the consumer implications of smart meters

A report written for the National Consumer Council by Gill Owen and Judith Ward, Sustainability First

Sustainability first

NCC National Consumer Council
Making all consumers matter

About the National Consumer Council

The National Consumer Council (NCC) makes a practical difference to the lives of consumers around the UK.

With changes in provision of services by government and companies, there is apparently more choice, and more talk about meeting consumers' needs. Yet, the rhetoric does not always match people's experience: markets can operate in ways that act against consumer interests; and consumers who are disadvantaged or inarticulate can be ignored.

The NCC uses its insight into consumer needs to advocate change. We conduct rigorous research and policy analysis to investigate key consumer issues, and use this to influence organisations and people that make change happen. We don't just respond to policy discussions, but shape future debate through our groundbreaking thinking.

An open and collaborative organisation, we seek to work with public service providers, businesses and regulators. We hold regular policy forums which provide us with a unique opportunity to exchange views and test our thinking.

Our relationship with the Department of Business, Enterprise and Regulatory Reform – our main funder – gives us a strong connection within government. But we are ready to challenge any organisation, public or private, that does not give consumers a fair deal.

We have linked organisations in Scotland and Wales, and a close relationship with colleagues in Northern Ireland. We play a leading role within European and worldwide consumer groups, ensuring that cross-border consumer issues are tackled and the consumer voice is heard within global institutions.

Please check our website at www.ncc.org.uk for our latest news.

We can often make our publications available in braille or large print, on audio tape or computer disk. Please contact us for details.

National Consumer Council
20 Grosvenor Gardens
London SW1W 0DH
Telephone 020 7730 3469
Facsimile 020 7730 0191
www.ncc.org.uk

About NCC's affordable and sustainable energy project

This report is part of NCC's affordable and sustainable energy project. Our project adds value to the energy policy debate by bridging the social and environmental challenges associated with fuel poverty and climate change.

We aim to promote policies and practices that make sustainable energy choices easier for consumers, as well as ensuring that consumers - especially disadvantaged consumers - can afford an adequate energy supply. NCC's affordable and sustainable energy project is led by Cassie Higgs (c.higgs@ncc.org.uk).

Published by the National Consumer Council
July 2008
© National Consumer Council
PD 28/08

About this report

The NCC commissioned Sustainability First to produce a report that assesses the consumer implications of smart meters. The report is written by Gill Owen and Judith Ward. The content of the report and the views expressed within it are those of the authors.

The report is the third major study by the authors on domestic smart meters in Great Britain. It builds on two earlier reports by Sustainability First which focused on the commercial, regulatory and policy challenges for delivery of domestic smart meters and the policy options for a domestic smart meter roll-out in Great Britain.

About the authors

Gill Owen is an energy policy consultant and Senior Research Fellow of the Centre for Management under Regulation at Warwick Business School. She chairs the Public Utilities Access Forum, is a Non Executive Director of Ofwat, a member of the Government's Fuel Poverty Advisory Group and a member of Ofgem's Social Action Plan Review Group. She is a former member of the Competition Commission and former non-executive member of Ofgem's board. She has a PhD in energy policy.

Judith Ward is an energy policy specialist and Associate Fellow of the Centre for Management under Regulation at Warwick Business School. She is an adviser to the UK Business Council for Sustainable Energy and a board member of the Institute for European Environment Policy. She was Group Head of Public Affairs for National Grid until 2004, having joined them in 1990. Her early career was spent, inter alia, in policy roles with the House of Commons Environment Select Committee and the national Electricity Consumers' Council. She has a Master's degree in Energy Resources Management.

Acknowledgements

The NCC and Sustainability First would like to thank the following for contributing their time and perspectives to research development and review:

Jonathan Stearn, energywatch; William Baker, energywatch; Louise van Rensburg, Ofgem; Sarah Darby, Oxford University; Derek Lickorish; and others, including colleagues at NCC.

We would also like to thank those that were interviewed for this research. Please see the appendix for further details.

Contents

	Page number
Foreword	1
Summary	2
Introduction	6
Costs of smart meters to consumers	8
Installation, implementation and timetable	11
Consumer engagement and energy saving	14
Competition, customer service and convenience	19
Data protection, security and interface with home networks	22
Prepayment meters	25
Customers in debt or with payment problems – remote switching capability	28
Vulnerable customers and those with special needs	30
New tariffs	32
New services	36
Conclusion	38
Appendix	39
References	40

Foreword

In the 2007 Energy White Paper, the government set out its vision, that over the next ten years, all gas and electricity customers would have smart meters. In April 2008, the government tabled an amendment to the Energy Bill, providing the Secretary of State with enabling powers to mandate smart meters for all households.

The NCC has been calling for government and Ofgem to mandate smart meters for several years as they offer considerable consumer benefits. We therefore welcome the government's vision and the new powers in the Energy Bill - as it means consumers are a step closer to receiving accurate energy bills and having clearer information on their energy use. The NCC is also pleased that the new powers include a clause on consumer protection provisions.

However, there is limited research on consumer protection issues surrounding smart meters. So, the NCC commissioned Sustainability First to undertake a study to examine the consumer implications of smart meters and analyse the safeguards that will need to be put in place to protect consumers. The report provides a comprehensive overview on the issues. The report also highlights some of the critical success factors associated with smart meters - to ensure that all the consumer benefits are realised. For NCC, some of the key issues and success factors include ensuring that:

- the distribution of smart meter roll-out costs are fair;
- the differential between pre-payment meters and standard credit is completely eliminated;
- measures are introduced to protect consumers from remote switching and disconnection;
- information on tariffs is provided in a standard format so consumers can make comparisons;
- measures are introduced to safeguard consumers from inappropriate marketing and mis-selling; and
- consumers are provided with independent information, advice and education.

