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# Smart Metering Implementation Programme: In-Home Display

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**Target audience:** Energy suppliers and network operators, consumers, consumer organisations and representatives, environmental bodies, meter asset providers, meter asset managers, meter operators and metering and communication equipment manufacturers, academics and other interested parties.


**Overview:**

This document is one of a number of supporting documents published alongside the Smart Metering Implementation Programme Prospectus.

This document sets out our proposals for a minimum set of functional requirements for the in-home display that will be provided to domestic customers. Among the minimum requirements is the need to present consumption in pounds and pence, which customers find easier to understand. We also propose that the display must include a visual (i.e. non-numerical) presentation that allows consumers to easily distinguish between high and low levels of current consumption. This document also sets out our proposals on the nature of the mandate on suppliers in relation to the provision of the IHD.



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## Context

The Government is committed to the rollout of electricity and gas smart meters to all homes in Great Britain and to the broad delivery framework underpinning the development of policy to date.

On behalf of the Department of Energy and Climate Change (DECC), Ofgem E-Serve has been managing the first phase of a central programme to design and implement new cross-industry arrangements for the delivery of smart metering. Ofgem E-Serve's smart metering work has been undertaken in conjunction with Ofgem's Sustainable Development Division.

The Prospectus represents the joint views of DECC and the Gas and Electricity Markets Authority (GEMA) based on the work conducted so far during the initial phase of the Smart Metering Implementation Programme ('the programme'). It sets out detailed proposals for consultation on the design and delivery of the smart metering system. Alongside the Prospectus, Ofgem is publishing a number of supporting documents which set out in more detail the alternative options considered.

Reflecting the approach adopted to date, the remaining work to scope the regulatory framework will be led by Ofgem E-Serve on behalf of DECC. Later this year, the governance and management arrangements for subsequent phases of the programme will be decided upon.

## Associated Documents

DECC and Ofgem have jointly published the Smart Metering Implementation Programme Prospectus. This document is one of a number of Ofgem supporting documents published alongside the Prospectus.

DECC has also published updated impact assessments for the domestic and non-domestic sectors and a paper on disablement/enablement functionality for smart gas meters.

To help inform the programme, Ofgem also commissioned specific research (carried out by FDS) into consumer awareness of, and attitudes towards, smart metering. All documents are available on the Ofgem website at the following location:

http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=40&refer=e-serve/sm/Documentation

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# Summary

The most visible part of the smart metering system for consumers will be the standalone in-home display (IHD), which will provide them with information on their energy consumption. This feedback can help consumers understand and change their energy usage, reducing bills and carbon dioxide emissions. The Government has decided that all domestic customers should be provided with a display.

In this supporting document, we have set out our proposals on the nature of the mandate on suppliers in relation to the IHD. We propose that a standalone IHD should be provided with a smart meter, which will deliver near real-time information to consumers on their energy consumption in a readily accessible form. Although suppliers will not be required to provide a display to non-domestic customers, they will be required to make available near real-time consumption information via the 'home area network' (HAN). Further details are set out in see the "Statement of Design Requirements" supporting document.

We propose that suppliers should not be subject to an enduring obligation, but should be responsible for maintaining and replacing IHDs for one year after installation of the smart meter. This is in addition to and without prejudice to other obligations, such as those arising out of statutory consumer protection provisions, and the terms of their contracts with consumers

Subject to the responses to this consultation, our intention is that the minimum functional requirements for the IHD should include:

- Presentation of real-time information on electricity and gas consumption.
- Presentation of historical information on consumption so consumers can compare current and previous usage.
- To facilitate consumer understanding, usage information must be displayed in pounds and pence as well as kilowatts and kilowatt hours and the display must include a visual (i.e. non-numerical) presentation that allows consumers to easily distinguish between high and low levels of current consumption. We are seeking views on whether information on carbon dioxide emissions should also be included.
- Presentation of accurate account balance information (amount in credit or debit).
- Capability to display information on both gas and electricity consumption.

Our proposal reflects feedback from consumer groups and our own consumer research that consumers find information in monetary terms easier to understand than units of energy. To aid understanding we also propose that alongside displaying current usage numerically, IHDs should provide some visual, non-numerical way of distinguishing between low and high current usage.

We are seeking views on two further issues: firstly, whether we should also require information to be displayed about carbon dioxide emissions; and, secondly, whether a specific obligation is required in order to address the accessibility needs of particular groups of consumers.

# 1. Introduction

## Context

1.1. The Government believes that every home in Great Britain should have smart energy meters, giving people far better information about, and control over, their energy consumption than they have today.

1.2. Within a customer's home the metering system will be made up of smart meters for gas and electricity, a 'home area network' (HAN) to communicate between devices in the home, and 'wide area network' (WAN) equipment for communicating back to the supplier or other authorised parties. Our proposed design requirements for these elements of the smart metering system are set out in the "Statement of Design Requirements" supporting document.

1.3. For domestic consumers, suppliers will also be required to provide an in-home display (IHD) giving information on energy consumption in an easily understandable form. A substantial proportion of the benefits of smart metering are expected to come from improved energy efficiency, either through reductions in energy consumption or shifting of consumption away from times of peak demand. The provision of the display is important in promoting greater consumer awareness of energy usage. Additional measures, such those taken up under the Green Deal, the provision of consumer information and energy efficiency advice, will also have an important role to play here.

1.4. This document focuses on the IHD and, in particular, sets out our proposals on the minimum functional requirements of the IHD. These proposals include the minimum set of common information that should be provided to all consumers. These proposals also cover the nature of the mandate on suppliers, including roles and responsibilities around provision, and requirements that would apply when a consumer does not wish to have an IHD.

1.5. In developing these proposals, we have sought to engage the full range of stakeholders from industry, consumer representatives and other interested parties. In particular, this has included a focus on the consumer's perspective as well as the views of industry participants who will take on responsibility for delivery following changes to the regulatory framework.

1.6. We have sought consumer engagement through the establishment of a specific smart metering Consumer Advisory Group, made up of consumer groups and experts, and through discussion with Ofgem's Disability Advisory Forum. To help inform the programme, we also commissioned specific research into consumer awareness of and attitudes towards smart metering. This has been published alongside this document[1].

[1] *Consumers' views of Smart Metering*, Report by FDS International, July 2010.

## 2. Functional Requirements of the IHD

This section sets out the minimum requirements for the IHD. The key issues covered here include the minimum information requirements, the presentation of information, arrangements for consumers with special requirements, and display portability.

**Question 1:** We welcome views on the level of accuracy which can be achieved and which customers would expect, in particular in relation to consumption in pounds and pence.

**Question 2:** We welcome evidence on whether information on carbon dioxide emissions is a useful indicator in encouraging behaviour change, and if so, how it might be best represented to consumers.

