Should the UK spend £10bn on smart meters?

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The Department of Energy and Climate Change (DECC) is expected to reveal its decision this month on how to implement a £10bn plan to replace 47 million gas and electricity meters with new smart energy meters in every British home, office and factory by 2020.

The government believes smart meters will provide accurate real-time information on consumers' energy consumption, encouraging them to use less. Smart meters promise to give consumers the ability to switch between energy suppliers almost instantly. Micro-generators will be able to sell spare energy back to the grid, and consumers will be able trickle-charge their electric cars at the cheapest rate. There will be no more meter readers or estimated bills.

The project will "dwarf" the Digital Dividend project to convert TV broadcasting from analogue to digital technology, says David Southwell, a spokesman for the Energy Network Association (ENA), which represents companies that own and manage the energy distribution networks "Every home and office will have to be visited [to fit the new meters]," he says.

Garry Felgate, chief executive of the Energy Retail Association (ERA), which represents gas and electricity suppliers, says the industry needs to invest up to £200bn over the next 10 years on new power stations and distribution grids to meet environmental targets and to ensure "the lights stay on".

The DECC impact assessment found that the smart meter project would cost £9.3bn and return £11.8bn over 20 years. So is spending the money now on smart meters the right way to go?

A DECC spokesman says the spending decision has been taken; still at issue is the roll-out plan. But last week, the government asked consultancy Accenture, which has pushed for city-based smart grid projects, to take another look at the business case.

Guy Doyle, chief energy economist at Mott MacDonald, a multinational management and engineering and development consultancy, says there are cheaper ways to cut energy consumption.

The biggest impact consumers can make on their energy bills is to turn down their thermostats, improve insulation in their houses, install energy-efficient boilers and lights, and swap their cookers for microwave ovens, Doyle says. "MOreover, these savings are locked in," he says.

It would be easier and cheaper to retrofit existing meters with a very basic energy meter. Consumers or energy retailers could then use existing fixed and mobile telephone, satellite and cable TV networks, or possibly even the electricity grid (see box) for communications, he says.

The information transfer requirement is negligible, he says. "Message sizes are a couple of bytes and they can update once a day. There would be some loss of functionality versus the premium solution, but the savings would be considerable."

He discounts the claimed benefits of extra information and control that smart meters and smart electricity grids could provide, pointing out that most of the grid is already under real-time control.

"There are about 300 grid supply point [GSP] meters [which measure the change from high-voltage to low-voltage distribution] all under real-time monitoring and providing very detailed information about consumption. One would want to be confident that the extra information from 28 million consumer metering points justified the cost," Doyle says.

He agrees that providing regular feedback to customers on their consumption should incentivise them to better manage their consumption, but research shows that consumers are only likely to save between 2% to 15% on their bills, and these savings are temporary as consumers do revert to old habits.

The energy industry is keen to have a centralised data network to manage the meters. But that might not be needed. Search engine firm Google is already testing how to use personal Google pages to provide customers with their electricity usage data with several energy companies, including Glasgow EPB.

Southwell says smart meters are essential if consumers want to recharge their electric cars at the lowest tariff, or those who generate their own electricity want to sell any surplus to the national grid,

But the real short-term consumer benefit of smart meters would be to simplify and speed up switching between energy suppliers. Doyle says the present process requires some 30-plus error-prone steps.

"A smart meter and grid would allow consumers to change suppliers almost instantly. Your supplier could take a reading while you were on the phone, say you owe so much, which you could pay by card, and the job's done," he says.

The other big advantage would be to cut the number of meter readers. Not reading meters would save energy firms £2.6bn, the impact assessment says.

But unemployment is close to record levels. Could the government afford to throw more people out of work? Would meter readers be happy to retrain to fit smart meters?

Had the decision to refresh the nation's meters been taken six years ago, when the government's finances were stronger, there would be little argument about it. But the size of the national debt, the current account deficit, the untested carbon saving, and the likely staff redundancies, all suggest the case for smart meters now is unproven.

How will the smart grid be controlled?

The kind of communications network needed to control the smart grid is a key issue affected by the decision on how the UK will roll out smart meters and convert the nation's 50-year-old electricity distribution network into a smart grid.

The question was the first asked in a consultation on ways and means to spend almost £10bn to replace the nation's 47 million gas and electricity meters by 2020, the aim being to cut the nation's energy consumption.

The Energy Retail Association (ERA), which represents the six main energy suppliers, is keen on a centralised communications network. It told the DECC, "A combined central metering management system (which includes communications network specifications) is the most effective way to govern retail and metering arrangements."

Others argue it could be done using the existing telephone, data, TV and possibly even the electrical power grid itself, or a combination of them. Or that it could be done with regional rather than national networks.

Jason Brogden, principal consultant for Engage and project manager for the ERA's smart meter project, says interoperability is crucial for the different components that make up the system. The industry would prefer to specify the network in terms of application interfaces that cover the meters' functions, the wide area network, the home area network and the human interface (ie, display), he says.

"The key thing is to define everything as a service," he says. This will allow suppliers to provide innovative answers to the meters, the networks and the displays because they have only to ensure that their components can accept defined inputs and provide defined outputs.

Either the government or the industry can then use procurement policy to get competitive bids from smart meter manufacturers, installers and communications services suppliers, he says.

Energy grid as broadband network

Two new standards are under development that will turn the electrical power grid into a secure high-speed broadband network.

They could allow energy companies to compete with existing telecommunications network operators, or to earn more by renting out spare capacity.

TheIEEE P1901 project will develop a standard for high-speed (faster than 100Mbps) communication devices via alternating current electric power lines. They will use transmission frequencies below 100MHz and run up to 1,500m from the nearest exchange or 100m from other network devices in local area networks.

The standard will ensure the privacy of communications between users and allow the use of networked devices for security sensitive services. The full implementation will allow devices on the network to talk to each other as well as other networks via Ethernet 802.1. The standard will also comply with national electromagnetic radiation limits to ensure they don't affect other electronic devices.

The IEEE P1903 standard will allow local devices such as TV monitors and personal digital assistants to use internet protocols to discover, set up, and maintain their own local area network independently of underlying transport networks.