The government is expected to make its final decision about a smart meter mandate in November 2008 once the impact assessment has been completed. Until such time, there are a number of issues that will need to be resolved – such as the roll-out strategy. Throughout the report, the authors highlight some of the pros and cons from a consumer perspective of two different roll-out models. We understand that the government could decide to adopt a hybrid approach, but the principles are likely to remain the same.

We hope the findings are useful and that the government, Ofgem, energy suppliers and other stakeholders adopt the recommendation outlined in this report - making smart meters a reality for UK consumers.

Cassie Higgs, Senior Policy Advocate, National Consumer Council

Summary

The government has an aspiration that all consumers will have a smart energy meter within ten years. The potential consumer benefits from smart meters are considerable. These include:

- improved retail competition;
- more accurate bills;
- lower bills due to better customer feedback;
- reduced costs and increased convenience for pre-pay;
- less environmental pollution due to reduced carbon emissions;
- new tariffs; and
- new services for consumers, including vulnerable consumers.

However, any smart meter roll-out will raise significant issues from the consumer perspective both in terms of principle and in implementation.

Roll-out options

This report assumes that there are two main options for roll-out and delivery of smart meters to every home in Great Britain within ten years; the Supplier Hub model and the Regional Franchise model.

Under a Supplier Hub model (competitive), the government would place a licence obligation on energy suppliers to provide smart meters for all their customers within ten years but leave it to energy suppliers to decide how to do this.

Under a Regional Franchise model (franchise), the government would place a licence obligation on energy suppliers to provide smart meters for all their customers within ten years – requiring energy suppliers to use smart meters that will be installed by companies awarded regional franchises.

Whatever model is adopted, there will be a need for:

- some new consumer protection measures;
- as much transparency as possible, especially in relation to retail pricing; and
- appropriately targeted consumer information, advice and education.

Cost of smart meters

For consumers, a major issue is the potential cost of a smart meter roll-out, and how they would be asked to meet the costs. Installation of smart meters over ten years could cost well-upwards of £5 billion in today's prices **[i]**. Additional costs to customers should be minimised, and the benefits which should flow to consumers should be maximized. Some customers are at risk of picking up a greater share of smart-

meter roll-out costs - in particular those customers that energy suppliers may be less keen to retain or attract because they cost energy suppliers more to serve.

Customer complaints

Smart meters should lead to fewer complaints over the medium to longer term (but possibly not in the short term). Technical problems, for example installer quality, meter-malfunction, communications or billing system interface, are inevitable in a roll-out of this magnitude. Customers could experience billing and switching problems while smart meters and mechanical meters continue to exist side-by-side. Energy suppliers need to ensure they have adequate numbers of properly trained customer service staff to deal with customer queries and complaints arising from the installation of smart meters, including home-access problems.

Data protection and security issues

Smart meters raise some potential data protection and security issues. These include:

- what data is collected, how is it used, how is it shared and for what purpose?;
- who owns the data - the consumer or the supplier?;
- security of personal data (particularly bank details);
- privacy - energy suppliers will know a lot about how people use energy for example;
- potential interference with other home networks; and
- use of the meter to transmit marketing information.

Energy suppliers already have to comply with data protection laws so data protection should not create any significant problems for consumers in a smart meter roll-out – so long as the laws are adequately enforced. Together with the Information Commissioner's Office, Ofgem and the government need to look at data capture, data use, data storage, data sharing and data ownership issues to ensure consumer protection is adequate. Energy suppliers need to continue their work on data security and ensure that technical problems between home networks are avoided or effectively managed. They need to provide consumers with adequate information and clear procedures for resolving problems.

Pre-payment meters

Smart meters will benefit prepayment customers but much of the benefit may be in the form of better and new services rather than dramatic price cuts. Whilst improvements in technology may tackle some of the causes of higher additional charges, there are also other factors causing the differentials between prepayment and direct debit. For example, their lower income profile may make them less valuable for cross-selling. Plus an expansion of payment options could raise the additional costs for pre-payment. Furthermore, the costs might not fall as expected if prepayment meter customers still buy credit frequently.

Remote switching and disconnection

Depending on the agreed specification, smart meters should enable energy suppliers to remotely:

- switch between credit and prepayment;
- disconnect supply without visiting premises; and
- reduce the load (load limiting) so the customer could just use lights and the fridge (for example) as an alternative to disconnection.

These functions will reduce suppliers' costs and thus should benefit consumers, provided that adequate consumer protection safeguards are in place. The existing consumer protection measures that apply to debt should still apply when smart meters are introduced but Ofgem needs to review the legislation, licence conditions and codes of practice governing the final stages of debt recovery/disconnection, and any potential uses of load limiting, to ensure customers are adequately protected. Ofgem should also review the protections for vulnerable consumers for whom even consumer friendly forms of prepayment would remain unsuitable. Such reviews should be conducted in full consultation with consumer organisations, energy suppliers and other key stakeholders.

