionality (i.e. reading out the information displayed on the screen – by a synthetic 'robotic' voice or prerecorded 'human' voice)]

iv. Speech input (e.g. "How much gas did I use last month?")

10. Accessing ambient information

One feature of IHDs is that they have been designed to provide at a glance indications to consumers of their data via ambient displays (displays that are always on).

a. Thinking of ambient displays, do you think you could make use of any form of traffic light display, for example that glowed red when usage was high, and green when usage was low?

b. What about other types of ambient indicators (such as vibration, beeps, buzzes)? What do you think would be the advantages/ benefits of these?

c. What do you think might be the disadvantages/ drawbacks of these?

11. Accessing smart meter information indirectly

It is of course possible for someone to be able to benefit from the information from smart meters through help from someone else.

a. How do you feel about the idea of needing to make a phone call to an automated or operator run system to access the display? Why is that?

b. Would you be satisfied with someone else in your household having access to the information on the display and them sharing it with you (for example in a conversation)?

c. If you had any concerns about the accessibility of the IHD would you know who to raise this with?

    i. Who? [energy supplier, regulator, HMG, charity]

12. Card sorting task

Now, I'm going to read out one at a time a range of different ways in which people have suggested making the information from smart meters accessible to people with different levels of sight (loss). I'd like to sort through them with

you. I will read each out, and then ask you to tell me which of 4 piles you would put it in:

- “You wouldn’t be able to access the information on it at all”; [NONE]
- “You wouldn’t be able to access much of the information using it”; [A LITTLE]
- “You would be able to access some but not all of the information on it”, [SOME]
- “You would be able to access an equivalent amount of information to what a fully sighted person could access” [ALL]

List of possibilities:

a. The IHD, as it is now.

b. The IHD with the features you discussed as desirable/ important earlier.

c. The display content of this IHD, but presented on a smartphone or tablet so I can zoom in and make it easy for me to read and interact with.

d. A different format of display, designed for partially sighted consumers, displayed on a smartphone or tablet.

e. A similar format of information but displayed on a web page, so I can make use of a screen reader, keyboard shortcuts, etc that I already know on a computer.

f. A friend or relative accessing my meter information on the web or via a smartphone and then helping me (by visiting, or on the phone) to act on it to save energy.

g. By someone else (e.g. a social worker or utility person) calling on me, looking at my IHD, maybe carrying out an energy audit on my usage and then helping me do things that will save energy.

h. By me calling a call centre and speaking to someone who can see my energy usage and can help me save energy (can't act on real time information, but can access historical half-hourly data and tariff information, ie. How much energy you used in each half hourly period over the last 13 months – this could allow and advisers to spot patterns and provide energy saving tips or suggest tariff/supplier change).

Which of these methods would be your preference?

13 Any other suggestions

Do you have any other ideas to improve your access to the benefits of smart meters that we've not discussed yet?

14. Lessons to be learned from other complex interactions

Before we finish, I just want to check if there are any good lessons you can suggest should be learned/ tips you can offer, based on how you engage with and interact with other complex interactive technologies (for example e-banking, e-shopping, using smartphones or PCs or TV controls, or radios or audio books), or even how you wish things could work? If you can think of any, please feel free to share them!

15. Wrap up and close

a. To wrap up then, can I ask how you feel about smart meters?

   i. Do you think they are a good thing or a bad thing?

   ii. Why's that?

   iii. Would you like to have a smart meter at home?

   iv. Do you feel uncomfortable about any aspect of smart meters?

b. Does the idea of smart meters raise any concerns for you, or worry you at all? Why's that?

c. Is this different to how you felt about them before today's interview?

d. Do you have any other comments on your experiences or further thoughts about smart meters that we have not discussed?

OK then, that's the end of the interview. I'm going to turn off the recorder now. Thank you very much for your time and participation. Your comments have been very helpful. Thank you again for your time. Goodbye!

Smart Meter Benefits for BPS Consumers

Aide-Memoire for Consultations with Industry Players

Final 14th August 2012

Note: this is a discussion guide, interviewers will tailor the discussion to each organisation consulted.

Introduction

Thank you for agreeing to meet up/talk to me.

As I mentioned, we're working on a project for the Department of Energy and Climate Change to identify and recommend feasible options for ensuring that blind and partially-sighted consumers are able to access the benefits from smart meter installation in the UK.

As part of the research, we're seeking the views of a selection of industry players, to discuss any plans they have for enabling blind and partially-sighted consumers to use smart metering-related products and services, and to seek their perspectives on how best to help these consumers gain maximum benefit from their smart meters.

Just to be clear, we've agreed with DECC that we won't be sharing the details of individual discussions with them. Your comments will be treated as confidential and will be aggregated with feedback from other consultations and will form part of a research report, but comments and any quotations used in this report will not be attributed personally to you/your organisation and will be kept anonymous. The final report will be published on the DECC website.