**Question 3:** We welcome views on the issues with establishing the settings for ambient feedback.

**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?

**Question 5:** We welcome evidence on whether portability of IHDs has a significant impact on consumer behavioural change.

**Question 6:** Do you agree with the proposed minimum functional requirements for the IHD?

2.1. Suppliers will be required to provide every domestic customer with an IHD, which will provide them with information on their energy usage.

2.2. Through discussions with stakeholders and building on the evidence of trials here and internationally, including provisional information from the Energy Demand Research Project (EDRP)[2], we have considered in more detail the minimum functionality required of IHDs. Our proposals will ensure that all consumers are given the opportunity to have an IHD that meets a range of minimum requirements. The provision of the IHD is important in promoting greater consumer awareness of energy usage. We fully expect suppliers and other service providers to innovate around these minimum requirements, for example, by providing a wider range of information on usage or additional functions where this meets consumer demand.

2.3. In this chapter, we focus on the minimum information requirements (that constitute the 'minimum information set') with which all IHDs should comply in order to ensure that consumers receive relevant consumption feedback to encourage behaviour change. The smart meter will be capable of transmitting consumption information to authorised devices such as IHDs on the home area network (HAN). To

[2] More detail on the Energy Demand Research Project can be found on the Ofgem website.

ensure that all IHDs connected to the HAN are capable of displaying this data, standards are needed to ensure that it is in a common format.

2.4. This chapter also looks at arrangements for consumers with special requirements, and examines whether there should be any requirements regarding how the data in the minimum information set is displayed.

2.5. The issue of whether all displays should be dual fuel or single fuel-enabled is covered in Chapter 3. In line with consumer group recommendations, we are proposing that all IHDs be capable of displaying the minimum information set for both gas and electricity.

2.6. All these issues are considered in the context of allowing flexibility for suppliers and third parties to innovate in this area of fast-moving technological change. Given the innovation already witnessed in recent years in the market for IHDs, we fully expect that the market will respond where there is consumer demand for IHDs which surpass the minimum requirements. The programme will continue to monitor this area carefully.

## Minimum information requirements

2.7. In this section, we first consider the minimum information set to be displayed on IHDs. There is general stakeholder agreement that the minimum requirements should cover only basic information. In line with this, consumer groups have emphasised the importance of simplicity in encouraging engagement across all consumers. We have therefore tried to strike the right balance between providing sufficient data to encourage behavioural change, while leaving room for suppliers and others to tailor the IHD to appeal to the needs of customers.

2.8. In developing the minimum information set, we have considered which pieces of information will facilitate behavioural change among consumers, based on available domestic and international evidence. While the majority of trials show that feedback generally stimulates energy savings, the evidence base is at present limited and mostly focussed on electricity.

2.9. Across the majority of trials involving direct feedback from IHDs, participants made average energy savings of two to fifteen per cent[3]. The trials however were diverse in terms of structure and design. The geographic locations and the companies involved varied widely, as did the demographics of the consumers involved. Some pilot studies involved randomly selected participants and control groups, while others were undertaken on an opt-in basis. The latter were likely to attract more energy-conscious consumers, leading to results that may not be representative of the population as a whole. Furthermore, some trials lasted only a few months whereas others were longer.

[3] *The impact of informational feedback on energy consumption—a survey of the experimental evidence*, Ahmad Faruqui, Sanem Sergici and Ahmed Sharif, The Brattle Group, May 2009.

2.10. These differences make it difficult to draw robust comparisons between trials, and thereby isolate the impact of any single data item on consumer behaviour. Due to the differences in the structures of the trials we have focussed on identifying the pieces of information that were common to the majority of displays. This provides a useful foundation for the minimum information set to be provided to consumers via the IHD. We have considered feedback information in the following categories:

- Information on current consumption;
- Information on historical consumption;
- Account and tariff information; and
- Other useful information.

2.11. In this section, we also address other potential data that might be displayed on the IHD, including feedback on carbon dioxide emissions and microgeneration. We then consider the issues around the frequency of updates from the meter to the IHD and whether to set requirements for a default screen.

**Current consumption**

2.12. Academic reviews, a report to the Energy Saving Trust (EST)[4] and provisional information from the EDRP, suggest that consumers use feedback on current consumption to identify quick energy savings and reduce energy waste. Examples include switching off lights and not leaving devices in stand-by mode. We have identified a core set of information on current consumption that was common to the majority of trials. Based on this, we are proposing that the minimum functional requirements for the IHD should include:

- Capability to display information on both gas and electricity consumption;
- Presentation of information on current electricity and gas consumption as well as current tariff;
- Presentation of information on historical consumption so that consumers can compare current and previous usage;
- Presentation of information on cumulative consumption for current day/week/month/billing period;
- To facilitate consumer understanding, usage information must be displayed in pounds and pence as well as kilowatts and kilowatt hours, and the display must include a visual (i.e. non-numerical) presentation that allows consumers to easily distinguish between high and low levels of current consumption[5];
- Presentation of accurate account balance information (amount in credit or debit);
- Local time; and
- Status of communication link.

[4] *Exploring consumer preferences for home energy display functionality*, Report to the Energy Saving Trust, Will Anderson and Vicki White, Centre for Sustainable Energy, August 2009.
[5] Our consumer research suggests that consumers generally understand monetary amounts better than units of energy (such as kilowatt hours) and that many consumers will be able to engage more easily with information displayed in a non-numerical way.

2.13. Feedback from our consumer research and provisional information from the EDRP reinforces the finding of Ofgem's Energy Supply Probe[6] that consumers prefer information relating to current consumption to be primarily expressed in local currency. This is because energy units are not widely understood. Consumer groups have acknowledged, however, that providing information on current consumption in energy units is also important as tariffs will change over time. This facilitates like-for-like comparisons between periods.

2.14. In terms of accuracy, providing information on current usage in pounds and pence that reconciles with a consumer's bill presents challenges because of the existence of standing charges, discounts and ad hoc charges. Our consumer research however confirmed that consumers are content with indicative figures given that current usage information is primarily used to identify quick energy saving opportunities.

2.15. Cumulative information is more likely to be used to help with budgeting. There is therefore a greater expectation that it will be accurate. As such, we expect cumulative usage information to be reflective of all energy-related consumption costs and therefore reconcilable to the bill (e.g. inclusive of standing charges and VAT but not necessarily discounts and ad hoc charges). We acknowledge that this may present challenges to suppliers, particularly in the case of gas, where the methodology used to calculate the cost of gas used by a consumer includes an average of the daily calorific value of the gas in a consumer's charging area.

**Question 1: We welcome views on the level of accuracy which can be achieved and which customers would expect, in particular in relation to consumption in pounds and pence.**

**Historical consumption**

2.16. Qualitative trials have shown that consumers are interested in comparing their consumption across periods[7]. This allows consumers to identify trends in consumption over time and identify what may have caused any changes (e.g. a new person in the household, a new boiler or appliance, addition of insulation or an extension to the house).