New services for the vulnerable

Smart meters will have the potential to provide some valuable new services for vulnerable consumers. However, because they can provide more information on energy costs, they could increase the incidence of self-rationing and self-disconnection amongst some vulnerable households, unless other action is taken. The government and Ofgem should require suppliers to provide effective energy efficiency advice in order to encourage people to take up energy saving measures. Such measures are available through schemes such as those funded through the Carbon Emissions Reduction Target (CERT). This should be provided alongside smart meter installation, particularly to vulnerable and fuel poor households. For those with sight problems there may be technology solutions that can help – for example a talking display. This should also be backed up by powerful and ongoing campaign that is targeted at a segmented audience.

New tariffs

Smart meters could lead to an eventual revolution in information about individual energy-use, offering scope for new tariffs and new ways to provide feedback to householders - including bespoke billing, displays and other methods.

Feedback and displays

Effective feedback on expenditure and consumption will be critical in increasing consumer awareness of energy use. A user-friendly and accessible electronic display, linked to the electricity and gas smart meters could provide this but some consumers may prefer other feedback methods (such as via the internet, the bill or text message), so consumers should have choice in the form of feedback.

Confusion over new tariffs and services

In time, there is likely to be a multiplicity of new tariffs and services offered in tandem with smart meters that could be of great interest to consumers. However, there will be considerable scope for more complexity and confusion as a result of different offers for time-varying, increasing block or seasonal tariffs. Much will depend on how sensitively energy suppliers develop and market new tariffs, also consumers' willingness to alter usage patterns and their understanding of new tariffs. Comparative information about tariff-offers on utility switching sites will be very important to help consumers choose between supplier offers. Choice of new tariffs should be voluntary and tariffs should continue to be offered competitively. Ofgem should lead an open debate with consumer bodies, energy suppliers and other stakeholders on the underlying principles of smarter tariffs.

Marketing to consumers

Ofgem should ensure that consumers are safeguarded from inappropriate marketing and/or mis-selling by energy suppliers in the wake of a smart meter roll-out. Appropriate customer protection measures will be needed to avoid this. These could build on those in the suppliers' self-governing code on doorstep selling (EnergySure scheme) and other regulations. Continuation of the Supply Licence condition which deals with marketing to domestic customers may also be appropriate, at least at the outset.

Demand reduction

To reduce energy use overall (for example not just to achieve a peak-price response), a goal of carbon reduction needs to be shared between government, customers and energy suppliers. This is most likely to be achieved through a combination of:

- a post-2011 supplier obligation to align marketing and climate agendas;
- effective consumption feedback; and
- smart meter tariffs.

Smart meters tariffs in combination with automated control of certain household appliances (for example, gas boiler controls, thermostats and water heaters) could help to revolutionise household demand response.

Introduction

The government has an aspiration that all consumers will have a smart meter within ten years and is considering how this might be achieved. Smart meters can record how much electricity or gas is used and at what time. The meter can store this information and then transmit it electronically to the energy supplier. Consumption information can be displayed to consumers via a display in the home, or via the web or a mobile, together with information on what it is costing.

As indicated below, the potential consumer benefits from smart meters are considerable. However, any smart meter roll-out will raise significant issues from the consumer perspective – both in terms of principle and in implementation. These issues will need to be resolved given the very significant cost and scale of this investment. A ten year roll-out will be highly visible, involve access to every home in the country, with considerable potential for disruption and misunderstanding.

In this report, it is assumed that the government will:

- require energy suppliers to ensure that all their domestic customers have a smart electricity and gas meter within ten years from a specified start date;
- require a smart-meter specification to be adopted across Great Britain to ensure smart meters are interoperable – (for example supporting some common basic agreed functions and data formats across all suppliers); and
- reach some form of stranding settlement (for example agreeing a process and a price) for at least a proportion of mechanical meters replaced early.

Two main options for delivery of this strategy are envisaged:

Supplier Hub: Under a Supplier Hub model (competitive), the government would place a licence obligation on energy suppliers to provide a smart meter for all their customers within a ten year period but leaves it to energy suppliers to decide how to do this.

Regional Franchise: Under a Regional Franchise model (franchise), the government would place a licence obligation on energy suppliers to provide smart meters for all their customers within ten years – requiring energy suppliers to use smart meters that will be installed by companies awarded regional franchises.

This report identifies and examines the potential benefits and shortcomings of smart meter specific issues from a consumer perspective and makes recommendations under the following headings:

- costs of smart meters to consumers;
- installation, implementation and timetable impacts;
- consumer engagement and energy saving;
- competition, customer service and convenience;
- data protection, security and interface with home networks;
- prepayment meters;
- customers in debt or with payment problems;
- vulnerable customers and those with special needs;
- new tariffs; and
- new services

Methodology

This report for the National Consumer Council builds upon earlier smart-meter research by the authors undertaken for Sustainability First **[ii]**. It also draws from the extensive material submitted in autumn 2007 to the government consultation on smart meters **[iii]** and from interviews with key stakeholders, including government, the regulator, and representatives of suppliers, manufacturers, consumer bodies and NGOs (listed in the Appendix).

Consumer goals from smart meters

Smart electricity and gas meters could support a number of important consumer goals. These include:

Improved retail competition - Smart meters will make switching easier, encourage suppliers to offer new deals, including loyalty deals, dual-fuel and new tariffs.

Accurate bills – Smart meters will bring an end to estimated bills saving customers time and irritation.

Lower bills due to better customer feedback – Customers will enjoy better feedback on their energy-use, including the 50 per cent of consumers who currently pay by monthly direct debit. This may motivate consumers to reduce usage.

