Getting to grips with smart displays
An expert appraisal of the usability of in-home energy displays
Consumer Focus is the statutory consumer champion for England, Wales, Scotland and (for postal consumers) Northern Ireland.

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Consumer Focus tackles the issues that matter to consumers, and aims to give people a stronger voice. We don’t just draw attention to problems – we work with consumers and with a range of organisations to champion creative solutions that make a difference to consumers’ lives.

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The Government has proposed that all homes in Great Britain have smart meters installed by 2019. Alongside their smart meter every customer will be provided with an In-Home Display (IHD) capable of displaying near real-time information on their energy consumption and other related data.

The aim of the IHD is to make normally invisible energy use more visible, by giving people detailed feedback about how much gas and electricity they are using as they use it¹, which in turn should help them identify where they can make savings on their energy bill. The precise displays customers get and the features of those displays will vary from supplier to supplier, but Government is expected to outline minimum requirements which all standard smart meter IHDs must meet to ensure a level of quality.

Consumer Focus has been working to ensure that IHDs are designed in a way that provides the greatest benefit to customers. It is important that all consumers, including those that are older or have a disability, receive an IHD which they find easy to use. This is particularly important as the overwhelming majority of the benefit to customers from having smart meters comes from them being able to use the information provided by their smart meters to better manage their energy use².

According to the Government’s recently published Life Opportunities Survey³, 29 per cent of all adults in GB have some form of an impairment⁴ resulting from injury or illness, genetic inheritance or the natural ageing process. Impairments are defined as long-term characteristics of an individual that affect functioning and/or appearance⁵ such as dexterity problems, impaired vision, hearing difficulties, mobility problems or long term pain. Some of which may impact how customers engage with their display.

How easy IHDs are to use (their usability and accessibility) is recognised as an important factor in determining their effectiveness as a customer tool to reduce their gas and electricity consumption in both the short and longer term.

In its recent decision document on smart metering, the Government said it would consider how best to ensure that, when providing customers with IHDs, suppliers meet consumers’ accessibility requirements⁶.

It has been suggested by some parties that, rather than producing displays which follow the principles of inclusivity by design, suppliers could address the needs of customers with impairments by offering them specially tailored devices.

¹ The current design requirements document states that electricity updates will be provided in ‘better than 10 seconds’ and gas updates every 30 minutes. For electricity only, updates will be provided in ‘near-real time’. For electricity and gas, the information on that day’s cumulative consumption will be updated every half hour.
² £4.6 billion of customer benefits identified in the Impact Assessment are expected to come from households reducing their energy use; DECC/ Ofgem Impact Assessment, 30/03/2011, http://tinyurl.com/234968z
³ Life Opportunities Survey, December 2010.
⁴ Loss of physiological and psychological functions of the body such as sight, hearing, mobility or learning capacity.
⁵ The social model of disability makes a clear distinction between impairment and disability. Impairments are long-term characteristics of an individual that affect their functioning and/or appearance. Disability, however, is viewed as the disadvantage, or restriction of activity and participation, caused by aspects of society that take little or no account of the needs of people with impairments. Section 1(2) of the Disability Discrimination Act 1995 (DDA) defined someone as disabled if ‘he or she has a physical or mental impairment which has a substantial and long-term adverse effect on her or his ability to carry out normal day-to-day activities’. The Equalities Act 2010 has subsequently replaced the DDA, although the definition of disability in the Act is similar to that which applied for the purposes of the DDA (47).
In some instances this is likely to be necessary, for example where a customer has a very specific need, such as being blind. However, specially designed products can be expensive and identifying the full range of customers who would benefit is challenging.

Another approach is to design the IHD in a way that customers with common impairments, such as sight problems, and dexterity issues, can access it, as well as those that don’t. Not only might that help keep costs down as fewer specialised displays would be required, but it should also help to reduce the number of customers who don’t engage with their IHD because of inaccessible design.

To help advance work in this area of ‘inclusive design’ and inform decisions on the design of IHDs Consumer Focus commissioned Ricability, a specialist consumer research organisation, to identify the design attributes of IHDs that affect ease of use. To do this, four usability experts assessed eight IHDs and energy monitors, identifying the design attributes that supported ease of use for everyone, but with a focus on older and disabled users.