2.17. For the IHD, historical information can be displayed in a range of ways: from profiling the last hour/day/week/month/year to a comparison of cumulative consumption this week with consumption last week[8]. We are not aware of evidence from any trials which has isolated the effectiveness of any specific approach to

[6] *Energy Supply Probe - Summary of initial findings*, Ofgem, October 2008.
[7] *The effectiveness of feedback on energy consumption – A review for DEFRA of the literature on metering, billing and direct displays,* Sarah Darby, April 2006.
[8] The scope of any requirement will depend on the capability of the meter to store and transmit data to the IHD. We propose that the meter be required to store up to one year's worth of half-hourly consumption information. This will influence the scope for comparison. We propose that this information is deleted from the meter on change of occupancy but not on change of supplier.

presenting historical information to consumers through IHDs. Given the range of ways in which it can be displayed, prescribing detailed minimum requirements may restrict innovation. We are therefore proposing a high-level requirement that historical data should be presented so as to allow a consumer to compare current usage with past usage in a meaningful way.

2.18. Outside of the direct feedback provided through the IHD, easy access for consumers to their historical data is central to maintaining a competitive retail market and delivering the smart metering benefits. Access for consumers as well as third parties authorised by the consumer becomes particularly important given that smart metering will facilitate more innovative tariff structures, potentially making price comparison more complex. This issue is discussed in more depth in the "Consumer Protection" supporting document.

**Account and tariff information**

2.19. To allow consumers to budget and plan ahead for their next bill, consumer groups have advocated that all IHDs should display information on their current account balance. Prepayment customers already receive this information on their meters.

2.20. While we understand that it may be challenging for suppliers to provide account balance information to IHDs that reconciles to the bill for credit customers, we are not aware of any technical barriers preventing the provision of such information. Therefore, we are proposing that IHDs should display accurate account balance information (amount in credit or debit) in near real time for prepayment customers and on at least a monthly basis for credit customers. If credit consumers opt in to more frequently updated account balance information, we would expect suppliers to respond. The extent of additional communications costs associated with a more frequent service needs to be analysed further, but initial analysis suggests that it would not be significant[9].

2.21. In the future, we expect a wide range of new tariffs to develop including time-of-use tariffs. Our consumer research and discussions with consumer groups have indicated that consumers may benefit from IHDs that display tariff information for each time-of-use period. IHDs would then provide a useful means of reminding consumers of tariffs at different times and alerting them to intraday tariff charges. We are therefore proposing that all IHDs should display the customer's current tariff (i.e. cost per unit in pence per kWh).

[9] Using the high-end assumption of one update per customer per day, this should result in suppliers sending each customer a packet of around 100 bits of data. Across all customers this equates to 0.7GB of data per day. To put this in context, by 2020 we expect around 100GB of data to be flowing through the central communications function per day.

**Carbon dioxide emissions**

2.22. Some stakeholders have recommended that information on carbon dioxide emissions from energy use should be included on the display. Providing consumers with information relating to carbon dioxide emissions could have the positive effect of raising awareness of the environmental impact of their energy use. We are however not aware of any evidence on the effectiveness of information on carbon dioxide emissions in encouraging consumer energy savings. In fact, in trials conducted by the Centre for Sustainable Energy (CSE)[10], although kilograms of carbon dioxide were available on the majority of displays used by the participants, the information was largely ignored by almost everyone.

2.23. Regarding natural gas burned in homes, the calculation of carbon dioxide emissions is fairly standard as the amount of carbon dioxide emitted per unit of gas is the same no matter when the gas is used. For electricity, however, the amount of pollution caused by consuming a single unit of electricity varies depending on the generation mix[11]. Some displays currently on the market use a carbon dioxide conversion factor based on the average grid mix. This, however, is an estimate and would not reflect the accurate picture of a consumer's carbon dioxide emissions. Providing information in this way may lead to customer confusion for those who have opted for a low carbon or green tariff.

2.24. Given the lack of evidence on the consumer benefits that are derived from providing information on carbon dioxide emissions on the IHD, we are currently minded not to include it as part of the minimum information set. We do however recognise the importance of raising consumer awareness of the relationship between energy consumption and emissions. As such, the programme intends to undertake further work on this area and would welcome views on this issue.

**Question 2: We welcome evidence on whether information on carbon dioxide emissions is a useful indicator in encouraging behaviour change, and if so, how it might be best represented to consumers.**

**Microgeneration**

2.25. Some stakeholders have suggested that IHDs should display information on microgeneration, including the quantity of electricity supplied to the grid. Microgeneration and export metering are supported in two ways by our proposals for the functional requirements of the smart metering system. Firstly, we propose that all smart electricity meters should be capable of measuring the import and export of electricity. Secondly, the measurement of generation would be facilitated by our proposal that the HAN requirements are capable of supporting additional metering devices within customer premises that may be required for microgeneration.

[10] *Exploring consumer preferences for home energy display functionality*, Report to the Energy Saving Trust, Will Anderson and Vicki White, Centre for Sustainable Energy, August 2009.
[11] Proportion of generation from coal, gas, oil, wind and nuclear power stations varies across the day. For more information see the Real time carbon methodology webpage.

2.26. While we accept that such information will be important for those consumers who have microgenerators, we believe that it is beyond the scope of the minimum information set for IHDs given the current low penetration of microgeneration. Ultimately, if there is consumer demand for microgeneration and export information on IHDs, we expect the market to respond to this demand. For example, more sophisticated IHDs may be provided as part of a microgeneration package purchased by the customer.

**Other information**

2.27. We propose that the IHD should show the local time, which should be synchronised to the other smart metering system components. The IHD should also be capable of determining the signal strength of the HAN to which it is linked. Where the signal strength is too weak to allow reliable communications, it should indicate this on the display. This would help consumers in deciding where to locate the display.

**Frequency of updates**

2.28. As mentioned earlier, evidence suggests that consumers are able to use feedback to identify quick energy savings and reduce energy waste. To allow consumers to identify these quick savings and isolate the impact of actions on usage, feedback should be very close to real time. However, there are technological constraints that impede the provision of real-time information on IHDs. The constraints are different for gas and electricity.

2.29. In terms of the provision of gas information, the constraint arises due to the battery life of the gas meter. To send an update to the IHD, the communication chip in the gas meter must 'wake up' and transmit a message containing consumption information. Stakeholders have informed us that, given the lifetime of current batteries and the other services that the gas meter must provide, requiring meters to send local HAN updates more frequently than every 15 minutes may cause the battery to run out before the end of a meter's estimated 15 year life. Given the more static nature of gas usage, primarily in space heating and cooking, we believe a 15 minute frequency should be adequate.

