

The domestic dashboard



Smart metering is set to hand ultimate control of energy consumption to the homeowner.

By Mike Richardson.

It's impossible to imagine driving a car without a dashboard – we'd soon run out of fuel. Yet this is exactly what we're doing with the energy in our homes; we're driving our houses with no means of control. Just as car drivers learn about mpg, homeowners need to understand kWh. However, the latest innovations in smart metering will not only help us save money on fuel bills, but save the planet too!

The energy used in our homes and office buildings accounts for a considerable amount of carbon emissions, with a significant portion coming from the energy we use to heat and light them. Add to this the increasing trend for home entertainment equipment and our houses are almost glowing with energy.

According to Government research, domestic carbon emissions represent more than 25% of the UK's carbon output. In the consultation 'Building a

Greener Future', the Department for Communities and Local Government proposed an ambitious target to achieve zero carbon new homes by 2016, as a significant contribution to the goal of reducing overall carbon emissions by 60% by 2050.

In an approach to empower the market into innovating and adapting low carbon technologies, the Technology Strategy Board (TSB) is already planning activities in this area through its 'Low Impact Buildings Innovation Platform' by investing £30million in collaborative R&D projects over the next three years.

"Our goal is to help UK industry meet the challenges of the low impact buildings of the future," explained platform leader Richard Miller. "We've been working with industry and academic partners to explore what these challenges entail by structuring five key themes."



These themes address 'design for future climate', 'design and decision tools', 'management and operation of buildings' – which has the most obvious link to electronics – 'new materials and components' and the final theme of integrating low carbon energy sources into low impact building designs.

"Electronics solutions will play a significant role in a number of these themes – along with other approaches," continued Miller. "In all these activities, electronics devices will be competing with other approaches for this funding. For our first competition, where £4m of funding is available, we are going through the early stages of sifting through the expressions of interest, helping consortia join together and think about how to approach it. We're receiving ideas involving the latest electronics innovations, as well as others using passive solutions – of which some would argue are more suited to the construction industry. The ideas are competing because we're trying to solve a defined problem and be as 'technology neutral' as possible."

Look smart

One consortium set up to develop an electricity display device was recently awarded a £250,000 grant by the TSB. Led by Onzo, a company set up to develop ways of changing consumer behaviour and reduce domestic energy consumption, its eponymous display product provides real time information about how much energy we use and where we use it. Onzo displays the carbon footprint of a home and transmits the data to the energy supplier over the internet.

"We're developing a system where displays play an ongoing role in people's lives, whilst the web access expands on the information available," explained Joel Hagan, Onzo's ceo. "People interact with this information in different ways; making micro decisions about which appliances to turn on and off; when to



leave electronic devices on standby; and more structural decisions, such as what appliances they buy and what settings they have their heating on."

What homeowners need is information on which they can act, whereas today, the meter in the cupboard under the stairs has obscure kWh figures on it.

"By minimising the friction of the system at every point, Onzo can reach mass population level," said Hagan. "Our energy sensor clips onto the cable below the meter and acts as a wireless transmitter to the display. This tells the user what's happening – just like a car dashboard – and warns you when you should act – or put the handbrake on!"

Hagan feels the long term future for smart metering will involve elements of control, but not before consumers have undergone an education process. "We need to familiarise ourselves with the terminology around energy by first having a meaningful conversation about setting the speed limit."

Complete control

Intelligent sensor and control company DeepStream Technologies designs system level components using proprietary 3d electronic circuitry substrates.

Designed into building structures or appliances, they provide real time information about how much an individual appliance uses during the day. The technology can be controlled centrally or remotely via the internet so consumers can set policies to ensure appliances are turned off at specific times. With this level of intuitive control, everyone can address the issues of growing energy demand, global warming and climate change.

"We're removing the manual element of switching things off by automating it so people no longer need to think about doing it," announced ceo Mark Crozier. "It brings a new level of electronics sophistication into the electrical system, which is generally mechanical, and provides a level of automating the electrical products built into the infrastructure of any building without having to wait for smart appliances to become available. It's more powerful than merely informing people via a smart meter."

The company eschews conventional substrates in favour of a hybrid injection moulded metal lead frame type of assembly, similar to what you would see inside a chip, overmoulded with a thermoplastic material of almost any shape.

