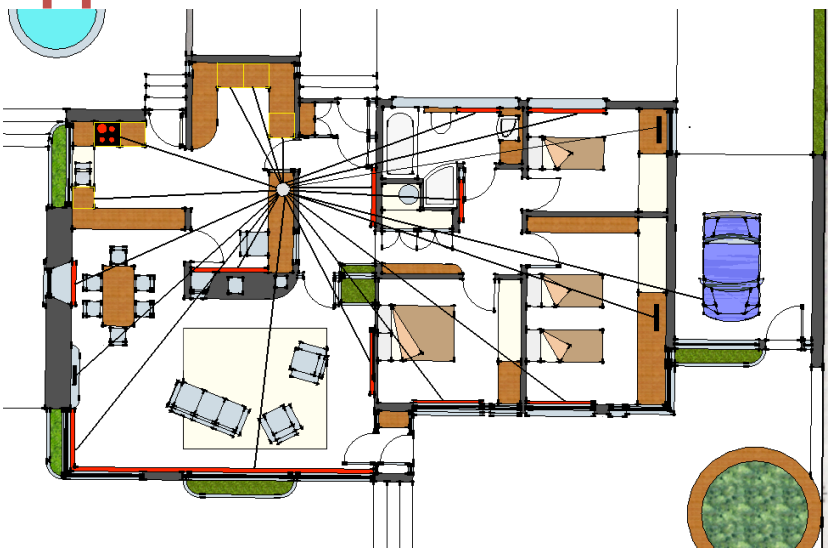
Smart Meters, HAN & smart appliances



Smart Meters

Alternatives to wireless Smart Meters and related technologies may be required for a number of reasons.

One of these is that, as many individuals who claim to be electrohypersensitive (EHS) - *or simply do not wish to be exposed to raised levels of manmade electromagnetic fields* - have shielded their homes against RF/microwave signals; wireless Smart Meters located within such dwellings (as most meters are in the UK) would be unable to connect to utility Home Area Networks (HAN) outdoors.

Another reason alternatives are required is that many materials used to construct standard dwellings (and many commercial buildings) shield, at least in part, emissions from such units.

Powerwatch (2010) proposes that this might be addressed by utilities offering to locate such meters outside the house. However, individuals could still be exposed to RF/microwave emissions from such units when directly outside their own property and could still result in them being able to use parts of their property as they used to. The use of wired Smart Meters (*such as used by EPB in Chattanooga (Baker 2011*)), would avoid such problems. Refer also to section on '*Human Rights and Smart Meters'*.

As a matter of best practice, filters should used to reduce high frequency transients and harmonics from Smart meters that may otherwise create 'dirty electricity' which have been indicated in some studies as negatively impacting on health (Milham 2010, Havas 2006). Refer also to section on '*Smart Meter Interference'.*

Home Area Networks (HAN)

"*The Home Area Network (HAN) is a critical part of the [UK] smart metering programme. As these HAN devices are to be connected into every home in Great Britain, the HAN must be both reliable and secure in order to provide the consumer with a top class user experience…*" SmartReach (2011).

According to 'The Worldwide Smart Grid Market in 2011: A Reality Check and Five Year Outlook Through 2015', "*Nearly 3/4 of all utilities either have no plans for home area networking, or have not yet made a decision. Only 2% have already committed to a business venture, with another 12% considering such a move*," (Berst 2011). It is proposed that the use of fibre-optics and RF/microwave regimes that are proven to be 'bio-friendly' could reverse this trend.

Public health concerns, the recent classification of RF/microwave radiation as a Class 2B carcinogen (WHO/IARC 2011), the BioInitiative Working Group (2007) recommending drastically lower RF/microwave exposure levels, and the recommendation by the Parliamentary Assembly of the Council of Europe (PACE 2011) that electromagnetic emissions should be "*as low as reasonably achievable*" (ALARA), provide further incentive to develop and adhere to best practice measures when developing HAN systems.

HAN design and specification

The Smart Meter HAN interface can be activated to both receive or transmit signals to smart appliances by either the utility company or the smart appliances themselves transmitting data. This can only take place, however, after the utility permits HAN communication by issuing a security password that only it controls.