2.30. In terms of electricity information, the constraint is around the availability of technical communication solutions. Existing solutions are currently capable of sending updates every five seconds.

2.31. Regarding HAN requirements, we propose that updates from the electricity meter should be capable of being sent and received at least every 5 seconds. Due to the limitations of a battery powered gas meter, we are proposing that information on gas usage should be capable of being updated at least every 15 minutes.

2.32. For the IHD, we propose that all displays should be capable of receiving and updating the minimum information set at least every 5 seconds for electricity and at least every 15 minutes for gas.

**Default screen**

2.33. Some consumer groups argue that there should also be minimum requirements regarding the default screen on an IHD to ensure that consumers have ready access to the minimum information set (e.g. within one or two button presses). While it is important to ensure that information is accessible, we believe that setting minimum requirements for information access and display would inhibit the ability of suppliers to tailor IHDs to meet the demands of different groups of consumers. We are minded not to set a specific requirement regarding the default screen but may take action if there is evidence that the minimum information set is not readily accessible.

## Presentation of information

2.34. Numerical data has been the predominant mode of feedback to date on displays. While evidence on the effectiveness of displays showing numerical data is reasonably well established, more recent research, including provisional information from the EDRP trial and the report to the EST[12], suggests that a changing rate is better expressed through a more visual medium. The use of basic analogue or ambient signals to represent current consumption information may be effective in facilitating behavioural change.

2.35. Ambient feedback is aimed at peripheral vision, not at supplying detailed numerical information. Examples of this include representation of a consumer's level of consumption by "traffic lights" (green indicators for periods of low consumption and red for high); or a 'speedometer' bar or gauge. Ambient feedback provides the user with a feel for what is going on without requiring detailed attention. It can usefully alert users to unusually high consumption. Such feedback can also be very useful for consumers with low levels of numeracy or literacy who may not have the ability to interpret numerical data.

2.36. An issue with 'traffic light displays' was highlighted by participants in our consumer research. Some participants expressed concern that older, vulnerable adults could be frightened into turning off or down appliances that they need in order to stay warm and healthy. This is less of an issue for electricity unless it is the main source of heating. Anecdotal evidence provided to Ofgem suggests that many fuel poor customers already ration their energy use and do not heat their homes sufficiently.

2.37. While we recognise that energy rationing is a serious issue, we do not feel that the solution is to not provide an IHD or to disallow ambient feedback to vulnerable consumers. We believe that IHDs can play an important role in helping fuel poor customers save money on their energy bills and help them climb out of fuel poverty. We believe that a better solution is to ensure that there is proper support and advice for those consumers who may ration their energy use. Issues concerning vulnerable

[12] *Exploring consumer preferences for home energy display functionality*, Report to the Energy Saving Trust, Will Anderson and Vicki White, Centre for Sustainable Energy, August 2009.

consumers are covered in more detail in the "Consumer Protection" supporting document.

2.38. The risk of rationing by vulnerable consumers may also be reduced by reviewing the settings for different ambient feedback levels. Aside from the issue of rationing, these settings are important for ensuring the provision of a meaningful indicator (i.e. not one which just permanently displays one colour). This is particularly important where a consumer uses electricity to heat their home. In such cases consumption for heating may be so high that it drowns out any minor movements in electricity consumption unless adjustments are made to account for this.

2.39. Given the growing evidence that ambient feedback is a useful indicator for consumers, we propose that the display must include a visual (i.e. non-numerical) presentation that allows consumers to easily distinguish between high and low levels of current consumption. This is particularly important for consumers with low levels of numeracy as well as being of benefit to the population at large. We are not aware of any controlled trials which definitively show which method of representation is the most effective in driving behaviour change. We are therefore not currently minded to require any particular format. We expect this to be a source of differentiation between IHD offerings.

**Question 3: We welcome views on the issues with establishing the settings for ambient feedback.**

## Arrangements for consumers with special requirements

2.40. The Government has decided that all households should be provided with an IHD. This is based on the view that universal deployment of IHDs will promote consumer engagement and the related energy and carbon dioxide savings throughout the population. The display should therefore be accessible for all consumers.

2.41. There are a number of potential equality issues relating to the provision of a display. For example, the location of the display will need to reflect particular consumer circumstances in order to ensure that it is easily accessible for those consumers. It is therefore important that consumers are able to choose where to locate the display. In terms of the design of the display itself, it is also important that the display is suitable for those with a range of disabilities, including the visually impaired, the hearing impaired and those with particular dexterity issues, as well as for those with low levels of numeracy and literacy.

2.42. The members of Ofgem's Disability Advisory Forum[13] outlined a number of design features that would help consumers with disabilities to engage more fully with the IHD. They felt that most of these features would also facilitate use by able-

[13] More detail on the Disability Advisory Forum can be found on the Ofgem website.

bodied consumers and should therefore be adopted as standard. In particular, they considered the following product design features as priorities:

- Large screen and font size;
- Large and tactile buttons;
- Feedback in plain English; and
- Audio output (specifically for blind consumers).

2.43. We expect suppliers to consider the needs of customers with disabilities when providing them with display devices. For example, this may include the use of large display screens and big buttons. Displays with audio output may also be of particular benefit for blind or partially sighted customers. We would not expect suppliers to charge customers with disabilities for providing this sort of feature.

2.44. We do not consider it appropriate to mandate detailed requirements in this area, not least to avoid hampering innovation. Nethertheless, we welcome views on whether there is a case for a licence obligation around the need for appropriately designed IHDs to be provided to consumers with special requirements (at no additional charge) and/or for best practice to be identified and shared once suppliers start to roll out IHDs.

**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?**

## Display portability

2.45. There is evidence from qualitative research that some consumers prefer to receive electricity consumption information on portable displays. This allows consumers to move the IHD from room to room and see the immediate impact of turning equipment on and off[14]. This evidence supports the view that consumers use feedback on current consumption to identify quick energy savings (e.g. switching off lights, not leaving devices in stand-by mode). There is also evidence, however, that portability may only be of short-term interest to consumers[15]. We are not aware of any quantitative evidence isolating the importance of portability in encouraging behaviour change.

2.46. If portability is set as a minimum requirement, then all IHDs must be capable of receiving power from a non-mains electrical source. This is likely to mean provision of displays with either rechargeable or non-rechargeable batteries. While

[14] *Exploring consumer preferences for home energy display functionality*, Report to the Energy Saving Trust, Will Anderson and Vicki White, Centre for Sustainable Energy, August 2009.
[15] *Exploring consumer preferences for home energy display functionality*, Report to the Energy Saving Trust, Will Anderson and Vicki White, Centre for Sustainable Energy, August 2009.

non-rechargeable batteries may be the cheapest option for suppliers at rollout[16], we estimate that over the lifetime of an IHD non-rechargeable batteries will have to be replaced every 12 months. Consumer groups, suppliers and display manufacturers have warned that allowing IHDs to be powered by non-rechargeable batteries would lead to higher costs for consumers and for the environment from purchasing and disposal respectively.