"Our circuitry overcomes the physical barriers of



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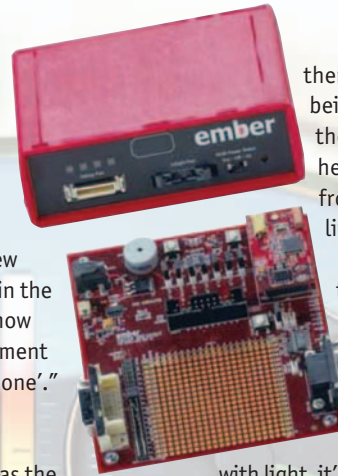


Above: DeepStream's 3d circuits are moulded inside robust plastic whilst the components mounted on the circuit are encapsulated.

Left: Onzo's EnergyDisplay smart meter displays the carbon footprint of a home and transmits the data to the energy supplier over the internet.



embedding intelligence by taking the form of a plug, socket or light switch," continued Crozier. "It fits into the same space as an existing electrical product without adding more space. Simply remove the back of your old light switch, insert our new back with the embedded electronics in the moulding and replace it. The switch now becomes a networked power management and load disconnection device 'all in one'."



Networking makes sense

In recent years, ZigBee has emerged as the global open wireless platform to develop key energy management and efficiency solutions. Ember's wireless sensor and control network technologies are said to enable energy efficiency improvements by better managing energy resources, reducing cost and preserving the environment.

"We offer customers flexible wireless solutions that control and monitor power usage," stated Ember's UK sales director John Corbett. "One area of focus is helping utility companies suffering from 'rolling' blackout problems like those experienced in America. They would like some control to prevent this – not like 'big brother' – but asking customers to let them 'control' certain, non essential high power aspects of their power usage wirelessly within the home."

then go back to sleep is increasingly being brought to bear – particularly in the power arena, where customers need help in designing devices that operate from small batteries with extended lifetimes."

Walk through your house at night with the lights off and it will most likely be lit up by a myriad of 'instant on' electrical systems. "It's not just your tv and home theatre entertainment systems," Paulus added, "LEDs are everywhere. With our houses ablaze with light, it's a wonder we can sleep at all!"

The last word on power goes to ZigBee Alliance chairman Bob Heile, who reckons the time for energy efficiency has come. "With global energy consumption rising, consumers and businesses are feeling the impact of soaring fuel and energy prices," he observed. "New power plant development costs have more than doubled since 2000 and it will be difficult to build ourselves out of this situation. Energy efficiency offers both an environmentally and economically friendly alternative that can offer long term benefits for both consumers and business alike."

Are we doing enough to combat climate change and promote zero carbon homes? There are three sides to this argument – supply, demand and Government.

"We all agree that something needs to be done to reduce domestic energy use – and the sooner the better," stated Hagan. "The key is putting useful information in the hands of consumers through dedicated energy displays."

Crozier claims one of the obstacles in this market is when one side is not incentivised. "If Government was serious about energy demands, it would create either tax or grant incentives to promote technologies that take automatic control of energy consumption – not just appliances that consume less energy, but also devices deployed in buildings to proactively reduce consumption," he concluded.

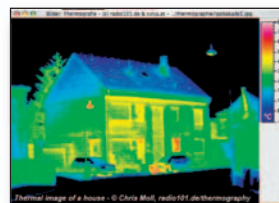
"Government is interested in reducing energy demand because it means building less power stations, whilst consumers are motivated because they want to reduce their energy bills.

"If this starts to bite in the UK, consumers will have an incentive to use technology because it will increase the value of their homes. This is far wiser than deploying smart meters in every home, because it doesn't reduce anything; it just indicates what you consume. However, making a grant available for direct reduction has a measurable outcome. These are the kinds of things Government could do, and it's an incentive that will attract strong public interest." ■



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Ember has built a robust and extremely sensitive radio around a proven flash based mcu. "Key to this has been reducing the power because the last thing you want is put technology into your energy saving environment that is using more power," added Corbett.



Corridors of power

The demands for power management ics have long been recognised in the battery powered device arena. Indeed, ics with both high efficiency conversion and low quiescent current are becoming very popular in networking systems.

"We see growing interest in accurate, automated energy usage monitoring," noted Don Paulus vp and general manager of Linear Technology. "Providing electronics for low standby current capability with the ability power up an electrical appliance and



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