

THE FUTURE OF ENERGY: SMART ENABLERS

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The energy industry is bracing itself for the transformations on the horizon. This insight alludes to the complexity of the present UK energy ecosystem with a particular distribution of responsibilities and roles, outlining the challenges facing energy distributors and retailers as the smart metering technology is put in place.

Not since the rollout of fixed line telecommunications to every premises in the UK has there been such a significant and ambitious national infrastructure project. The task involves visiting most of the 27 million homes of the UK to roll out new electricity and gas smart meters with a completion target of 2020. The £11 billion rollout program is expected to return savings of £17.8 billion to the domestic and smaller non-domestic sectors over the subsequent decades. The technology itself will bring about some valuable immediate benefits to the consumers, but more excitingly will act as enabling technology for a complex web of benefits to the wider energy ecosystem¹.

THE SMART METERING INITIATIVE

Smart meters will pave the way for a transformation in the way energy is supplied and used. They have the potential to generate more energy conscious consumers, by encouraging people to better manage and reduce their energy consumption. Energy retailers will be able to offer a wider and more tailored range of services to their customers. Investment in the distribution network will be better optimised and assets better managed.

At a time when the industry faces critical pressures for transformation, the smart meter rollout will open the door to change. The shift in consumer behaviour can initiate momentum with the resultant cascade of benefits being far reaching.

NATIONAL ISSUES

The UK energy system is at a critical stage in its evolution. Our dependence on energy is threatened by growing pressures for decarbonisation, international tensions calling for energy independence and rising fuel poverty.

The Climate Change Act established a target for the UK to reduce its carbon emissions by at least 80% of 1990 levels by 2050². The UK is currently a net importer of energy, but a phasing out of outsourced fossil fuels will assist in emissions reduction, relieving the UK from internationally rising fuel prices, whilst helping to ensure national energy security through self-reliance. To achieve this, a target has been set for 15% of all UK energy generation to be from internal renewable sources by 2020, established by the UK renewable Energy Roadmap. At the same time as our dependence on fossil fuels is slowly removed, sectors such as transport and heating will shift their dependence to the electrical supply, but despite this increased load many still expect the electricity sector to be almost entirely decarbonised by 2030. Accommodating this growing electricity demand with renewable sources may be largely achieved through the UK's considerable offshore wind-generation capability. However, matching the variable and irregular supply of wind power and other low carbon,

inflexible sources to the uneven demand profile is one of the major challenges facing today's energy market.

Domestic buildings account for about 27% of final UK energy consumption and are largely responsible for the peaks in the demand profile⁴. So in order to optimise demand-supply management in a less flexible, greener market, the domestic demand profile must be addressed.

UK ENERGY ECOSYSTEM

In the UK energy market responsibilities are divided among many players along the energy network, from generation to plug socket.

Generators - The construction, maintenance, and regulation of the energy generation facilities. These companies will then sell energy to retailers (or big businesses) on the wholesale market at rates depending on form, source and flexibility of the energy.

National Grid - Owns the high voltage transmission (and high pressure gas) network from generation to transformers at substations.

Distribution Network Operators (DNOs) - Own and maintain the physical network carrying medium voltage to distribution transformers near domestic premises, and the distribution network carrying low voltage electricity into households and small businesses. Geographically divided into 14 organisations.

Energy Retailers - Suppliers of utilities to domestic consumers and small businesses, competing on the energy market.

The UK market differs from other European markets in a number of crucial ways. The UK has no dominant DNO owning a majority of the national distribution network. Instead the responsibility for its maintenance in the event of power failures and investment for necessary reinforcement falls to the geographically determined organisation. Whenever the capacity or versatility of the network needs improvement, the DNOs will consult and agree upon the necessary investment

with a regulatory body, then ensure their return via modified costs incurred on the retailers for their use of the network, which in turn are passed on to the consumers. Other European energy markets have different systems for investment regulation, nonetheless the underlying motives for optimisation are shared.

Additionally, a peculiarity in the UK system is that the DNOs own and are responsible for the physical distribution infrastructure right up to the domestic or business premises, but the on-site meters themselves are the property of the utility Retailer. However, the homeowner has the freedom to actively switch between suppliers, as a result the legal ownership of the meters must also be switched. This complication, as well as the necessity to manually read final meter readings, prolongs the switching process and discourages a consumer engagement with the energy retailer market, risking creating a static and uncompetitive environment.

THE SMART METERING SYSTEM

The primary purpose of the household smart meter system is to autonomously send and receive near-real time usage and tariff data between the retailer with which the meter is registered and the consumer premises. To do this the system includes a number of components. The traditional gas meter will be replaced by a gas smart meter which has attached to it a low-power radio transmitter, powered by a low-voltage battery capable of lasting longer than the anticipated lifetime of the meter. This transmits consumption readings at regular intervals over a secure Home Area Network (HAN) to a communications hub, which will be attached to the electricity smart meter installed elsewhere in the property.

