'Smart meters need a rapid rethink,' researchers say

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The official UK smart meter network was switched on in November 2016 and since then smart meter devices have been installed in millions of homes across the UK. The Government wants one in every household by 2020, but a team of researchers from the University of Bath argue that the meters being installed are not up to measure.

In response to this, the team has undertaken an £1.5 million research programme over four years and developed a meter that has genuinely created significant energy and money savings for home owners. The homes using these smart meters benefited from an unprecedented 22% saving in gas consumption and the occupants became better consumers of energy by being more educated about where energy was being wasted in their homes.

The Government and energy companies are investing heavily in smart metering devices that report energy use to the user with the aim of reducing their energy consumption.

However, the effectiveness of such In-Home Displays (IHDs) has been questioned, with savings shown only to be small and in some cases, energy readings to be inaccurate or inflated, whilst critics claim it's the energy companies benefiting most greatly through reduced meter reading costs. This brings into question the logic of spending £11 billion on the technology.

Current IHDs on the market generally just report energy consumption

data, with more advanced models presenting this in monetary terms. However, no devices provide personalised advice to homeowners about how best to make effective energy savings based on their own energy usage.

The iBert intelligent smart meter developed by researchers at Bath was tested in 47 homes and uses a small number of cheap sensors to gather the data required to advise home owners about their energy usage, then make recommendations for how to save money based on observing the houses' energy usage over the previous week or more.

This data allows the meter to predict what the building is made of and how the home owners are using it, and how much energy is being wasted through aspects such as windows being left open; the heating being on when the house is unoccupied; and appliances such as televisions left on standby.

This design is the first to use simple language to communicate with home owners about their energy usage. Unlike any IHD on the market, it contains a thermal model of the building and its occupants, enabling it to make useful and accurate recommendations to home owners when they are demonstrating poor energy usage.

For example, if a home owner's central heating stayed on until 10am each day despite the house being unoccupied by 8am, the device would calculate the amount of money being wasted and suggest the home owner adjust their heating clock to 8am. Instead of just relying on monetary waste as a motivational factor, the system can also "speak" in non-monetary units such as loss of tree cover, tons of carbon or cost to society - thus aligning itself to differently motivated households.

The recommendations are presented via a smart phone or a computer allowing homeowners to clearly see where they are being energy

inefficient and how much money they could potentially save from altering their behaviour.

Project lead and Professor of Low Carbon Design at the University of Bath, David Coley said: "We have shown that presenting energy data and feedback in a clear and understandable way has a positive effect on the energy behaviour of home owners.

"For the first time, a smart metering system has been designed to help people learn what they need to do, and only interact with them if they might be being profligate.

"Current smart meters are being rolled out across the country at a cost of a staggering £11 billion but, through design, are limited in their ability to help reduce energy consumption. This needs to change."

For the first time, this study in partnership with Exeter City Council, investigated the effect of replacing such simplistic IHDs with a device providing a variety of information specifically designed to improve consumer energy literacy and provide clear actionable information aimed at changing energy behaviour.

Co-investigator and Senior Lecturer in the Department of Psychology, Dr Ian Walker added: "Through this extensive study, we have shown our design to be highly successful in significantly reducing household energy usage and bills.

"By presenting energy data clearly, we have proven it is possible to improve home owners' energy literacy and in doing so, better understand how to change their energy behaviour and reduce their energy bills."

Climate change and energy use continue to be a global issue and the residential energy sector accounts for 23% of total energy consumption

worldwide, placing it third after industry (37%) and transportation (28%). In the UK, residential energy consumption represents 29% of total energy use which translates to roughly 12% of UK greenhouse gas emissions. It is unsurprising this sector therefore plays a significant role in determining climate change policy, resulting in efforts to reduce residential energy consumption by influencing the energy behaviour of building occupants.

The findings of this study have been published in *Building and Environment* and was part of the ENLITEN project, funded by the Engineering and Physical Sciences Research Council (EPSRC).

More information: Nataliya Mogles et al, How smart do smart meters need to be?, *Building and Environment* (2017). DOI: 10.1016/j.buildenv.2017.09.008

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