2.47. We estimate that setting portability with rechargeable batteries as a minimum requirement would cost suppliers approximately £135 million more than provision of a mains-only (i.e. non-portable) IHD[17]. Given that we are not aware of any quantitative evidence supporting portability as an essential function to deliver the benefits, we are minded not to set portability as a minimum requirement. If evidence is presented showing that portability has an important impact on consumers' energy consumption, then this requirement will be reviewed.

2.48. When providing the IHD, we expect installers to respect the consumer's preference regarding its positioning within the home. This will be subject to certain restrictions, including signal strength and availability of a mains power point where the IHD is mains-only.

**Question 5: We welcome evidence on whether portability of IHDs has a significant impact on consumer behavioural change.**

**Question 6: Do you agree with the proposed minimum functional requirements for the IHD?**

[16] According to available information, we estimate that the one-off cost of providing an IHD with: non-rechargeable batteries is 92p; a mains charger (no batteries) is £1.20.
[17] The cost of providing an IHD with rechargeable batteries depends on the power consumption of the IHD and the desired lifetime between charges. We estimate that an IHD with two AA sized rechargeable batteries should power the minimum specification IHD for at least a week before needing to be recharged. We estimate that this will cost £3.74 (cost of 1 rechargeable battery is £1.27 and the adaptor is £1.20). The impact of these options was assessed using the December 2009 IA model.

# 3. Nature of the Mandate on Suppliers in relation to the IHD

This chapter sets out our proposals on the nature of the mandate on suppliers in relation to the provision of the IHD and the options we have considered. The key issues covered here include the nature of the requirement on suppliers, requirements on early movers and the length of any mandate.

**Question 7:** Do you have any views or evidence relating to whether innovation could be hampered by requiring all displays to be capable of displaying the minimum information set for both fuels?

**Question 8:** Do you agree with the proposals covering the roles of and obligations on suppliers in relation to the IHD?

## Nature of requirement on suppliers

3.1. We propose that the requirement to provide the IHD should be placed on suppliers. As the main point of contact for most customer issues, supplier responsibility would seem to be the natural choice. The smart metering installation visit will be an important event in the energy supplier's relationship with the customer. As such, it will be in the commercial interests of suppliers to ensure that the installation experience is a positive one. Furthermore the programme strongly believes that promoting competition in provision of the IHD will further encourage innovation in this area of rapid technological change. Finally, placing the obligation on suppliers offers them greater control over their supply chains.

3.2. We have also examined the option of obliging the new central data and communications function (referred to as DataCommsCo or DCC) to provide the IHD. This would be more likely to result in a common IHD offer across all consumers. Despite clear cost advantages via the economies of scale from bulk purchasing, feedback from the EDRP suggests that one size does not fit all. Enabling suppliers to differentiate their offers to suit their customer bases will lead to greater consumer choice and create the most likely conditions for delivering the consumer behaviour change central to the programme's benefits case.

3.3. An issue will arise in households that have different suppliers for electricity and gas. Just under a third of households receive electricity and gas from separate suppliers. Consumer bodies have indicated a clear consumer preference for households to receive one IHD. This is further reinforced by our consumer research. We looked at how best to satisfy this consumer preference in households with two suppliers, while maintaining competition among suppliers and facilitating innovation.

3.4. In line with consumer group recommendations, we are proposing that these aims could best be achieved by setting a requirement that all IHDs be capable of displaying the minimum information set for both gas and electricity.[18] However,

[18] We are not aware of any technical reason why a dual fuel IHD should require additional or more costly components than a single fuel IHD.

there has been initial feedback from the EDRP that some consumers engage well with single fuel displays integrated into existing familiar home interfaces (e.g. home heating controllers).[19]

3.5. To maximise consumer choice and competition, we believe that the second supplier should always have the option of providing an IHD. While this may mean that some consumers with separate suppliers are offered two displays, we believe that the benefits to consumer choice and innovation outweigh any related costs. We are therefore proposing that where a household has two energy suppliers, the second supplier will be required to provide an IHD, except in cases where they can satisfy themselves that the minimum information set for their fuel is already accessible to the consumer on the existing dual fuel display.

3.6. To ensure that the rollout leads to as high a penetration of IHDs as possible, we expect suppliers to take all reasonable steps to provide them to consumers at the point of installation. We have however considered what specific requirements should apply in cases where the individual consumer declines the IHD at that stage. In these cases, we are proposing a requirement on suppliers to provide an IHD if the consumer requests one within one year from the installation visit. Suppliers will be required to notify customers of their rights in this respect. Given that an additional installation visit would be likely to lead to further costs and inconvenience for both suppliers and consumers, we are minded to allow suppliers the freedom to choose how to fulfil such an obligation.

**Question 7: Do you have any views or evidence relating to whether innovation could be hampered by requiring all displays to be capable of displaying the minimum information set for both fuels?**

## Requirements on early movers

3.7. We recognise that some suppliers are deploying smart meters in advance of the start of the mandated rollout. It is important, however, that this activity is delivered in a way that protects consumer interests. From the start of the mandated rollout, we propose that suppliers will be obliged to provide an IHD to a household when they install a smart meter. We have examined whether supplementary requirements should be placed on suppliers to provide an IHD to those consumers who, prior to the start of the mandated rollout, received a smart meter but not an IHD that meets the minimum requirements for the mandated rollout.

3.8. Due to the energy saving benefits which IHDs will facilitate for consumers, the aim of the programme is to ensure that all consumers have access to the minimum information set on an IHD.

[19] This issue of appliance-specific IHDs versus central ones is discussed further in the following paper: *Influencing user behaviour with energy information display systems for intelligent homes*, G. Wood and M. Newborough, 2006.

3.9. At present, suppliers deploying smart meters provide energy consumption feedback to their customers in a number of ways. In some cases this is done via IHDs, whereas in others, information is provided online through web-based portals. For a proportion of these consumers, the availability of feedback on energy consumption will have led them to switch to a smart tariff in the first place. However, others will have had their traditional meter replaced with a smarter one in line with the ongoing recertification process. We are not aware of any instances of suppliers providing smart meters that are not accompanied by an offer of an additional means of consumption feedback.

3.10. There is a balance between the need to ensure that consumers do not miss out on the benefits of a minimum specification IHD, while avoiding imposing additional inconvenience on those already satisfied with their current means of consumption feedback. Requiring suppliers to offer all these customers an IHD could lead to wastage as well as inconvenience for the customer. We are therefore proposing that suppliers should be required to provide these customers with an IHD for no up-front charge, but only on request. This requirement would last for one year following the start of the mandated rollout. Suppliers will be required to notify customers of their rights in this respect. This proposal would be subject to review in the light of evidence from early mover deployments.