There was a range of good ergonomic design attributes among the products. But, some displays were let down by design features that meant in practice their overall usability was poor.

It was felt that all products could be made easier to use for a larger range of consumers.

The evaluation identified a number of general design principles that support good accessible and usable design.

- Large, clear, legible text and graphics
- Intuitive icons
- Clear use of zones to separate unrelated information
- Backlighting
- Easily detectable buttons with positive tactile feedback (and an instant visual response)
- Intuitive navigation, button labels are there to inform (fewer buttons do not necessarily mean easier/better navigation)
- Easy to access batteries and adapter sockets
- Clear and legible instructions written in plain English
- Diagrams annotated and text large enough to read comfortably

If refined using a test and evaluate process, these principles would offer the best opportunity to meet as many users’ accessibility needs as possible, including older and disabled users which make up a sizeable and growing proportion of our population.

As a next step we recommend that further research is carried out to develop Industry Guidance with consideration given to the need for regulation.

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6 Smart Metering Implementation Programme: Response to Prospectus Consultation; page 15, 2.30. The Government will consider how best to ensure that, when providing customers with IHDs, suppliers meet consumers’ accessibility requirements. In the next phase, the programme will explore whether the principles of ‘inclusivity by design’ could be included within the technical specifications for the smart metering system.
Introduction

Government has proposed a target that all homes will have smart meters installed by 2019. Smart meters are the next generation of gas and electricity meters with a range of additional functions.

As part of the rollout, all residential households will be provided with an In-Home Display (IHD) capable of displaying near real-time information on their energy consumption. This should be provided at no up-front cost and will have to meet yet to be finalised minimum standards. The main objective in issuing IHDs is to give customers a tool to help them better manage their energy use and reduce their energy bills. The usability of IHDs has been recognised as important to their effectiveness as a tool to help customers reduce their energy consumption in both the short and longer term.

Government has decided that industry should meet consumers’ accessibility requirements when providing IHDs, and plans to explore whether inclusivity by design could be included in the basic IHD offer.

To help advance work in this area and inform decisions on the design of IHDs, Consumer Focus commissioned Ricability, a specialist consumer research organisation, to identify the design attributes of IHDs that affect ease of use. This report presents the findings from the usability expert assessment of selected IHDs and energy monitors. It forms the second part of a three staged piece of research looking at how we can maximise the accessibility of IHDs and make them easy to use for as many consumers as possible.

The first piece of the research is a review looking at current lessons learnt around accessibility and inclusivity by design from suppliers’ existing installations and available research. The final phase of the research will include qualitative customer research.

It should be noted that unlike energy monitors, few IHDs, with a smart metering functionality are currently manufactured and available to consumers. We would like to thank the manufacturers that provided energy monitors and displays for this research, including prototypes that are as yet not on the market. Discussions with manufacturers indicate that many welcome this feedback which can help inform their product design. Our aim is that this collaborative approach can help deliver early benefit for consumers.
In-home displays

Objective
Identify the key IHD ergonomic attributes that affect ease of use with a focus on all consumers, including older and disabled. It should be noted that the minimum specification requirements developed by Government were not evaluated.

Methodology
The usability assessment consisted of eight IHDs and energy monitors, selected by Ricability’s Senior Researcher and Ergonomist Mark Harnett, being individually assessed by four usability experts.

IHD selection
Energy monitors and IHDs were both considered for assessment due to similarities in information content and the way people interact with them. While it was understood that IHDs would be dual fuel and have greater functionality than energy monitors, the design principles that make IHDs and energy monitors easy to use are essentially the same eg legible text and easy to press buttons.

Manufacturers and suppliers were contacted to get as many different IHDs and energy monitors as possible to ensure the market range was well represented. A full list of manufacturers contacted can be found in annex 1.

Mark Harnett selected eight products from the 13 provided by manufacturers and suppliers. This required a provisional ergonomic assessment of the user interface and controls to eliminate products that shared similar design features that would not add variation to the expert appraisal.

