IN MAY 2013 the UK government announced that the introduction of more than 50 million smart meters across the nation was to be delayed by just over a year. At the time, the Department of Energy and Climate Change (DECC), which is the government organisation responsible for the roll-out of the meters, stated that communications and energy industries needed more time to design, build, and test systems to ensure the programme was a success. Most industry players doubtless breathed a sigh of relief.

As Lawrence Slade, chief operating officer from industry trade association, Energy UK, puts it: “This has given industry more time; fitting some 50 to 60 million meters is not something you can do overnight, so the extra time was always going to be welcome.”

Mass roll-out is now scheduled to start in Autumn 2015, which, asserts Slade, gives the entire sector precious extra months to ensure each part of the supply chain is fully functioning. “[We] can now make sure the data communications companies are set up and all end-to-end systems testing is in place,” he says. “Manufacturers can make sure they are happy with meter specifications, suppliers can ensure plans for installer recruitment are in place and we can start building up consumer confidence much more.”

But extra time or not, the reality is installing more than 50 million smart meters in homes and small businesses across the nation is a massive logistical endeavour, riddled with challenges. Consumer confidence is a primary hurdle.

**Cost worries**

So what exactly is the consumer getting? In terms of devices, a typical home or small business will be installed with a smart meter that comprises an electricity meter and a gas meter. For the domestic consumer, the smart meter comes with an in-home display that provides near real-time feedback on energy usage and its cost. This information should help the user better manage energy use and save money on bills.
Within the home, the smart meter and in-home display are wirelessly interconnected via a smart metering home area network (SM HAN) to the home’s central communications hub. If a home generates its own electricity, for example via solar panels, the generation meter that measures energy produced will also be connected to the SM HAN. And in time, consumer devices such as hot-water storage, fridges, freezers and washing machines will also connect to the SM HAN so the smart meter can provide energy data on these devices. The home’s central communications hub will wirelessly transmit the energy data from the home, across a regional mobile network, or Wider Area Network (WAN), to the energy supplier. As DECC highlights, providing suppliers with accurate data for billing in this way removes the need for a meter reader to visit the premises and brings an end to estimated billing. People will only be billed for the energy they use, the meters can be switched between pre-payment or credit mode, and consumers will have easier access to better deals from different suppliers.

Data privacy
For its part, DECC assures consumer privacy over data and has established a programme to boost consumer understanding over how meters work. The government organisation estimates the installation of smart meters over the next twenty years will cost £12.1bn and provide £18.6bn in benefits. It also expects typical consumer consumption will drop by 2 per cent, a figure described as conservative by UK electricity and gas regulator Ofgem.

But as the smart meter roll-out gathers momentum, unease over the programme is surfacing. A primary concern is upfront cost. UK government projects the cost of smart electricity meters to be around £43, with smart gas meters coming in at £56 and displays at £15. Given this and roll-out costs, it predicts that come 2015, bills will increase by £7 a year for the average dual-fuel customer in the short term, until the cost of meters is balanced out over time by the lower operating costs for energy suppliers. But with media reports contradicting this – for example British Gas chief executive Chris Weston is reported to have said energy bills could rise by around £50 per annum – consumer tensions could rise.

“IT is not yet clear how easy it’s going to be to get meters installed, and I don’t think it’s at all clear how many visits on average it’s going to take to install a meter,” says Dr Martyn Thomas, chair of the IT policy panel at The IET. “This has a big implication on cost, and at the end of the day it’s going to be the consumer who carries all those costs, not the shareholders.”

Consumer refusal
And then there’s the tricky question of whether the consumer actually says yes to having a smart meter. According to Ofgem, the onus is on suppliers to take all reasonable steps to install smart meters in every household by the end of 2020. Is this realistic?

A 2012 DECC survey into public attitudes, carried out on 120 respondents, indicated that once smart meters and in-home displays are understood, very few consumers felt they would turn one down. But as Thomas asserts: “At the moment it’s not clear that the public will be waiting at their front doors with open arms beckoning in meter fitters. Even if appointments are made, will they be kept?”