Pay-as-you-go-revolution – Additional costs of pre-pay should reduce and convenience should increase with multiple ways of topping up credit. Prepayment could be used by 20-30 per cent of consumers compared to the present 11-14 per cent.

Ease of moving home – Consumers are likely to have a better customer experience. Smart meters should also eliminate incorrect meter identification when consumers move home.

End to meter reading – Smart meters will put an end to meter reading - a convenience benefit for consumers.

Energy and carbon savings - For electricity, new tariffs could stimulate load-shifting and perhaps some possible demand reduction – potentially reducing peak-related costs – both short (operational) and long-term (investment). For gas, smart meters with visual displays may encourage consumers to turn-down the central-heating thermostat. New tariffs coupled with automated control of certain household gas and electricity appliances (for example gas boiler controls, thermostats, water heaters and freezers) may result in peak-load or demand-response.

New services - Smart meters should support a range of new services for consumers, including import / export prices for micro-generation, energy efficiency packages, smart-appliances and, eventually, smarter homes, possibly with electronic monitoring services to help the vulnerable.

Costs of smart meters to consumers

For consumers, a major issue is the potential cost of a smart meter roll-out, and how consumers would be asked to meet the costs of such transformational investment **[iv]**.

Metering presently amounts to less than two per cent of domestic energy bills, but installation of smart meters over ten years could cost well-upwards of £5 billion in today's prices **[v]**. Without a full business-case for energy suppliers, the case for government to intervene in a smart meter roll-out rests upon the potential consumer and environmental benefits and, in particular, the value and timing of possible energy and carbon savings **[vi]**.

Clearly decisions are yet to be taken, but it seems that a competitive supplier-led approach is a more likely way forward than a regional franchise model, not least because of the significant intervention which the latter would entail.

This section considers the cost implications for consumers of smart meters, indicating where there are differences between the competitive and franchise model. If the economic benefits or other policy considerations between the two models are finely balanced, then the approach that best limits consumer exposure to needless cost and risk and which maximises consumer benefit would be more desirable.

The main cost issues for consumers are as follows:

Overall cost to consumers – The government's final impact assessment will be key in identifying the overall cost to consumers. Published economic models attribute varying values to the timing and quantity of energy saving benefits and to the logistical benefits of a franchise model. The benefit to the consumer will depend on how far individual suppliers reflect lower operating costs in their retail tariffs and on how far the new smart meter assists them in reducing their consumption. The first of these is likely to be a reflection of the effectiveness of retail competition under either model.

Incremental approach, innovation and meter communications – The franchise model could offer logistical and other benefits but locks suppliers and customers into a franchise for up to ten years. Incentives for technology advances and cost reduction may be blunted or require detailed regulatory supervision. The competitive model provides flexibility and possible cost reduction, as suppliers will be free to take incremental advantage of technology advances, particularly for communications where options are still evolving.

Installation costs – These should be lower under the franchise model due to logistical benefits of a predominantly geographic and proposed dual-fuel approach. However, the competitive model is likely to be

at least partly geographic and access issues will be a constraint in both models - a 50 to 60 per cent access rate is common for meter calls not initiated by the customer.

Procurement - Under either model, a ten-year mandate should give a strong message to manufacturers about volumes. The competitive model could over time lead to lower costs as a result of sustained competition among meter manufacturers and communications providers.

Stranding costs for old meters replaced early – These costs will arise from a ten year roll-out in both models, potentially amounting to many hundreds of millions of pounds. The question arises as to how far stranding costs will be met directly by consumers. This will be for government and Ofgem to decide. Under the franchise model, a geographic roll-out would mean meters being replaced regardless of age. Under the competitive model, suppliers could choose to replace older meters first. Therefore, lower overall stranding compensation is likely under the competitive model compared to the franchise model.

Stranding costs for new smart meters - Provided an inter-operability specification is agreed, consumers should not be exposed to termination fees to cover stranded costs of new smart meters when they switch suppliers. Under the competitive model, energy suppliers might seek to recover their costs from consumers over a shorter period than under a franchise, but this is not a given. Ultimately, this would be for energy suppliers to weigh against their wish to keep their retail prices competitive.

Costs falling evenly on all customers - At first sight the competitive model looks more likely to result in meter-related charges varying for particular customer groups - for example pre-payment, dual-fuel or those who opt for new tariffs. A franchise approach would seem more likely to result in charges being averaged across consumers. But in practice, because retail prices will remain non-regulated, the distributional impacts of either model will depend upon how competitive the retail market is for each customer group – for example prepayment, direct-debit, dual-fuel. Irrespective of the roll-out model, energy suppliers are likely to make attractive offers to customers they are keen to retain or attract – for example dual-fuel customers, while recovering a larger proportion of smart meter costs from less commercially attractive customer groups. This could be particularly damaging for vulnerable and disadvantaged households that fall into this category. The government and Ofgem should ensure that these customers should not be discriminated against.

Price transparency of meter related costs – Given the additional total costs of smart meters and their installation (say, £200 per two-meter household), price transparency is an important consumer issue. A franchise could enable more transparency because what the franchisee can pass through to suppliers is likely to be subject to a degree of regulatory oversight. Conversely, under the competitive model, suppliers' costs will be a matter wholly between energy suppliers and their meter providers. However, under either model, energy suppliers will incorporate smart meter costs into retail tariffs as they see fit, and these costs are not likely to be transparent to consumers.