Background

1. Firstly, could you just give me a bit of background of your own role in <organisation>? [incl confirming job title]

2. What involvement, if any, have you and <organisation> had to date in discussions around addressing the needs of blind and partially sighted consumers, in the roll-out of smart meters?

3. What do you see as being the primary benefits of smart meters for BPS consumers?

Your products/services

4. Thinking about <organisation>'s current products and services (for all meter types, not just smart meters), in what ways do you currently cater

for the needs of blind and partially sighted people? [probe for any current design features considered to be helpful for BPS consumers]

a. In their mainstream products/services

b. Any products/services designed specifically for BPS consumers?

c. In measures to engage with BPS consumers such as vulnerability training of staff, braille bills, bills on CDs etc.

d. Level of demand from BPS consumers for specific features and/or tailored services and communications

5. And in planned *future* products/services?

6. Are there any specifications or guidelines you follow in helping to make your products/services accessible by blind and partially sighted people?

Views on IHD solutions for BPS consumers

7. Thinking in general terms about in-home displays (IHDs), there are various potential design features which could make them more accessible for people with sight impairments. I'd just like to get your views on the practicality and any cost implications of some of these: [for each, test whether this feature is incorporated in their own products, and if not why not – e.g. consumer reaction, aesthetics, or cost. Where cost is a factor, seek a ballpark development cost, an incremental unit cost at the volumes they're expecting for their devices, a ballpark incremental unit cost for niche products at relatively low volumes, and an approximate timescale from project start to market launch]

   a. Large, well-spaced buttons, which contrast with their background, and with the most common features/functions having the largest and most distinctive buttons

   b. Buttons which can be distinguished by touch

   c. Tactile/basic audio feedback from buttons (such as a click or a beep)

   d. Speech feedback from buttons (such as saying "Electricity usage")

   e. Talking menus

   f. Speech input (e.g. "How much gas did I use last month?")

g. Avoiding the same button being used for multiple functions

h. Large display screens, with backlighting and anti-reflective coatings

i. Large font size for the display text, and/or the ability to change font size

j. Limited amount of information on the display at any one time, to avoid 'clutter'

k. Some sort of ambient audible indication of energy usage (for example, to alert users when they are using a lot of energy)

l. Text to speech functionality (i.e. reading out the information displayed on the screen)

8. Are there any other desirable design features (for BPS consumers) which we haven't mentioned?

Views on alternative solutions for BPS consumers

9. The IHD is not the only way in which consumers can get access to information on their energy usage. Again, I'd just like to get your views on the practicality of some of these: [for each, test whether this option is currently offered, and/or whether they know of plans to do so – by them or other industry players; and whether they perceive the option to be technically and commercially feasible]

a. Offering a telephone number for sight-impaired consumers, which they can call for someone to talk them through their recent energy usage

b. Offering a telephone number for sight-impaired consumers, which they can call for an automated voice read-out of their recent energy usage

c. A face-to-face support service, whereby someone calls in on a BPS household, to talk them through their recent energy usage, and to offer suggestions on ways of reducing their energy consumption safely

d. Providing the consumer with online (web) access to their household's energy usage information, in an accessible format compatible with 'screen readers'

e. Providing the consumer with access to their household's energy usage information via a smartphone/tablet app which gets the

usage information directly from the smart meters or IHD via the Home Area Network

f. Providing the consumer with access to their household's energy usage information via a smartphone/tablet app which gets the usage information via the Wide Area Network

10. Are there any other ways we that haven't mentioned for blind and partially sighted consumers to access energy consumption information?

And finally…

11. Overall, what do you think would be the best approach for the government, Ofgem and industry to take in ensuring that the consumer benefits from smart metering are accessible to blind and partially-sighted people?

[Thank and close]

Smart Meter Benefits for BPS Consumers

Aide-Memoire for Consultations with Other Stakeholders

Final 14th August 2012

Note: this is a discussion guide, interviewers will tailor the discussion to each organisation consulted.

Introduction

Thank you for agreeing to meet up/talk to me.

As I mentioned, SQW are working on a project for the Department of Energy and Climate Change to identify and recommend feasible options for ensuring that blind and partially-sighted consumers are able to access the benefits from smart meter installation in the UK.

As part of the research, we're seeking the views of organisations such as <organisation>, to seek their perspectives on how best to help these consumers gain maximum benefit from their smart meters.

Your comments will be treated as confidential and will be aggregated with feedback from other consultations and will form part of a research report, but comments and any quotations used in this report will not be attributed personally to you/your organisation and will be kept anonymous. The final report will be published on the DECC website.