The communications hub, powered through the electricity meter, will connect the meters over the HAN to other on-premise devices such as micro-generation technology and load control devices. It will also feature two-way communications over a Wide Area Network (WAN) communications solution, that will transmit both gas and electricity consumption data at intervals as frequently

as 30 minutes⁵. Energy retailers and authorised third parties will gain access smart meters and the data provided through a licensed service provider - the Data & Communications Company (DCC), who will provide and manage WAN and data access services to the energy industry according to the Smart Energy Code (SEC).

In addition to the metering devices, retailers also have an obligation to provide consumers with the option to install an In-Home Display (IHD). This device will wirelessly connect to the HAN accessing the near-real time usage and, combining this with the pricing tariff presently offered by the supplier, can display the household's usage rate in an understandable form. Intended to be displayed in an easy-to-see part of the house, it is hoped that by making this information available it will encourage consumers to engage with their consumption rates and promote more energy conscious behaviour.

The hardware provided by each retailer must meet a minimum technical specification known as the Smart Meter Equipment Tech Standards 2 (SMETS2). This specification ensures technical interoperability and that certain security and data privacy requirements are met. Smart meters that meet this specification are capable of enrolment into the DCC system. The technical

interoperability of smart meters under the SMETS 2 specification is of vital importance to the success of the smart meter deployment in Great Britain. Since smart meters will remain under utility Retailer ownership, the DCC must provide a common interface through which retailers can access all SMETS 2 compliant meters. Without this common interface, smart meters would present a real risk to effective competition in the energy market since a consumer changing retailer to save costs could lose access to smart meter functionality and benefits if their new supplier was incapable of accessing or anaging an existing Smart Meter System for reasons of technical incompatibility.

PUBLIC IMAGE – THE BIGGER PICTURE

It is essential for the long-term success of the program that the smart meters be considered a positive innovation by the public, both before and after the installation period.

The ambitious and expensive rollout has been met with more than its fair share of bad press. A report from the National Audit Office argued that the year-long delay to the start of the smart meter rollout will mean the expected economic benefits will be around £2 billion less than originally envisaged⁶, but the majority of criticism has focused

on the returned benefits at the consumer level. Such reports have raised concerns that consumers may be paying more for their energy use during peak times for unavoidable activities such as cooking, or claiming that consumers may be faced with an overall larger energy bill as the cost of the rollout is passed down to them. A 2013 survey done by YouGov revealed that 84% of UK consumers feel that energy suppliers maximise profits at the expense of customers, and 74% believe that any savings facilitated by smart meters will be by increased prices to cover the cost of installation⁷.

The UK Government has not mandated that consumers must accept Smart Meter installations – energy retailers must allow individuals to opt out of the deployment programme. Therefore the significance and sensitivity of public image should not be underestimated. It is essential that the public embrace the technology and exploit the data and services that will enable change in their consumption habits. It is the modified behaviour at the consumer level which will initiate the cascade of benefits to all players in the energy sector over a medium-long term period. It therefore should be a priority of every player in the industry to promote to the consumer the widespread benefits of the program in which they play a critical role. This is especially relevant to retailers as they find themselves with an invaluable opportunity to influence consumers during the inhome installation stage.

To rally public support, and hence engagement, the short-term household advantages must be emphasised. Consumers uncertainty in whether the benefits of adopted the smart meter will outweigh the cost is aided by proper communication through intelligent marketing. Smart Energy GB have undertaken the national publicity campaign, with the core message that 'smart meters put people in control', to encourage what they call 'innovation decision behaviours'; saying yes to having the smart meter installed in the house, then accepting and routinely using the smart technology. Such a behaviour starts with uncertainty, evolves into confidence, adoption and eventually benefit.



Smart Energy GB and psychologists have identified a number of mechanisms to encourage these behaviours. For example creating a sense of social change, the perception of social norms is considered one of the stronger drivers for societal change or reassuring concerns on the matter. Hence early-stage promotion is a sensitive matter and negative media coverage can threaten the success of any program aiming to bring about essential change to the industry.

ROLLOUT PROCESS

Currently planned to commence April 2016, the smart meter rollout will see 53 million meters replaced across the 27 million houses of England, Wales and Scotland, with a completion by the end of 2020.

It is the responsibility of the supplier to install smart meters in their registered homes free of charge to the customer. Ofgem has enacted the smart metering installation code of practice which further protects consumers by prohibiting sales attempts during installation⁹. In the early stages suppliers will be given flexibility over the rate and pattern of their installations - this should enable suppliers to respond to specific consumer demand for smart meters and develop their instalment plan with the use of experience and feedback. Intermediate instalment targets will later be established by Ofgem and suppliers will be required to report regularly on their progress against these targets.

Ahead of the official start date some companies such as British Gas, Eon and First Utility are already offering smart meters to an earlier technical specification (SMETS 1). Such installations will help these retailers meet their regulatory obligations to supply smart meters and will also provide them with useful experience in the smart meter deployment process.