Conclusion on costs to consumers

A smart-meter roll-out could cost well upwards of £5 billion. On balance consumers could benefit from smart meters provided that:

- the government final economic appraisal confirms a positive net benefit;
- any stranded cost settlement is tightly drawn;
- energy suppliers pass on their operational savings to customers;
- the expected consumer benefits are in practice realised; and
- there is transparency and comparative information for retail prices.

In any smart meter roll-out, additional costs to customers should be minimised, and the benefits which should flow to consumers should be maximized. Some customers are at risk of picking up a greater share of smart-meter roll-out costs as energy suppliers are likely to make attractive offers to customers they are keen to retain or attract – for example dual-fuel customers – while recovering a larger proportion of smart meter costs from less commercially attractive customer groups. Ofgem and the government should work together to ensure that these customers, many of which may be vulnerable, should not be discriminated against.

Recommendation on costs to consumers

Ofgem should consider asking energy suppliers to indicate smart-meter related costs in energy bills alongside the cost of other environmental initiatives, such as the Renewables Obligation and Carbon Emissions Reduction Target.

Installation, implementation and timetable

Consumer requirements

Significant non-cost related issues arise for consumers in the way smart meters may be rolled out and installed. In this report, it is assumed that over a ten year period, all customers will be required to accept a smart meter for both electricity and gas (where on gas supply).

Consumers will therefore want:

- information about smart meters and their installation, from trusted sources – including energy suppliers, government, the Energy Saving Trust, Ofgem and consumer bodies;
- to understand reasons for the change to a smart meter and any consequence of refusing one;
- to understand developments which may follow, such as, billing changes, improved consumption feedback and potentially new tariffs;
- hassle-free arrangements for home access, including timed appointments on a convenient date. Both electricity and gas supplies will be off for a period;
- trust in meter installers and their accreditation;
- least physical disruption and mess; and
- clear explanation of differences between old and new metering and billing arrangements, including ongoing support (for example a helpline).

Customer convenience and responsiveness during installation

The main issues for consumers are:

Information – A franchise model may at first sight offer more focused installation activity and information giving. However under either model, sustained and targeted information programmes by various means will be needed, not just at the point of installation.

Home access – Customer-friendly arrangements will be important for ready resolution of home-access problems. A meter roll-out is not directly comparable to natural gas conversion in the early 1970s in terms of customers at risk of being left without gas supply (and so had a strong incentive to be at home on the specified date). Also, with fewer women at that time out at work, somebody was more likely to be at home.

Customer smart meter request – Under the competitive but not the franchise model, consumers could shop around for a smart meter early on.

Customer smart meter refusal - If energy suppliers are subject to a ten year smart meter licence obligation, they would be in breach if every customer did not have a smart meter at the end of the period. During a geographic roll out, should consumers refuse access to install a smart meter, they could be required to provide

their own readings and/or could be charged for a meter-reader visit. Ultimately, a supplier may obtain a warrant at the customer's expense to gain access to install a smart meter, or, terminate supply.

Technical problems during and post roll-out – Technical problems (for example installer quality, meter malfunction, communications set-up and billing system interface) are inevitable in a roll-out of this magnitude. Under a franchise, there may be a build-up of installer skills and experience, but overall effectiveness will largely depend upon incentives in the contracts at franchise grant. Conversely, the competitive model may give a stronger incentive to energy suppliers to manage quality, technical and operational issues which impact upon their own customers. Under a franchise, customers may need to establish whether they need to deal with the energy supplier, meter franchisee or both.

Billing, switching and moving home during ten year transition – Customers could experience billing and switching problems while smart meters and mechanical meters continue to exist side-by-side. However, all energy suppliers already successfully run and manage multiple systems. A franchisee might manage all meter-related activity (for smart and non-smart) in their area, potentially reducing scope for mis-directed data when a customer switches supplier or moves home. However, the franchise model would entail some common IT systems, with scope for new technical problems. The competitive model would mean building upon existing arrangements for transferring data between energy suppliers and some argue that billing related problems could arise because present processes may struggle to cope. For reputational reasons however, it seems likely that energy suppliers would wish to avoid such a scenario. Ofgem and the relevant consumer bodies will nonetheless need to monitor billing related complaints as a priority during any smart meter roll-out.

Timetable – Some complex commercial and technical arrangements will need to be agreed before a mandated ten year smart meter roll-out might start, and this may take eighteen months to two years to resolve. The competitive approach could probably start sooner than the franchise as fewer regulatory stages would be needed before implementation but the former might entail a longer roll-out period. Franchise proponents believe that meters could be fully rolled-out in seven years, but this may be optimistic. If the government announces that it is going down the competitive route, energy suppliers may start fitting smart meters straight away to gain experience and a competitive edge before the official start date – subject to their view on the risks.

Proportion of customers without an electricity or gas smart meter after ten years – Under either model all homes should have both gas and electricity smart meters after 10 years. Under a franchise, all homes can expect to be systematically 'smarted' on a geographic basis. By contrast under a competitive model, customers who continue to buy gas and electricity from separate suppliers, gas-credit customers in particular, are likely to have a smart meter fitted towards the end of a roll-out. These 'one-offs' could cost more, but much will depend upon communications costs at that point.

Conclusion on installation

A major plank of any successful roll-out will be that consumers understand and broadly accept the reasons for new energy smart meters. At first sight a franchise may seem to offer greater installation efficiency, but in practice a competitive model could prove practical and flexible from a customer viewpoint. Smart meter installation will carry major reputational risks for suppliers. Under either approach, suppliers, Ofgem and the government should make strenuous efforts to ensure smooth installation arrangements.