Still Energy UK’s Slade does not foresee any problems: “Once we start getting the benefits out in the open and debunking some of the risks that have come out, I think people will start coming round to the idea that this is actually a good thing.”

John Scott, former technical director of Ofgem and now director of Chiltern Power, believes communications with future customers are going to be key to the acceptance of smart meters. However, he also advocates looking beyond upfront costs.

“You need to look further than the immediate cost of the smart meter because all the opportunities and benefits come from achieving the smart grid and having informed and educated customers,” he says. “This is the game-changer for drawing customers to engage with the energy system.”

As smart meters are rolled out and consumers become more familiar with how they operate, Scott highlights how demand-side management could considerably reduce the strain on the nation’s power grid and reduce energy bills. Here, consumers will shift demand for energy from peak times to periods of lower demand, and crucially suppliers can encourage this load-shifting by enabling tariffs that reward customers for consuming energy during quiet times. Indeed, British Gas is already trialling a ‘Free Power Saturdays’ tariff for possible launch next year.

“The roll-out of smart meters is just the beginning of what should be a huge range of opportunities,” says Scott. “And this active demand side is really important to the economics of the future grid, which is why DECC and Ofgem are pushing hard for smart metering and what it will lead to in terms of demand management.”

But as promising as the vision is, hurdles remain. Take the notion of distributed storage, whereby consumers may use large home batteries to store the energy they have generated from their solar panels or other form of distributed generation.

If in the future a customer wishes to use some of his or her stored energy, this is simply not possible given today’s
wiring, earthing and protection
circuits. These networks will need a
considerable upgrade to recognise such
off-grid operation, and Scott is adamant
the industry should be looking at issues
such as this now.

Specifications
But while keeping an eye on the future
smart grid is key, right now many in
the industry are still grappling with the
first wave of smart-meter specifications,
and other teething problems. In
April 2012, DECC released the Smart
Metering Equipment Technical
Specifications – SMETS1 – that detailed
how equipment should be deployed
during the Foundation phase of smart-
meter roll-out. These specifications
included a host of technical detail,
but gaps existed, namely with
communications network interface
standards and security architecture.

DECC has since issued SMETS2,
which provides more detail, but
still concerns are rife, especially
over future-proofing the first wave
of smart meters. “Ideally you’d
want to design the system in much
more detail before starting to install
equipment,” says Thomas. “The IET
has been saying for five years now
that given the smarter grid will deliver
the benefits, running ahead of the
grid architecture and design with
meter specifications is a mistake.”

“If I was running this programme, this
isn’t where I would want to be,” he adds.

“Too many of these difficulties have
come about because of the political
pressure on timescales. The political
timetable has been allowed to dominate
over the engineering realities.”

Meanwhile John Scott harbours
additional concerns over the energy
market model for the nation’s smart
metering roll-out. Unlike most
other European countries, network
operators are not responsible for
metering services. Instead, to boost
market competition, the government
has concluded that energy suppliers
should hold the contract with the
consumer and be responsible for
smart-meter roll-out, an arrangement
known as the Supplier Hub model.

“When you look at the smarter
network where, for example,
distribution companies wish to
access demand side services, you
have to ask is this model right
for the future?” he says. “Contact
with the customer will become
enormously more rich and many
more opportunities exist than just
reading meters and paying bills.”

One option would be to hand
responsibility over to network
operators, but as Scott highlights, to
make such a change is hardly trivial.

“People are reluctant to raise this as it
would bring such a huge upheaval,” he
adds. “But I do think the Supplier Hub
model needs a fresh look.”

But amid concerns, other industry
players remain upbeat. As Energy UK’s

Ofgem has approved an
installation code of practice,
outlining how suppliers should
give a practical demonstration of
an installed meter to a customer
and should not conduct sales and
marketing pitches when
installing a meter. [British Gas]
Lawrence Slade highlights, the energy suppliers have been heavily involved with the design and content of smart metering specifications. “We’re pretty comfortable with this,” he says.