Wireless HAN

At present all the current proposals for HAN in the UK are for wireless networks - though one of these systems, M-Bus, can be used wirelessly and was originally conceived as a simple wired network especially for Smart Meters. The wired option of M-Bus is used to create wired HAN networks in several European countries including Germany and is likely to cause fewer problems for those who are electrohypersensitive (EHS).

Signals from wireless HAN can be blocked or degraded by the presence of some types of building materials.

In particular signals can often be blocked by foil-backed plasterboard (used in many buildings) and some types of foil-backed high thermal insulation. Wire mesh used in some old buildings for plaster and lath work also blocks signals. Concrete and some dense building materials too can compromise signals.

Signals can also be deliberately blocked by the use of particular materials and finishes by electrosensitives who attempt to screen themselves and their homes from RF/microwaves which they say can often make them feel unwell.

The result of such factors is that reliable signals cannot be received in some areas, whilst increased signals can be encountered in others thereby raising occupancy exposure to RF/microwave radiation).

Ideally wired options should be available to reduce risk to those who are considered particularly vulnerable to RF/microwave radiation, those who for personal reasons do not wish to be exposed to such regimes, and those who wish to optimally use smart appliances without signal degradation.

Wired HAN

Powerwatch (2010) suggest that it may be appropriate for the UK to consider supplying Smart Meters that can have their wireless function disabled and allow for wired M-Bus port to be used as single screened wire connections instead of wireless. They further suggest that as the UK forbids there being any directly wired connections to gas meters, either opto-isolated couplings (at the outside of gas meter enclosures) or short lengths of fibre-optic cables are used as the final connection.

Fibre-optic HAN

HAN are now considered essential by many consumers, with growing numbers of people wishing them to be preinstalled in new homes. This can now be achieved in every room using plastic optical fibre (POF) instead of wireless or copper cabling.

POF is easy to install (without the need for an electrician) and can be used for distances of up to 100 m (328 feet) - *industrial glass fibre optic cables send digital signals far further but are more expensive and should only be installed by professionals*. A POF system is also available which has a low voltage DC distribution system allowing digital products to be run more energy efficiently (FL 2011).

The use of fibre-optic cabling, in contrast to other alternatives, allows built-in systems to be 'future proofed' against increasing needs for bandwidths whilst helping to create 'electromagnetically clean' environments and good transmission. It would appear prudent to consider its use for consumers' HAN and Smart Meters to make them more desirable to end-users.

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Smart Appliances

The range of smart appliances and devices includes: coffee makers, cooker, dishwashers, microwave ovens, standard ovens, thermostats, toasters, tumble dryers, washing machines, water heaters, freezers and refrigerators. Smart electric sockets also exist for offices and home use.

Zypryme (2010) predicts that the global market for smart appliances will be as follows in 2015*:

Clothes washers - $3,542,000,000 (€2,608,000,000)
Refrigerators - $2,693,000,000 (€1,983,000,000)
Clothes dryers - $2,236,000,000 (€1,646,000,000)
Dishwashers – $1,354,000,000 (€997,000,000)
Freezers - $1,166,000,000 (€858,500,000)
Other smart appliances - $4,184,000,000 (€3,080,000,000)
* Projected figures given in US dollars.

A number of commentators and consumers take issue with the 'need' for some appliances to be smart. As an example, one US pilot study has shown that consumers do not want utilities to tell them when to do the laundry or use the dishwasher (Ansell 2010).

It is important to assess the market accurately for appliance manufacturers who may wish to invest in it and not create unnecessary risks by 'talking up' the market or specifying the wrong type of systems.

It is presently predicted that in 2015 there will be a combined global market for 'smart' clothes washers, clothes dryers and dishwashers of $7,132,000,000. (€5,251,000,000)

The predicted combined global market for 'smart' refrigerators and freezers in 2015 will be $3,859,000,000. (€2,841,000,000)

Hunn (2011) suggests that as refrigerators and freezers are operational throughout the day, they are less suited to be smart than the appliances just discussed. Whilst this is debatable, the point he makes about the need for appliances to decrease their energy consumption still further through innovative design is highly valid. As he notes, the cheaper appliances of a number of companies advocating the use of smart technology presently have poor energy performance.