Recommendation on installation

During a smart meter roll-out, robust complaints handling processes will need to be in place at supplier-level and among consumer bodies.

Consumer engagement and energy saving

Smart meters could lead to an eventual revolution in information about individual energy use, offering scope for new tariffs and new ways to provide feedback to householders, including bespoke billing, displays and other methods. It may be many years before the full extent of this data-revolution becomes apparent, but in the meantime smart meters will be central in improving consumer engagement with their energy use.

Consumer information, advice and education

Smart meters are a tool – helping to enable behavior change and demand reduction. If the potential benefits of smart meters are to be fully realised, it is absolutely essential that there is a well-resourced body - providing independent consumer information, advice and education on how to use the information households are given and a powerful campaign – designed to encourage those with wasteful energy use to use it more wisely. It is important that any consumer information and campaign is ongoing and well targeted – using social marketing to help change behavior and encourage demand reduction. Messages should be tailored and targeted to different consumer segments – maximising the likelihood of success.

Conclusion on consumer information, advice and education

If the potential benefits of smart meters are to be fully realised, consumer information, advice and education is essential.

Recommendation on consumer information, advice and education

The government should ensure there is a well-resourced and powerful campaign delivered throughout the smart meter roll-out – perhaps led by the Energy Savings Trust. This will help to improve energy savings awareness.

Supplier marketing strategies

Under a competitive approach, marketing of new tariffs, dual-fuel offers and services is likely to happen alongside smart meter installation. Marketing may be linked to age-related meter replacement, a broadly geographic approach, or could be targeted at particular customer groups such as Pay-as-U-Go, dual-fuel or energy-saving. Consumers are likely to receive smart-meter promotional offers not only from their present supplier but also from competitors, especially for dual-fuel.

Under a franchise, meters will be installed by the meter franchisee for each area and will be a separate activity from marketing. Thereafter consumers in that area could perhaps expect a period of active marketing by all suppliers, with a range of different tariffs and offers.

Under either approach, consumer bodies will wish to be reassured that supplier marketing strategies are reasonable and that customers are not confused. Consumers will need access to comparable price information

to take advantage of the retail offers best suited to their personal needs (for example utility switching websites).

Importance of dual fuel customers in a smart meter world

Thirty-three per cent of domestic customers are 'dual-fuel' (for example contracted with a single supplier for both gas and electricity). Forty-seven per cent of domestic customers can be described as 'single-fuel' (contracted with separate suppliers for gas and electricity) and twenty per cent are electricity only **[vii]**. Suppliers will market dual-fuel packages through combined smart-meter arrangements for both electricity and gas under both models.

Under a competitive model, arrangements for a single-fuel electricity supply via a smart meter should be straightforward. However, arrangements for a single-fuel gas supply may be:

- more costly - for example, via a stand-alone gas smart meter with its own modem; or
- administratively more complex - for example, via a 'piggy-back' agreement where one supplier would route data from its gas meter by wireless signal via another supplier's electricity meter.

The complexities of smarting single supply gas is one reason why some energy suppliers actively favour the franchise model, where electricity and gas meters would be rolled out together by the meter franchisee with meter data centrally routed.

Under either approach however, there could be no question of customers being required to take both fuels from a single supplier. Freedom to choose an energy supplier is at the heart of retail competition, and it will be up to energy suppliers to make offers which attract customers. As noted, energy suppliers may make more attractive offers to some customer groups at the expense of others. Attracting and retaining dual-fuel customers in a smart meter world is likely to be an important retail strategy for energy suppliers.

Conclusion on supplier marketing strategies

Some customers are at risk of picking up a greater share of smart-meter roll-out costs - in particular 'single fuel' gas credit customers. Ofgem and consumer bodies should work together to ensure that 'single fuel' gas credit customers are not discriminated against. Ofgem should also continue to stress the potential benefits to consumers of switching.

Recommendation on supplier marketing strategies

Ofgem should ensure that consumers are safeguarded from inappropriate marketing by suppliers in the wake of a smart meter roll-out.

Customer feedback

Many consumers may welcome the better feedback on their energy consumption that smart meters could facilitate **[viii]**. Better feedback may lead to energy savings. The government-sponsored Energy Demand Research Project (initial findings 2008) should start to provide empirical information for the first time in a Great Britain context on the real potential.

Feedback might be provided in a number of different ways. These include:

- energy bills;
- displays;
- web-linked feedback;
- mobile phone;
- interactive TV or
- a combination of the above.

Most consumers are likely to prefer simple formats, without undue detail **[ix]**.

Bills – Many consumers will wish to continue to receive paper bills as a clear statement about their tariff, payment status and how much energy they are using. Consumers may not see an immediate change, because adaptations to IT systems to cope with data from smart meters will be expensive and new feedback formats may take time to develop. Over time one could expect to see the kind of developments associated with mobile phone bills – including choice of billing frequency, monthly bills and variable direct-debits, detailed consumption break-down by time-of-use and comparative information with graphics.

Displays – Electronic displays for electricity and gas use could be a single device or one for each fuel. A single device for both fuels may be suitable for dual-fuel customers. The Energy Retail Association is considering a standard specification which may allow a single display where a customer buys gas and electricity from two separate suppliers. Two displays; one for electricity and one for gas; could prove simple, but could also involve more power consumption. Manufacturers and designers are fast developing a range of consumer displays with a great variety of display capabilities including cost, tariff and consumption data (for electricity and gas), plus messages or alerts from energy suppliers. Potentially, more sophisticated displays can also display data about individual appliance consumption. Alarm or 'traffic-light' systems may be used as feedback for tariffs which incorporate critical peak pricing or load-limiters.