3.11. Given that an installation visit is likely to lead to further costs and inconvenience for both suppliers and consumers, we are minded to allow suppliers the freedom to choose how they wish to fulfil this obligation. While there is a risk that provision by post could result in less effective information for consumers, the consumers concerned are likely to be more familiar with energy consumption feedback and IHDs. Requiring a home visit may also deter consumers from taking up the offer.

## Length of mandate

3.12. Academic literature characterises the process of achieving an enduring shift in household energy consumption as a cycle of change.[20] Information about energy consumption and the scope for change stimulates householder action. Feedback about the consequences of such action on energy consumption and related financial rewards is then the starting point for further action or the maintenance of behaviour change.

3.13. A single intervention can lead to a reduction in a household's energy consumption if it is sufficient to trigger or otherwise enable this cycle of change. In this section, we consider the role the IHD plays in this cycle of change and hence whether or not suppliers should have an enduring obligation to maintain and replace IHDs. The options we consider are:

[20] See for example: *The effectiveness of feedback on energy consumption – A review for DEFRA of the literature on metering, billing and direct displays*, Sarah Darby, April 2006.

- Option 1: Short-term obligation - responsibility on supplier to maintain and replace an IHD for one year after installation; and
- Option 2: Enduring obligation **-** responsibility on supplier to maintain and replace IHDs in perpetuity.

**Evaluation**

3.14. The majority of pilot studies show that consumption feedback stimulates energy savings, particularly for electricity. Across the majority of trials involving direct feedback from IHDs, participants made average energy savings of two to fifteen per cent. A key question is whether this visible behavioural change requires continued use of the IHD.

3.15. To date, there has been no relevant large scale trial lasting for longer than two years. This means there is no quantitative evidence relating to the enduring impact of displays. While some consumers clearly respond to the direct feedback provided by IHDs, they may lose enthusiasm or interest over time once initial savings have been locked in. Placing an enduring obligation on suppliers to replace and maintain IHDs would increase costs and should only be mandated if it would be expected to deliver clear net benefits. We cannot at this stage draw on any evidence to support such a mandate.

3.16. The two year Ontario trial provides some useful insights into the usage of IHDs[21]. A survey conducted at the end of the trial found that two years after receiving IHDs, almost one third of consumers surveyed who had access to a functioning IHD chose not to use it for the duration of the trial. Importantly, this was an opt-in trial so these consumers were likely to be more energy conscious than the average consumer. Despite this, the IHD did incite long-term behavioural changes. Of the consumers surveyed:

- 76 per cent said they had lowered the temperature of their thermostat;
- 74 per cent had been more careful about opening windows;
- 65 per cent cleaned furnace filters; and
- 43 per cent insulated water heaters.

3.17. These changes did not require enduring use of the IHD. This suggests that longer-term behaviour change can be triggered by short-term use of an IHD.

3.18. There is some evidence of displays with specific functionality being used on an enduring basis. This occurs where the IHD performs an essential function, or can save consumers money on an enduring basis. Examples of enduring functionality include:

[21] *In-Home Real-Time Display, Customer feedback from a 30,000 unit deployment*, Hydro One, presentation at the Home Energy Displays Conferences Connect in Orlando, April 2009.

- EDF Tempo displays in France which have traffic lights indicating future tariff tiers. Over 300,000 residential consumers are on the tempo tariff and according to EDF, 87 per cent have understood the tariff principle very well[22];
- Prepay remote keypad displays in Northern Ireland allow consumers to top-up without having to access the meter. 27 per cent of domestic consumers use a keypad to top-up their credit[23]; and
- The EDRP is testing energy feedback displays incorporated into the household's heating thermostat/controller. Early indications are that integrating a display into existing consumer appliances/interfaces may increase the level of consumer interest in feedback on gas consumption.

3.19. In the example where a consumer relies on an IHD rather than other prepayment top-up channels (e.g. telephone, internet or cash), it is more likely that they will use the display on an enduring basis. What remains unclear, however, is whether enduring use of the display also affects behaviour beyond the use of the specific functions that it offers.

**Recommendation**

3.20. There is, at present, little evidence regarding the enduring impact of IHDs on energy consumption. The market for delivery of energy information is at an early stage of development. While there is currently evidence that IHDs are an effective delivery method in the short term, consumer preferences may change as technology develops.

3.21. To encourage innovation and facilitate flexibility for future development in this area, we propose that suppliers should not be subject to an enduring obligation, but should be responsible for maintaining and replacing IHDs for one year after installation of the smart meter. This is in addition to and without prejudice to other obligations, such as those arising out of statutory consumer protection provisions, and the terms of their contracts with consumers. After this time, it will be up to consumers to repair or replace their IHD. We expect consumers to be able to purchase IHDs from suppliers and other retailers. Suppliers may choose to offer tariffs that include longer-term support of IHD devices.

3.22. One exception to this would be in the situation where the IHD was being used as the primary interface for a prepayment customer. This could be the case if, for example, the meter is inaccessible. In such cases, we would expect the supplier to ensure that a functioning IHD was available on an enduring basis in order to meet their licence obligation to only charge by prepayment where safe and practicable to do so. The "Consumer Protection" supporting document contains more details on this issue.

[22] *The tempo tariff,* EDF, presentation at the Defflocom workshop in Trondheim, June 2004.
[23] *Keypad meters - The Northern Ireland experience*, NIE Energy, presentation at UK ERC workshop, Managing residential electricity demand: Learning from experience in the UK and Ontario, May 2008.

3.23. We will monitor the impact of displays in pre-rollout trials and the early rollout period as well as emerging evidence from the EDRP. If evidence becomes available showing that IHDs have an important enduring impact on consumers' energy consumption, then the length and nature of the obligation may be reviewed.

**Question 8: Do you agree with the proposals covering the roles of and obligations on suppliers in relation to the IHD?**

# 4. Conclusions and Next Steps

This chapter summarises our proposed minimum functional requirements and arrangements for provision of the IHD. It also sets out the next steps for ensuring that IHDs meeting the minimum functional requirements are rolled out across Great Britain.

## Summary of key proposals

4.1. We propose that the minimum functional requirements for the IHD should include:

- Capability to display information on both gas and electricity consumption;
- Presentation of information on current electricity and gas consumption as well as current tariff;
- Presentation of information on historical consumption so that consumers can compare current and previous usage;
- Presentation of information on cumulative consumption for current day/week/month/billing period;
- To facilitate consumer understanding, usage information must be displayed in pounds and pence as well as kilowatts and kilowatt hours and the display must include a visual (i.e. non-numerical) presentation that allows consumers to easily distinguish between high and low levels of current consumption;
- Presentation of accurate account balance information (amount in credit or debit);
- Local time; and
- Status of communication link.