Background

1. Firstly, could you just give me a bit of background of your own role in <organisation>? [incl confirming job title]

2. What, if any, involvement have you and <organisation> had to date in discussions around addressing the needs of blind and partially sighted consumers, in the roll-out of smart meters?

Views on the benefits of smart metering for BPS consumers

3. There are various consumer benefits cited for smart metering (see list below). I'd just like to get your views on how important these are for blind and partially-sighted people and discuss issues specific to BPS people in accessing these benefits.

    - being helped to **reduce their energy consumption and bills**, through the consumption feedback provided by smart meters

- being **charged accurately** for their energy usage, rather relying on energy companies' estimates

- **not having to let meter readers into the house**

- **easier switching of suppliers**, to take advantage of more attractive services and prices

- ability to use **time-of-use pricing**, thereby further reducing the household's energy bills by shifting some consumption to low-cost times of the day

- easier **top-up methods for pre-payment meters** (e.g. over the phone or the internet), and easier switching between credit and pre-payment meters (which would traditionally require the installation of a different meter)

- supporting the installation of **micro-generation**, such as solar panels and micro wind turbines, by avoiding the need for an extra meter to measure the export of electricity from the home.

4. Are there any other benefits from smart metering which we have not mentioned above *(probe on issues for BPS consumers in accessing these benefits)?*

Views on current products/services

5. Thinking about *current* products and services (for all meter types, not just smart meters), to what extent do you think they cater for the needs of blind and partially sighted people? [probe for any current design features considered to be helpful for BPS consumers]

   a. In mainstream products/services

   b. In any products/services designed specifically for BPS consumers

   c. In measures to engage with BPS consumers such as vulnerability training of staff, braille bills, bills on CDs etc.

6. Are you aware of any planned *future* products/services which will make smart metering information more accessible to blind and partially sighted people?

7. What specifications or guidelines are there to help to make smart metering products/services accessible by blind and partially sighted people?

8. [*To be asked to RNIB and Consumer Focus only*] The smart metering equipment technical specification calls for an IHD to be "designed to enable the information displayed on it to be easily accessed and presented in a form that is clear and easy to understand including by Consumers with impaired sight". Do you have any estimates of the numbers of UK adults who are unable to read *any* display visually? Do you have any information on what proportion of people have difficulty reading text at various font sizes?

    a. If not able to answer this directly: how could we find this out?

Views on IHD solutions for BPS consumers

9. Thinking in general terms about in-home displays (IHDs), there are various potential design features which could make them more accessible for people with sight impairments. I'd just like to get your views on the desirability and relative importance of some of these:

    a. Large, well-spaced buttons, which contrast with their background, and with the most common features/functions having the largest and most distinctive buttons

    b. Buttons which can be distinguished by touch

    c. Tactile/basic audio feedback from buttons (such as a click or a beep)

    d. Speech feedback from buttons (such as saying "Electricity usage")

    e. Talking menus

    f. Speech input (e.g. "How much gas did I use last month?")

    g. Avoiding the same button being used for multiple functions

    h. Large display screens, with backlighting and anti-reflective coatings

    i. Large font size for the display text, and/or the ability to change font size

    j. Limited amount of information on the display at any one time, to avoid 'clutter'

    k. Some sort of ambient audible indication of energy usage (for example, to alert users when they are using a lot of energy)

    l. Text to speech functionality (i.e. reading out the information displayed on the screen)

10. Are there any other desirable design features (for BPS consumers) which we haven't mentioned?

Views on alternative solutions for BPS consumers

11. The IHD is not the only way in which consumers can get access to information on their energy usage. Again, I'd just like to get your views on some of these: [for each, test whether this option is currently offered, and/or whether they know of plans to do so; whether they perceive the option to be feasible; the rough proportion of BPS households for which the option may be appropriate; and whether similar services are used for other applications, e.g. internet banking]

    a. Offering a telephone number for sight-impaired consumers, which they can call for someone to talk them through their recent energy usage

    b. Offering a telephone number for sight-impaired consumers, which they can call for an automated voice read-out of their recent energy usage

    c. A face-to-face support service, whereby someone calls in on a BPS household, to talk them through their recent energy usage, and to offer suggestions on ways of reducing their energy consumption safely

    d. Providing the consumer with online (web) access to their household's energy usage information, in an accessible format compatible with 'screen readers'

    e. Providing the consumer with access to their household's energy usage information via a smartphone/tablet app which gets the usage information directly from the smart meters or IHD via the Home Area Network

    f. Providing the consumer with access to their household's energy usage information via a smartphone/tablet app which gets the usage information via the Wide Area Network

12. Are there any other ways that we haven't mentioned for blind and partially sighted consumers to access energy consumption information?

And finally…

13. Overall, what do you think would be the best approach for the government, Ofgem and industry to take in ensuring that the consumer benefits from smart metering are accessible to blind and partially-sighted people?

[Thank and close]

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