The final eight incorporated a wide range of design attributes. It was important to ensure as many design elements as possible could be assessed for their ease of use by the experts. The other five were excluded as their design attributes were considered similar enough to the other products.

It was clear that some products were aimed at a more tech-savvy market, and that some would cost considerably more than others. However, no IHD/energy monitor was excluded for these reasons because:

- it was considered that understanding what key design attributes support ease of use was important, regardless of cost and market segmentation
- relatively cheap design attributes that support ease of use may be found on expensive products

(It is worth noting that the minimum specification IHD capital cost used in the DECC Impact Assessment was £15.)

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7 DECC/Ofgem Impact Assessment, Smart meter rollout for the domestic sector (GB), 30/03/2011 (page 24)
Here are the products included and excluded from the usability expert assessments. See Annex two for bigger images of the selected products.

**Included products**

- Current Cost – EnviR
- Eco-eye Elite
- Efergy Elite
- Ewgeco
- Geo – Unifi
- Humm – Minim
- Landis+Gyr (5262c)
- Navetas
Excluded products

- Current Cost – Trec
- Efergy e2
- Geo – Solo
- Onzo
- Owl
Four usability experts were selected:

- Ian Hosking, Senior Research Associate (University of Cambridge, Department of Engineering)
- Sabine van den Heuvel, Accessibility Specialist – Evaluator (RNIB)
- Roy Brooker, Principal Scientist (Intertek Research and Testing Centre)
- Mark Harnett, Senior Researcher and Ergonomist (Ricability)

**Expert evaluation**

Experts were asked to assess each of the eight products in turn, identifying the features that made them easy or difficult to use and gave a brief rationale why. To do this the experts annotated a large image of each IHD. Assessments were conducted individually at first before being given the opportunity to discuss their opinions more openly. In doing so particularly good and bad examples of design attributes were identified.

Experts also discussed the information displayed by the IHDs.
Findings and discussion

In this report product examples are given to illustrate specific points. It should be stressed that these are examples only and it is not a reflection on the in-home display/energy monitors as a whole.

For simplicity, energy monitors and in-home displays will simply be referred to as IHDs in the remainder of the report.

Hardware (physical characteristics)

Battery and mains supply, implications for positioning

It was felt that to get maximum benefit from an IHD it should be positioned where it can be regularly scanned and easily interrogated if desired. The IHDs assessed varied with battery only display (these had a mains adapter socket but no adapter, eg Eco-eye elite), mains powered only displays (eg Unifi) and a display with both (Ewgeco).

While a battery powered IHD would be portable, concerns over battery life were raised. Therefore, it was felt that it should primarily run off the mains. This is in line with the Government’s proposed minimum specification for IHDs. Cable length ranged from approximately 150cm to 200cm. This would have an affect on where consumers would be able to place the IHD, ie not necessarily in the most convenient or influential location. The availability of wall plug sockets may also be a limiting factor.

Battery covers on all the IHDs were difficult to remove and replace. Older consumers, and those with hand strength/dexterity impairments could find this particularly difficult or impossible. Manufacturers need to consider more carefully how people can access and change batteries.

Image 3: Ewgeco and Efergy Elite battery covers

8 The Minimum Specification for IHDs (Requirement IH.01) as of 27 July 2011 states that; ‘The IHD shall support mains power operation.’
Similarly, manufacturers need to consider how easy it is for consumers to connect to the mains. Some adapters had to be orientated in a specific direction and were exceptionally fiddly to plug into the IHD, e.g., Navetas required good sight and fine motor skills. For IHDs capable of using both batteries and mains power, connection was particularly important as they have been designed with portability in mind, so plugging in and unplugging may be the norm. Of the selected products only the Ewgeco had this functionality. Connection was made particularly easy by use of a mains connected cradle for the portable battery fitted IHD to sit in.

The Efergy Elite had a rubber cover over the mains adapter socket found at the rear of the IHD and the Eco-eye Elite had the socket located in the battery compartment, under the removable cover. In both cases these made access very difficult.