And Slade is confident the first, foundation-phase meters will be future-proof. “We’re working with manufacturers to make sure everyone is very clear about how a meter that is being put on a wall will be interoperable and how the market will work as the roll-out phase progresses,” he adds.

The highest hurdle?
But specifications and future-proofing aside, perhaps the most troubling issue has yet to be truly tackled: the security of data collected by smart meters and transmitted to energy suppliers.

Many in the IT industry are concerned that, for example, unscrupulous consumers could commit fraud by manipulating the data captured by the meter, or a hacker could compromise a smart meter to find out a home owner’s minimum energy usage and learn when they are most likely to be out.

But an even greater threat has emerged. As Professor Ross Anderson from UK-based Cambridge University revealed in 2010: “Smart meters contain a remote ‘off’ switch... to ensure that customers who default on their payments can be switched remotely to a pre-pay tariff. This ‘off’ switch also creates information security problems of a kind and on a scale that energy companies have not had to face before.”

The worry is that a ‘cyber-attacker’ could hack through a network’s security layers and, as Anderson explains, send a command to millions of homes instructing meters to permanently switch off the supply. Or as Scott points out: “If you sent an instruction to open the switches of a large number of meters, you’d disconnect a huge amount of load, which would probably destabilise the British grid.”

These concerns have been taken seriously, with government and relevant energy groups working with CESG – Communications Electronics Security Group – the UK government’s authority on the security of communications and electronic data to tackle issues. And while measures are underway to make sure the end-to-end security model is robust, DECC has yet to formalise a security specification.

At the time of writing the organisation declined to answer Wiring Matters’ questions on the security of smart meters and other issues, and many industry players remain uneasy.

“Your implementation needs to be robust enough so you are secure against even a nation-state using serious amounts of resource to break through security,” says Thomas. “However, there is no precise statement of what the properties of the [security] architecture are... and then there’s the question of whether a security architecture would get implemented properly.”

“This is so important and so potentially critical that to rely on informal specification rather than carrying out a proof is irresponsible,” he adds. “It’s a serious threat and we need to get it right.”

Given the grave security concerns, and other issues facing the smart meter programme, is a timely roll-out likely? Thomas has doubts and outlines how projects of this scale tend to over-run.

A smart meter from EVB Energie, Germany. As well as automatic meter reading, the device uses two-way communications to reduce load and connect/reconnect remotely. [EVB Energy Ltd]

FACT BOX
SUCCESSFUL BIDDERS

In August 2013, the DECC awarded its multi-million pound contracts to the companies that are to coordinate the communications and services networks linking the UK’s 53 million smart meters with the business systems of energy suppliers, network operators and energy service companies.

The entire programme encompasses numerous data and services communications organisations, all of which are part of the so-called Data and Communications Company (DCC), UK-based business process management organisation, Capita, has been nominated the DCC Licensee to oversee all operations while IT systems consultancy CGI IT UK is to develop and operate the IT system that controls the movement of messages to and from smart meters.

Meanwhile UK-based utility and environment consultancy, Gemserv, is to maintain and update industry codes for the use of smart meters.

Crucially, Telefónica UK, will provide the communications network for transmitting data from smart meters to energy companies in the central and southern part of the UK. It will use its existing cellular network, branded O2, supplementing this with smaller wireless networks – called mesh networks – to connect meters in regions that don’t have O2 mobile coverage.

At the same time, UK communications company Arqiva will provide the communications network in northern England and Scotland. The company will use a long-range radio communications network, developed by US smart meter communications company, Sensus Technology.

“It’s not yet clear that the roll-out can be sensibly completed on the time-scales that government is asking for,” he says. “But I think the government will be flexible in the face of reality as it approaches.”

However, Scott is more optimistic the necessary smart-meter infrastructure can be put in place to meet roll-out deadlines. “This is a huge logistics task but with good project management, adequate resources and so on,” he says.

“The conversion to natural gas involved visiting every house and we did that pretty effectively, so why not?”