"*Consumer agreements may focus on utilities controlling only particular appliances such as freezers, air conditioners or luxury items such as swimming pools*," Wynn (2010).

Health and communication issues

Smart appliances allow communication between consumers' Home Area Networks (HAN) and utility HAN.

At present some manufacturers allow communications solely through RF/microwave connections, with no provisions being made for wired connections, or for their 24/7 signals to be disabled.

When such appliances are used, the pulsed RF/microwave signals they emit are supposed to be transmitted very infrequently. Milham (2011), however, has reported measuring [almost] "*continuously radiating RF from internal power transmitters*" from a smart oven and smart dishwasher designed to transmit their energy usage to wireless Smart Meters. Emissions only ceased when the power to them was switched off.

As mentioned at the start of this section, smart electric socket extension leads are also now available. One brand offers units that emit RF/microwave radiation at 2.4 GHz during their operation at a typical time interval of 10 seconds down to 1 second if required. Slower configurations can also be created.

That socket extension lead is being sold as being "*ideally suited for use within an office environment as a simple replacement for traditional 4 way extensions typically found under desks*." Possible health risks and potential liability claims resultant through increased RF/microwave exposures appear not to have been considered.

Orders are already being lost with a number of items because some individuals are refusing to have smart appliances and devices (that emit RF/microwaves throughout the day) installed in their homes and workplaces. Exposures to such radiation can make some individuals quite ill.

As mentioned in an earlier section, Schreier et al. (2006) noted that approximately 5% of the Swiss population may be electrohypersensitive (EHS) - the percentage of EHS individuals may be roughly similar in other countries. This is a large sector of the customer base to risk alienating. Creating wired options would help reduce such risk.

Trade Unions may also influence the degree to which particular smart formats are adopted, especially as a result of the recent WHO/IARC (2011) classification of RF/microwave radiation as a Class 2B carcinogen.

The Trades Union Congress in the UK (TUC 2008) states: "… *trade unions believe the aim should be to remove all exposure to any known or suspected carcinogen in the workplace*," and "*Caution should be used to prevent exposure to substances in Group 2B*," there may be the call for the removal of such devices in the workplace where 'safer' practical alternatives are available.

Consumer confidence

"*With growth like this it is easy to overlook the needs of the consumer."* Jason S. Rodrigues, CEO & Director of Research, Zpryme Research & Consulting, LLC (Zypryme 2010).

Some consumers have started to question how many smart appliances actually benefit them by being 'smart', and are stating that they are unhappy with the idea of having a large number of RF/microwave emitters within their homes, particularly when they will often have to be in close proximity to them (Sage 2011).

Increased exposure to RF/microwave emissions 24/7 may prove a particular problem in bedsits and studio flats due to the high concentrations of equipment often within very limited space.

These matters need to be addressed, especially as related to the possible effects of their RF/microwave emissions on potentially vulnerable individuals, such as children, pregnant women, the elderly, and those with debilitating conditions.

Ideally, wireless transmissions from such systems should be able to be disabled and wired smart interfaces built in as standard.

For the success of smart appliances and devices to be optimised, it is necessary to assess the science robustly and understand the consumer psyche.

Improving consumer response

"*Rather than let the smart metering industry have a period of relative stability to confirm their technical specifications, complete trials and educate users, this new mania around [smart] appliances adds a level of unnecessary technical uncertainty*," Hunn (2011).

Hunn (2011) adds a valid point to the debate about smart appliances with his comments shown above. He further notes that the wholesale introduction of such technology at this time could provide "*a very dangerous distraction to the core requirements of smart energy. … It adds technical uncertainty at a point when the*

industry is trying to coalesce on standards for smart meters and it distracts appliance vendors from concentrating on core improvements to the technology of their devices."

"*The industry needs to consider whether the prospect of a smart appliance is worth pursuing in the short term, as it has the potential to do more harm than good*," Hunn (2011).

If appliance manufacturers take such matters into consideration, they can greatly reduce their risks in a volatile financial climate.

By delaying the rollout of a number of smart appliances at the present time to help ensure the success of smart grids, appliance manufacturers could allow themselves a 'window of opportunity' to better develop more ecologically and environmentally friendly technologies and launch them when the public is ready to receive them – a true 'Win/Win' situation.

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