However, it should be noted that neither device came with a mains adapter as standard, but simply had the capability to be powered that way.
Freestanding / wall mounted

All the IHDs assessed were designed to be freestanding, some could also be wall mounted eg, Unifi. They ranged in sturdiness and strength seemingly with the least sturdy IHDs all designed with hinged, pop-out stands.

Concerns were raised over the durability of the products in general, but the hinged stands were particularly weak. The IHDs were not specifically tested for this, but build quality was clearly an issue, the stands of the Ewgeco and Eco Eye Elite both broke before the assessments took place.

The ease in which pull-out stands could be accessed varied despite most being similar in design. People with poor hand dexterity in particular may struggle as there was nowhere to get sufficient and comfortable grip. Sharp edges were also found on some IHDs, such as the Navetas (bottom of the stand).

The EnviR stood out as a sturdy freestanding product. It consisted of a large base and benefitted from a hinged display that meant the viewing angle could be adjusted.

The Ewgeco was the only IHD assessed that came with a cradle. This meant the IHD did not need to be unplugged and plugged in again, but simply replaced in its cradle after use. However, it was let down by a particularly unsteady base when freestanding and was prone to falling out the cradle when in an upright position (replicating a wall mounted position).

It should be noted that the IHDs were not wall mounted during the assessments but it was considered important that wall mounted displays should be easy to remove from the wall to allow for easy interrogation.

The Efergy Elite was designed to be freestanding and wall mountable, however the mains adapter socket was located on the back so should the consumer want to power it this way and wall mount it, they could not. The IHD did not come with a mains adapter as standard but simply had the capability to be powered that way.

Buttons

There are a number of factors that combine to affect the ease of use of buttons. This section attempts to isolate individual ergonomic attributes as far as possible to give good and bad examples of what makes buttons usable. It should be noted that there are two types of buttons, physical buttons and touch screen buttons.

Image 5: Efergy Elite’s adapter socket cover
Image 6: Efergy Elite (top) and Ewgeco (bottom) show differences in button size and spacing (approximately to scale, not full size)
Physical and touch screen buttons

Buttons that are large enough to be pressed without risk of pressing surrounding buttons were considered useful, particularly for people with reduced dexterity or hand control. Some smaller buttons were considered to be sufficient where spacing between the buttons was more generous.

Many of the IHDs had buttons that doubled up in functionality eg for settings and navigation. While fewer buttons are often considered beneficial, this is only the case where buttons remain intuitive. The experts felt that separate buttons for settings on some IHDs could be an advantage as buttons with more than one function were sometimes confusing. The Landis+Gyr IHD was considered a good example of how buttons for settings and those for navigating energy information keeps the user experience simple.

Some buttons required a press, hold and release action, eg Efergy Elite, or a specific set of presses within a given period, eg EnviR. This can be difficult or painful for many people, particularly those with weak hands. This is an example of fewer buttons increasing the complexity.

Buttons that contrast well with the background make identifying their position easier for everyone, but particularly people with poor sight.

Button labelling

Good colour contrast between button labels and the background make identifying the correct button easier for everyone, but particularly benefits users with poor sight. The Unifi and the Minim had particularly poor colour contrast. However, they did have tactile markings that would help some partially sighted consumers identify the buttons.
Image 8: Efergy Elite (top) and Ewgeco (bottom) show good and bad colour contrast between buttons and their surround

Image 9: EnviR (white on black labels) and Minim (black on black labels)
Efergy Elite has protruding buttons (top) and recessed buttons (bottom)
Physical buttons

Buttons that protrude, eg **Efergy Elite**, are easier to press for people with poor dexterity and easier to locate by touch, particularly useful for people with poor sight. Moreover, buttons that were recessed were particularly difficult to press. The **Efergy Elite** included both in its design.

Buttons that were easy to press and gave positive tactile feedback (feeling a click), eg **Minim**, helped efficient interaction, particularly important for people with poor sight. Spongy and wobbly buttons, eg **Eco-eye Elite**, were found to give a false feeling that a button had been pressed.