4.2. Regarding the nature of the mandate on suppliers in relation to the provision of the IHD we propose that:

- The supplier that installs the first smart meter at the premises would have an obligation to provide an IHD. Consumers may opt not to have an IHD at the time of the installation but will have the right to change their minds for a period of 12 months. A second supplier would not need to provide a further IHD if they were satisfied that the information related to both fuels could be displayed successfully on the existing IHD.
- Suppliers should be responsible for maintaining and replacing IHDs for one year after installation of the smart meter. This is in addition to and without prejudice to other obligations, such as those arising out of statutory consumer protection provisions, and the terms of their contracts with consumers.
- Minimum functionality required of IHDs will be included in the Smart Metering System Functional Requirements Catalogue (the "Catalogue").

## Next steps

4.3. The mandate on suppliers in relation to the provision of the IHD will be taken forward as part of the wider changes to the regulatory regime. These are set out in the "Regulatory and Commercial Framework" supporting document.

4.4. Details of the plans for evolving the technical specifications for all parts of the smart metering system are set out in the "Statement of Design Requirements" supporting document. The key steps are:

- The industry will develop technical specifications for IHDs, through the Smart Metering Design Expert Group, to provide sufficient technical certainty to equipment manufacturers and industry players to enable them to manufacture IHDs that meet the requirements of the Catalogue and are interoperable; and
- Suppliers will be obliged to install (or cause to be installed) and be responsible for IHDs that comply with the Catalogue and technical specifications.

# Appendices

**Index**

# Appendix 1 – Consultation Response and Questions

1.1. We would like to hear the views of interested parties in relation to any of the issues set out in this document. When responding please state whether you are responding as an individual or representing the views of an organisation. If responding on behalf of an organisation, please make it clear who the organisation represents and, where applicable, how the views of members were assembled.

1.2. We would especially welcome responses to the specific questions included in each chapter and that are replicated here. These detailed questions sit behind the more high-level questions contained in the Prospectus.

1.3. Responses should be received by **28 October 2010** and should be sent to:

- Margaret Coaster
- Smart Metering Team, Ofgem E-Serve
- 9 Millbank, London SW1P 3GE
- 020 7901 7000
- smartmetering@ofgem.gov.uk

1.4. Unless marked confidential, all responses will be published by placing them on the websites of Ofgem (www.ofgem.gov.uk) and DECC (www.decc.gov.uk). Respondents may request that their response is kept confidential.

1.5. Respondents who wish their responses to remain confidential should clearly mark the document(s) to that effect and include the reasons for confidentiality. Respondents are asked to put any confidential material in the appendices to their responses. It would be helpful if responses could be submitted both electronically and in hard copy.

1.6. Individual responses and information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information regimes (these are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 1998 (DPA) and the Environmental Information Regulations 2004).

1.7. In view of this, it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department of Energy and Climate Change or Ofgem. We will process your personal data in accordance with the DPA. In the majority of circumstances, this will mean that your personal data will not be disclosed to third parties.

1.8. Any questions on this document should, in the first instance, be directed to:


- Margaret Coaster
- Smart Metering Team, Ofgem E-Serve
- 9 Millbank, London SW1P 3GE
- 020 7901 7000
- smartmetering@ofgem.gov.uk


1.9. You may make copies of this document without seeking permission. Further printed copies of the consultation document can be obtained from the contact above. An electronic version can be found on the Ofgem website at: www.ofgem.gov.uk. Other versions of the document in Braille, other languages or audio-cassette are available on request.

**CHAPTER 2**

Question 1: We welcome views on the level of accuracy which can be achieved and which customers would expect, in particular in relation to consumption in pounds and pence.

Question 2: We welcome evidence on whether information on carbon dioxide emissions is a useful indicator in encouraging behaviour change, and if so, how it might be best represented to consumers.

Question 3: We welcome views on the issues with establishing the settings for ambient feedback.

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?
Question 5: We welcome evidence on whether portability of IHDs has a significant impact on consumer behavioural change.

Question 6: Do you agree with the proposed minimum functional requirements for the IHD?

**CHAPTER 3**

Question 7: Do you have any views or evidence relating to whether innovation could be hampered by requiring all displays to be capable of displaying the minimum information set for both fuels?

Question 8: Do you agree with the proposals covering the roles of and obligations on suppliers in relation to the IHD?

# Appendix 2 – Glossary

## C

### Catalogue

The functional requirements of the smart metering system are brought together in our proposed Smart Metering System Functional Requirements Catalogue (the "Catalogue"). This covers the smart metering system for both domestic and smaller non-domestic sectors.

### Codes

Industry codes establish detailed rules that govern market operation, the terms for connection and access to energy networks. The supply and network licences require the establishment of a number of industry codes that underpin the gas and electricity markets. The electricity codes are: Balancing and Settlement Code (BSC), Connection and Use of System Code (CUSC), Distribution Code, Grid Code, Master Registration Agreement (MRA), System Operator-Transmission Owner Code (STC), Distribution Connection and Use of System Agreement (DCUSA). The gas codes are the Uniform Network Code (UNC), Independent Gas Transporter (IGT) Network Codes, Supply Point Administration Agreement (SPAA).

### Consumer

Person or organisation using electricity or gas at a meter point.

### Consumer Advisory Group (CAG)

The Consumer Advisory Group consists of members from groups representing a broad range of domestic consumers. It was set up to help inform the programme and to promote understanding of key consumer issues, particularly more complex issues that cannot be fully explored through primary consumer research.

### Customer

Any person supplied or entitled to be supplied with electricity or gas by a supplier.

## D

### Department of Energy and Climate Change (DECC)

The Department of Energy and Climate Change was created in October 2008, to bring together: energy policy and climate change mitigation policy.

### Disability Advisory Forum

A group hosted by Ofgem that is attended by a range of organisations representing the interests of people with disabilities.

### Dual fuel

A type of energy contract where a customer takes gas and electricity from the same supplier.

## E

### Economies of scale

Where the average costs of producing a good or providing a service falls as output increases.

### Electricity meter

A measuring instrument that records the quantity of electricity supplied.

### Energy suppliers

A company licensed by Ofgem to sell energy to, and to bill, customers in Great Britain.

## F

### Functional requirements

The minimum functions that must be supported by the different elements of the smart metering system to ensure the delivery of the benefits of smart metering. Describes what the smart metering system must do (not how it must do so).