Web-based – Developments in web-based feedback for commercial energy users with smart meters point the way to rapid innovation for the household sector. Younger customers in particular, may prefer to manage utility and other accounts and obtain feedback over the internet.

Customers may want the following from a display:

- a display installed, made operational and briefly explained;
- clear leaflet left at installation;
- clear consumption and tariff information on the display;
- straightforward use;
- to know what to do if the display fails; and
- possible additional support for some vulnerable customer groups.

The Energy White Paper (May 2007) states that: 'Our expectation is that, within the next ten years, all domestic energy customers will have smart meters with visual displays of real-time information that allow communication between the meter, the energy supplier and the customer' **[x]**.

The White Paper wording suggests that electronic displays, conveniently located and radio-linked to smart meters will be offered to every householder, irrespective of which roll-out approach is adopted. Under the franchise model this could be a standard display across a franchise region or suppliers could differentiate their service with own-branded displays. Under the competitive model, it would be up to energy suppliers to decide what type of display to offer. Under either model, displays are likely to be central to supplier marketing. Early clarification from government or Ofgem will be needed on the extent to which displays are expected to be inter-operable (or not) with any installed smart meter-type. Other considerations for displays include the fate of the display when a customer switches supplier, or, where a display malfunctions, is broken or lost.

To require a display where a customer would prefer other forms of feedback – for example web-based or mobile-phone based - or indeed simply does not want feedback via a display, could result in additional and needless expense for both suppliers and consumers. Energy suppliers should be able to incorporate different displays into their offers (basic/sophisticated) and consumers should also be able to buy and install their own smart-meter compatible displays.

Energy saving and demand reduction

Energy and money savings for consumers may come from:

- improved consumption feedback; and
- new tariffs designed to encourage electricity load-shifting and energy saving.

Under both the competitive and franchise approaches, energy suppliers can be expected to market new tariff and energy saving packages.

The Energy Saving Trust estimates that a one degree celsius turn-down of the gas central heating thermostat might reduce domestic gas use by as much as ten per cent **[xi]**. This could come about through:

- consumer response to sustained and visual feedback about gas usage;

- new volume-related tariffs to incentivise consumers to reduce their gas-use; or
- remote boiler-control and thermostat switching.

For electricity, load-shifting rather than absolute demand reduction is the likely main outcome from time-of-use tariffs, based on experience in the NIE Keypad 'Powershift' trial. In effect, the Powershift consumers saved money but not energy **[xii]**. Some electricity demand reduction could be achieved from better feedback on electricity consumption via smart meters.

Demand reduction will depend on how much information is presented to consumers and how much investment there is in a powerful campaign (based on consumer segmentation) designed to encourage those with wasteful energy use to use it more wisely. Critically, any carbon benefit, either from electricity load-shifting, or from electricity demand reduction, will depend upon the carbon intensity of the marginal generating plant.

If gas demand reduction is a main environmental goal from smart meters, then the franchise model may deliver this sooner than the competitive model **[xiii]**. However, at the end of ten years, all consumers should have both an electricity and gas smart meter, regardless of the roll-out approach.

Conclusion on consumption feedback and energy saving

Effective feedback on energy expenditure and consumption will be critical in increasing consumer awareness of energy use. An electronic display, radio-linked to both the electricity and gas smart meters, could have a central role to play. However, some consumers may prefer other feedback methods, if these suit their household or tariff-choice best. Such flexibility may be more evident with a competitive approach.

Recommendation on consumption feedback and energy-saving

Consumers should be provided with feedback and should have choice in the form of feedback they receive.

Competition, customer service and convenience

Meter reading, billing and complaints

In 2003, energywatch commissioned NOP to survey 2,000 consumers about their experience of billing by their gas and electricity suppliers. Key findings included:

- Thirty-five per cent received estimated bills frequently or very frequently – a figure backed up by suppliers;
- Nine per cent had experienced debt due to poorly estimated billing;
- One in five believe that the estimated bills they receive are very or fairly inaccurate;
- Fewer than one in three people said that their meters were read quarterly; and
- Less than a half (48 per cent) check the accuracy of the energy bills they receive **[xiv]**.

Smart meters would mean that energy suppliers would no longer have to send out someone to read the meter because data would be sent to the energy supplier on a regular basis (although it is still possible that a visit will be required for a bi-annual safety check). This will provide a number of benefits to customers. Firstly, they will not have to send in their own meter readings. Secondly, smart meters would bring an end to estimated bills, so customers can avoid the risk of under payment (which can lead to debt build up) and over payment (cash flow). Thirdly, customers would not have to spend time (for example in telephone calls) getting estimated bills corrected. Finally, there is a security benefit, given that some distraction burglaries arise from people posing as meter readers.

Smart meters should reduce the problems of inaccurate and estimated bills. Whilst complaints to energywatch have reduced since 2003, billing complaints have reduced at a lower rate than any other category and in late 2007 accounted for approximately 68 per cent of all complaints **[xv]**. However, based on past experiences with the introduction of retail competition and new billing systems, there is likely to be an upsurge in complaints during the early phases of smart meter installation, due to problems with the technology, its interface with billing systems and supplier switching systems.