Touch screen buttons

Touch screens are not able to provide tactile feedback in the same way physical buttons can. However a small vibration, like on mobile phones, is possible but not found on the **Navetas**, the only touch screen assessed.

Dials

There were no dials found on any of the IHDs.

Backlighting

Backlighting, or sidelighting, increased contrast considerably, particularly in low lighting environments. Two IHDs (**Navetas** and **Ewgeco**) had a backlight on continuously so could be scanned/read from a greater distance, two had backlights come on when a button was pressed and the remainder had no backlight at all. No displays had a designated backlight button.

Image 11: Ewgeco (top) and Unifi (bottom) show the difference backlighting makes in a moderate lighting environment
Displays that required a button press to trigger the backlight frustrated experts, as they simultaneously changed what was displayed on the screen. For example, pressing the mode/set button on the **Efergy Elite** when displaying ‘energy now, KW’ triggered the backlight but also skipped the screen on to ‘energy now, £ per hour’.

The **Efergy Elite** backlight stayed on for approximately six seconds, this was not considered long enough to take in the information displayed on the screen (**Landis+Gyr’s** backlight stayed on for 60 seconds). It would be useful for consumers to be able to customise this setting or have a designated backlight button to allow them to read and understand what is on the screen at their leisure.

The **Efergy Elite’s** backlight would only come on when a button was pressed between 6pm and 6am; experts could not see the benefit in providing this functionality for a designated period only.

The **Ewgeco** was the only IHD with customisable backlight settings (four levels of brightness when situated in its cradle), experts felt this was useful functionality. However, maximum brightness of the backlight was reduced when taken out of its cradle.

**Reflection**

All screens suffered from reflection which considerably reduced the readability of what was on the screen. Anti-reflective coatings can help reduce this. Where the IHD is positioned within the home will also make a difference, if light is reflected directly towards the user, this will make the screen very difficult to read.
Software and interface design

Default screen scanning
Consumers often scan information displays rather than continuously interrogate it for information. The default screen would therefore benefit from displaying as much of the key information as possible in an easy to read, uncluttered manner, and from a distance greater than arms length.

Text and icon legibility
This section attempts to isolate the individual ergonomic elements that make text legible, good and bad examples are given where applicable. While people with poor sight may benefit most from clearly legible text, good legibility benefits all.

The size of the characters is one of the fundamentals that affect how easy it is to read. Sizes varied greatly between IHDs and on the same IHD. Using different text size on a single screen can often be useful for hierarchical purposes but the smallest should always be large enough to read clearly by as many people as possible.

Image 13: Eco-eye Elite (below) and Unifi (right) show differences text size (approximately to scale but not full size)
Some text was simply considered far too small; to read from distance by all, but also up close by some. This was common among IHDs including the Unifi.

The Eco-eye Elite displayed one piece of information on the screen at any one time. The extra large numbers were easy to read from a distance, however the units were small in comparison. Without larger units it was not possible to determine what the numbers meant.

Font type varied, simple San Serif fonts were easiest to read, eg some text on the EnviR. Text made up of a series of straight lines was most difficult to read eg Navetas. Fonts varied from display to display and on the same display.

Good colour contrast between text and the background increases legibility. Most colour contrast was about the same without a backlight. Backlighting further increased contrast, see Backlighting on page 18.

Scrolling text was used on the Navetas only. This was difficult to read as only part of the word(s) was displayed, people with a visual impairment or reading difficulties would be particularly likely to struggle. The speed of movement was customisable but felt scrolling text could and should have been avoided.

Icons
The intuitiveness of icons ranged considerably. Experts understood that some things were difficult to convey through use of an icon eg tariff, in such cases they should be clearly defined and easy to find in the manual as was the case with the Unifi. However, there were examples of familiar icons being redesigned, such as the mute icon.

Icons also need to follow the same rules as text in terms of legibility (see Text and icon legibility on page 20).
Image 15: Navetas scrolling text

Image 16: With sound and muted. Icons from Nevetas
**Responsiveness**

When a button was pressed on the *Efergy Elite* there was a delay before a change in state took place. Experts repressed the button again in light of the lack of response but the screen would eventually move forward twice. It was therefore considered important for the IHDs to respond to an action instantly.