British Gas have already installed 1.3 million meters pre-DCC. However any advanced domestic meters (ADM) installed before the mass rollout that do not meet SMETS1 standards will not satisfy the suppliers obligation

to provide a smart meter to that household and a replacement will be necessary during the official rollout period. For ADMs meeting SMETS1 standards, but not all security and data privacy requirements to qualify it as SMETS2, the DCC will make an assessment of an individual basis as to either it is viable to make the necessary technical upgrades. If so, these upgrades will be the responsibility of the current household supplier. If no technical solution is deemed feasible the meter will not be admitted to the DCC system and will remain monitored directly by the supplier, which may result in the household being unable to gain full access to future services offered through the DCC network.

It is thus in the interest of providers to meet the full technical requirement in all their early installations. This will help optimise asset management by avoiding premature replacement of ADMs before their lifetime expiry, technical upgrades requiring additional visits to the premise during the mass rollout, or possible loss of customers when it comes to light that their early instalment of a SMETS1 ADM has put them at a disadvantage compared with their DCC enrolled neighbour.

The Smart Metering Installation Code of Practice outlines further obligations on the suppliers regarding all aspects of the installation arrangement and visit. More specifically, the code identifies the requirement for the installer to educate the customer on the services provided by the system:

'...ensure that use of the smart metering system is demonstrated to the customer in a clear and accurate manner, and is easy to understand, including what information is available from the smart meter service, how this can be accessed, and use of the IHD.'

Furthermore, in cases where the system is to be operated in prepayment mode:

'...the Customer is provided with a demonstration of the prepayment functions - including, where appropriate, tariff details, debt screens, releasing emergence credit and re-enabling supply, and guidance (with demonstrations where possible) on getting

credit and the topping-up process.'

The additional services specific to the prepayment mode referred to in the latter extract will be discussed and analysed later in this report.

Given these obligations, and the complexity of upgrading systems to integrate with DCC services, it is clear that energy retailers will face significant challenges throughout the national rollout of smart meters. Many of the objectives of the programme, such as increased consumer awareness of energy consumption, enabling the smart grid and improvements to the switching process provide no obvious direct benefit to retailers - so the emerging smart energy. Code will need to provide clear and effective regulation to ensure they invest time, effort and money into making the roll-out successful.

Ofgem will also face a significant challenge in monitoring and enforcing compliance with this code and the performance of the DCC under the terms of its unique licence to provide the enabling services for SMETS2 meters. As the smart energy code comes into effect, energy retailers will be required to ensure their metering systems are SMETS2 compliant (or SMETS1 and adaptable).

AMBITIOUS SOLUTIONS NEED CONSUMER CONFIDENCE

The problem of energy security in the face of environmental concerns is a big one, threatening the conveniences and luxuries of modern life. Though the timescales may be hotly debated, as global coal, oil and natural gas resources are eroded the generation base of UK energy must inexorably shift increasingly towards carbon-free renewables. Restructuring and reinforcing the out-of-date distribution infrastructure will also be necessary, all whilst supplying a growing and increasingly dependent society with cheaper energy. These challenges must be met by equally ambitious solutions. Whilst the Smart Metering programme is only a component of the strategy required, it will require huge investment¹¹, full commitment

from all players in the sector and business plans that do not rush for return but favour industry wide growth. Since the programme will ultimately be funded through increased energy costs to consumers and that individuals may choose to opt out of receiving a smart meter, developing and maintaining consumer confidence will be vital.

The first challenge facing industry is the ambitious infrastructure roll-out – As the energy retailers will bear the primary responsibility of direct engagement with consumers, they will face yet another challenge in ensuring that the public embrace the technology. A successful program will require a correctly managed public image – consumers will need to be convinced that the benefits and potential savings that are enabled by smart meters outweigh the additional costs that will be added to their bills to cover the cost of the roll-out.

The smart meter rollout is the first step in the potential transformation of the energy market. It stretches way beyond automatically transmitted meter readings. Without smart meters, future evolution of the energy grid, where demand profile is influenced in real time for efficient supply-demand balancing will not be possible. Data enabled and provided by smart meters will eventually be integrated into the wider smart home, allowing consumer energy consumption and energy storage to respond to the fluctuating supply capacities and costs that are likely to be characteristic of our future energy generation and distribution networks.



¹ Smart Metering Implementation Program: Prospectus . Department of Energy and Climate Change.

² (2008). Climate Change Act 2008 . UK Government Legislation.

³ (Jul 2011). UK Renewable Energy Map. Department of Energy and Climate Change.

⁴ (Jul 2015). Energy Consumption in the UK: Chapter 3 – Domestic Sector Energy Consumption . Department of Energy and Climate Change..

⁵ Service Providers . The Data Communications Company. ⁶ (Jun 2014). Update on Preparations for Smart Metering. National Audit Office, DECC.

⁷ (2013). Utilities: Smart Meters 2013. YouGov Reports.

⁸ (Dec 2013). Engagement Plan for Smart Meter Roll-out . Smart Energy GB.

⁹ (Apr 2013). Smart Meter Installation Code of Practice . Ofgem.

¹⁰ (Aug 2015). Smart Energy Code 4.3, Section N - SMETS1 Meters . Smart Energy Code Company.

¹¹ (January 2015). Smart meter roll-out for the domestic and small and medium non-domestic sectors (GB) : Impact Assessment; Department of Energy and Climate Change.



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