**G**

### Gas and Electricity Markets Authority (GEMA)

The Authority is Ofgem's governing body. It consists of non-executive and executive members and a non-executive chair. The Authority determines strategy, sets policy priorities and takes decisions on a range of matters, including price controls and enforcement. The Authority's principal objective is to protect the interests of existing and future consumers in relation to gas conveyed through pipes and electricity conveyed by distribution or transmission systems. The interests of such consumers are their interests taken as a whole, including their interests in the reduction of greenhouse gases and in the security of the supply of gas and electricity to them. The Authority's powers are provided for under the Gas Act 1986, the Electricity Act 1989, the Utilities Act 2000, the Competition Act 1998 and the Enterprise Act 2002.

### Gas meter

A measuring instrument that records the volume of gas supplied.

### Green tariffs

An energy tariff which is marketed as having environmental credentials. There is a scheme in place that certifies tariffs that have an environmental attribute. The scheme meets Ofgem's green supply guidelines.

### Gas valve

A gas valve may be incorporated into a gas meter to regulate the flow of gas into the consumer premise. It is distinct from the isolation valve.

**H**

### Home area network (HAN)

The smart metering HAN will be used for communication between smart meters, IHDs and other devices in consumers' premises.

**I**

### In-home display (IHD)

An in-home display is an electronic device, linked to a smart meter, which provides information on a customer's energy consumption.

**K**

kWh

Kilowatt-hour is a unit used to measure energy consumption in both electricity and gas. The kilowatt-hour is a unit of energy equal to 1000 watt hours or 3.6 megajoules. Energy in watt hours is the multiplication of power in watts, and time in hours. A 100W light bulb left on for one day will consume 2.4 kWh (0.1*24).

**L**

Licence

Transporting, shipping and supplying gas; and generating, transmitting, distributing and supplying electricity are all licensable activities. Ofgem grants licences that permit parties to carry out these activities in the GB market. The licenses require the establishment of a number of multilateral industry codes that underpin the gas and electricity markets. Licensees need to be signed up as parties to codes in order to operate in the gas and electricity markets (see codes).

**M**

Microgeneration

Microgeneration is the generation of lower carbon heat and power by individuals, small businesses and communities at a small scale.

**O**

Ofgem

The Office of the Gas and Electricity Markets (Ofgem) is responsible for protecting gas and electricity consumers in Great Britain. We do this by promoting competition, wherever appropriate, and regulating the monopoly companies that run the gas and electricity networks.

Ofgem E-Serve

Ofgem E-Serve is responsible for Ofgem’s support and delivery functions. It focuses on administering environmental programmes and the delivery of sustainability projects such as the Smart Metering Implementation Programme.

**P**

### Prepayment meter (PPM)

These are meters that require payment for energy to be made in advance of use or else they will prevent the supply of gas or electricity. A PPM customer pays for energy by inserting electronic tokens, keys or cards into the meter.

**S**

### Smart meter

In addition to traditional metering functionality (measuring and registering the amount of energy which passes through it), smart meters are capable of two-way communication allowing them to transmit meter reads and receive data remotely.

**T**

### Technical specifications

The technical specifications for the smart metering system will be an explicit set of solutions and guidelines as to how the smart metering system will fulfil the functional requirements.

### Time-of-use tariff

Under a time-of-use tariff, a supplier varies its charges based on when energy is used (e.g. day/night; peak/off-peak; or by season). Such tariffs can be dynamic (changes in real time) or static (changes at predictable times).

# Appendix 3 – The Authority's Powers and Duties

1.1. Ofgem is the Office of Gas and Electricity Markets which supports the Gas and Electricity Markets Authority ("the Authority"), the regulator of the gas and electricity industries in Great Britain. This Appendix summarises the primary powers and duties of the Authority. It is not comprehensive and is not a substitute to reference to the relevant legal instruments (including, but not limited to, those referred to below).

1.2. The Authority's powers and duties are largely provided for in statute, principally the Gas Act 1986, the Electricity Act 1989, the Utilities Act 2000, the Competition Act 1998, the Enterprise Act 2002 and the Energy Act 2004, as well as arising from directly effective European Community legislation. References to the Gas Act and the Electricity Act in this Appendix are to Part 1 of each of those Acts.[24]

1.3. Duties and functions relating to gas are set out in the Gas Act and those relating to electricity are set out in the Electricity Act. This Appendix must be read accordingly[25].

1.4. The Authority's principal objective when carrying out certain of its functions under each of the Gas Act and the Electricity Act is to protect the interests of existing and future consumers, wherever appropriate by promoting effective competition between persons engaged in, or in commercial activities connected with, the shipping, transportation or supply of gas conveyed through pipes, and the generation, transmission, distribution or supply of electricity or the provision or use of electricity interconnectors.

1.5. The Authority must when carrying out those functions have regard to:

- the need to secure that, so far as it is economical to meet them, all reasonable demands in Great Britain for gas conveyed through pipes are met;
- the need to secure that all reasonable demands for electricity are met;
- the need to secure that licence holders are able to finance the activities which are the subject of obligations on them[26];
- the need to contribute to the achievement of sustainable development; and
- the interests of individuals who are disabled or chronically sick, of pensionable age, with low incomes, or residing in rural areas.[27]

1.6. Subject to the above, the Authority is required to carry out the functions referred to in the manner which it considers is best calculated to:

[24] Entitled "Gas Supply" and "Electricity Supply" respectively.
[25] However, in exercising a function under the Electricity Act the Authority may have regard to the interests of consumers in relation to gas conveyed through pipes and vice versa in the case of it exercising a function under the Gas Act.
[26] Under the Gas Act and the Utilities Act, in the case of Gas Act functions, or the Electricity Act, the Utilities Act and certain parts of the Energy Act in the case of Electricity Act functions.
[27] The Authority may have regard to other descriptions of consumers.

- promote efficiency and economy on the part of those licensed[28] under the relevant Act and the efficient use of gas conveyed through pipes and electricity conveyed by distribution systems or transmission systems;
- protect the public from dangers arising from the conveyance of gas through pipes or the use of gas conveyed through pipes and from the generation, transmission, distribution or supply of electricity; and
- secure a diverse and viable long-term energy supply.

1.7. In carrying out the functions referred to, the Authority must also have regard, to:

- the effect on the environment of activities connected with the conveyance of gas through pipes or with the generation, transmission, distribution or supply of electricity;
- the principles under which regulatory activities should be transparent, accountable, proportionate, consistent and targeted only at cases in which action is needed and any other principles that appear to it to represent the best regulatory practice; and
- certain statutory guidance on social and environmental matters issued by the Secretary of State.

1.8. The Authority has powers under the Competition Act to investigate suspected anti-competitive activity and take action for breaches of the prohibitions in the legislation in respect of the gas and electricity sectors in Great Britain and is a designated National Competition Authority under the EC Modernisation Regulation[29] and therefore part of the European Competition Network. The Authority also has concurrent powers with the Office of Fair Trading in respect of market investigation references to the Competition Commission.

[28] Or persons authorised by exemptions to carry on any activity.
[29] Council Regulation (EC) 1/2003