**Presentation**

What and how much information was critical to how easy to read and understand IHDs were. The way this information was displayed varied greatly between IHDs, from the *Eco-eye Elite* that displayed one piece of information at a time on a large digital display, to the *Unifi* that presented a large amount of information in different formats. Both have their advantages and disadvantages.

No display was considered to be faultless in terms of providing information in a clear, uncluttered and legible way. A number of specific observations with examples made by the usability experts are set out below.

**Clutter**

Some IHDs presented information in a cluttered manner. For example the *Unifi* provided a lot of useful information but did not segregate it, nor did it use the whole display. Areas appeared visually busy that made identification of specific information hard work, particularly when compared to the *EnviR* that presented information in clearly defined areas by using lines and white space.

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*Image 17: EnviR (left) has clearly segregated areas for information. Unifi (right) has a concentrated area for almost all information (approximately to scale, not full size)*
The Navetas used areas of the display to show different bits of information. Icons of individual appliances were grouped together but similar appliance or appliances room by room might be more logical. It should be noted that this was a demo unit so may not have been fully representative of how it would be set up.

**Graphics**

Some of the IHDs presented graphs to display historic energy use. For consumers to be able to use this information it needs to be presented in a legible and intuitive way. A number of issues are related to this:

- Some of the graphs were simply too small to read eg Efergy Elite
- The Efergy Elite also presented yesterdays energy timeline backwards
- Some increments were very small and difficult to decipher eg Efergy Elite
- Increments got larger in size on some IHDs eg Minim, the purpose of this was not clear

**Unit location**

Units were sometimes disassociated from the number/graphics they belonged to or were too close to other numbers/graphic, eg Unifi. This can increase the time taken to locate, read and understand the information.
**Navigation**

Navigation through current energy consumption, history and settings were generally quite easy. However, the amount of functionality had a bearing on this. One of the most confused areas of navigation was a result of dual function buttons, see Buttons, Physical and touch screen buttons on page 18.

**Ghosting**

Some IHDs when read from an angle suffered from ghosting, a double image that appears on the screen, eg EnviR. In this instance, the second ‘ghost’ image is a shadow created by the characters/images on the screen created by the ambient light and the depth of the LCD screen. This is common among LCD displays, but reduces the legibility.

Image 20: EnviR suffers from ghosting when read at an angle

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**Ambient feedback**

**Colour coding**

The experts felt that the use of a colour coding system (or traffic light system) to reflect current energy consumption was useful. Of the IHDs assessed three provided overall energy consumption information using green, amber and red (Landis+Gyr, Ewgco and Navetas) and one (Navetas) also used this coding to indicate the usage level for individual appliances.

A large amber or red light would be enough to inform most consumer of high consumption. For people that are colour blind (red-green colour blindness effects approximately 8 per cent of males and 1 per cent of females in the UK) a second visual cue would be necessary, such as different positions for each colour and identifiable from distance – like a traffic light eg Landis+Gyr.

It was felt that having a traffic light system for every appliance, like on the Navetas would have both advantages and disadvantages. For some consumers, this level of information may be too much to take in, but for others this information would provide them with an instant picture of what appliance/s use energy above a threshold. What the threshold is and how it is set is very important, but this was not something that could be assessed using Navetas’ demo model.

Red is typically associated with warnings, danger etc but here means ‘high’ use, it is not clear whether in some situations an appliance that is simply ‘on’, eg a kettle, will trigger a red light. A kettle does not have low, medium or high settings so a red light could concern some customers.

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* Bupa healthcare website
  http://www.bupa.co.uk/individuals/health-information/directory/c/colour-blindness
  (viewed 3.6.2011)
Consumers turning off or down vital appliances, such as heaters, to reduce costs concerned the experts. More work is needed in this area.

The Ewgeco, claims to have inbuilt intelligence to ensure that specific appliances do not trigger a red light and alarm the consumer simply through being ‘on’. It is not clear if any of the other products have similar functionality.

Audible alarms
Some IHDs, eg Efergy Elite, had an audible alarm that would sound when a certain energy threshold was reached. This feature was useful to alert the consumer to high usage, particularly when it is not within viewing distance. The Efergy Elite allowed the alarm to be turned off if desired.

Text to speech
None of the IHDs contained text to speech, although experts were agreed that this would make IHDs accessible for people with no useful sight.

Instructions and terminology
Hard copy instructions were considered a crucial part of the energy reduction initiative as they are likely to be a key source of information for many consumers if they are unable to use the IHD after installation. While the instructions for each product were not individually assessed some were noted to use unexplained jargon, unintuitive metaphors, small print and lacked information and detail in parts. This aspect will be looked at in more detail in the next stage of the research.

Information

Appliance specific measurements
The Navetas, Unifi and EnviR were the products assessed with functionality to display energy use of individual appliances. This was thought to be useful for consumers to inform them how much energy various appliances use.

The Navetas energy monitor is able to determine the energy consumption of a specific appliances using their electrical signature and is able to measure this direct from the main incoming meter cable.

The Unifi and EnviR require appliances to be plugged into a separate device which in turn must be plugged into a wall socket. This device transmits energy information to the IHD. The Unifi allows the consumer to turn off the appliance remotely or directly at the plug in device if desired.

Image 21: Landis+Gyr shows one way of using colour to represent energy consumption
It is clear from the IHDs and energy monitors received from manufacturers and providers that there is a diverse range of designs that make some products more accessible and usable than others. Such variation in the market can be beneficial to all as consumers can purchase the product that best suits their needs. However, it is important that any basic offer installed by providers as standard should be as inclusively designed as possible to limit the exclusion of any individuals and ensure maximum numbers of people can easily use them.

There was a range of good ergonomic design attributes among the products. But, some were also let down by design features that meant their overall usability was poor. Products were often only as usable as the least usable part. For example, large legible numbers are accessible, but if combined with small illegible units they become unusable. Such inconsistencies in were not uncommon.

The evaluation identified a number of general design principles that support good accessible and usable design.

- Clear, legible text and graphics
- Intuitive icons
- Clear use of zones to separate unrelated information and clutter free
- Backlighting
- Easily detectable buttons with positive tactile feedback (and an instant visual response)
- Navigation should be intuitive, button labels are there to inform (less buttons does not necessarily means easier/better)
- Batteries and adapter sockets easy to access
- Clear and legible instructions written in plain English
- Diagrams and text large to read comfortably

If refined using a test and evaluate process, these principles would offer the best opportunity to meet as many users’ needs as possible, including older and disabled users.

**Next steps**

This report looks at the usability of the physical display. This is one aspect of ensuring that displays are accessible, and more research is clearly needed in this area. An important next step is consumer testing of displays. However, another piece of work is also necessary to consider the broader elements that impact on how accessible a display is, for example the type of instructions and the verbal/written support that consumers are given.

Ofgem should, as a minimum, seek to develop good practice guidance on usability of displays and, following research, consider whether some form of regulation would be necessary.

It is also recommended that research should be undertaken to deliver:

- Industry product feedback reports to individual manufacturers/suppliers including ratings
- Consumer guidance, eg what to look for when selecting a display to meet your needs

It is suggested that a test and evaluate process should be adopted to ensure the needs of as many people as possible, including older and disabled people, are met.
Annex 1 Manufacturers

Manufacturers contacted to gain access to IHDs and energy monitors

- AlertMe
- Current Cost
- Diykyoto
- Eco-Eye
- Efergy
- Ewebox
- Ewgeco
- Geo
- Landis+Gyr
- Navetas
- Onzo
- Qees
- The Owl
Annex 2 Images

Below are images of the eight IHDs/energy monitors selected for the usability expert assessment. Measurements included indicate maximum height and width of the each display and accurate to ± 5mm.
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If you have any questions or would like further information about our research, please contact Holly Reilly, by telephone on 020 7799 7971 or via email holly.reilly@consumerfocus.org.uk or Zoe McLeod on 020 7799 7973 or zoe.mcleod@consumerfocus.org.uk

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