Smart meters should also improve other aspects of service to customers. For example, by making the process of home moving simpler. They will probably also make it easier and cheaper for energy supplier to offer customers different billing options (for example monthly bills, internet bills, variable direct debits based on actual consumption) although many of these options are already available without smart meters.

Conclusion on customer service

Smart meters will benefit customers through more accurate bills. Smart meters should lead to fewer complaints over the medium to longer term but possibly not in the short term when complaints related to their introduction could rise.

Recommendation on customer service

Energy suppliers need to ensure they have adequate numbers of properly trained customer service staff to deal with customer queries and complaints arising from the installation of smart meters.

Retail competition

Smart meters should make it easier for customers to switch supplier through more accurate and efficient data processes and transfers. A simplified switching process will also reduce costs for suppliers. So smart metering could help to make the market more competitive by making it easier to switch and enabling suppliers (through reduced costs) to offer better deals. If more customers switch, energy suppliers might have to offer better loyalty deals, so smart metering could potentially help to reduce prices for all customers.

Smart meters should also make it quicker for customers to switch supplier. This could be almost immediate - with the potential for the customer service agent to read the meter and affect the transfer either during or shortly after the customer's request. Whilst this is a benefit for consumers, this will require further safeguards with regards cooling-off periods and their enforcement.

But the benefits may not be experienced by some groups of customers if suppliers can identify the ones who are less likely to switch and charge them higher prices than those who are more likely to switch. At present, for example, prepayment meter customers pay higher prices. This is partly due to the higher costs of the meters but also due to the lower propensity of such customers to switch energy supplier.

Smart meters (by lowering costs) may also facilitate market entry by new suppliers. Past failure of some smaller market entrants was attributed in part to high costs of billing and collection of money. The benefits of smart meters for retail competition are difficult to quantify but could be substantial **[xvi]**. The model adopted for roll-out of smart meters will make no difference to two key features of retail competition:

- ability of customers to switch supplier and/or to take gas and electricity from different suppliers if they wish. Whichever model is adopted the government and Ofgem will insist that these consumer rights are maintained; and
- the extent and effectiveness of retail competition. Smart meters should make switching easier and lead to new offers that increase competition irrespective of the model.

Conclusion on retail competition

Smart meters will probably facilitate new offers and increased competition and this should benefit customers, but a proliferation of new deals could be confusing (see new services section for more information).

Recommendation on retail competition

Ofgem should introduce guidelines for energy suppliers to ensure that energy tariffs are marketed clearly and transparently to customers. As part of the guidelines, energy companies should be required to provide information on tariffs in a standardised format so consumers can make comparisons. Ofgem should carry out consumer research annually to assess whether consumers are confused about the proliferation of new tariffs; and update the guidelines accordingly.

Data protection, security and interface with home networks

Key issues

- what data is collected, how is it used, how is it shared and for what purpose?;
- who owns the data – the consumer or the supplier?;
- concerns about security of personal data (particularly bank details) – especially following problems of lost government data in 2007;
- concerns about "Big brother" privacy - i.e. energy suppliers will know a lot more about how and when people use energy;
- concerns about whether smart meter in-home communications systems will interfere with other home networks (wireless broadband notably) affecting their reliability and/or compromise data sent over those other networks;
- concern that customer data will be sold to third parties for marketing purposes; and
- energy suppliers using the smart meter to transmit information to the consumer – much of this may be useful (for example energy saving) or even essential (in the case of supply interruptions), but it could include marketing information which some consumers might welcome but some may not.

There are two European Directives that are relevant to smart meters:

1. The European Data Protection Directive (EC 95/46) governs the processing of personal data by data controllers and grants rights to individuals.
2. The European Privacy and Electronic Communications Directive (EC 2002/58), which is currently under revision – with the aim to make it technology neutral.

Two pieces of UK legislation enact these directives and thus govern whether and how a supplier can use information about an energy consumer: The Data Protection Act (1998) and the Privacy and Electronic Communications Regulations (2003).

The EU Data Protection framework requirements include:

- processing of personal data is allowed only when specific legal grounds apply;
- personal data collected for one purpose cannot be used for another purpose without consent;
- obligation to maintain adequate security; and
- limitations on the transfer of personal data to other countries.

Smart meters may not transmit the customer's name or address, but it will involve transmitting personal data - probably through the use of a meter point number (similar to an IP address), which can be associated with a person. The information that smart meters will transmit from the customer to the supplier includes:

- meter readings;
- consumption data; and
- payment details for prepayment meter customers.

From the energy supplier to the consumer they will transmit:

- data - such as change of tariff;
- a change in functionality – such as credit to prepayment; and
- information – such as energy saving messages, notice of service disruptions and marketing messages.

As personal data is defined as "information relating to an identified or **identifiable** (emphasis added) natural person", smart meter technologies will capture "personal data". In respect of smart meters, energy suppliers will be data controllers and responsible for complying with data protection laws, even if they outsource any data processing functions. Use of personal data captured by smart metering technologies can be used for customer profiling and marketing but subject to data protection laws **[xvii]**.

Energy suppliers already have to comply with data protection laws, so the main requirement in respect of existing obligations is adequate enforcement.

The Energy Retail Association is aware of the key issues where further action is required and is dealing with them in the Supplier Requirements for Smart Metering project **[xviii]**. However, three key issues need to be addressed:

Data capture, use, storage and sharing by the energy supplier – What will energy suppliers do with the data they get from smart meters? Although participants of a series of focus groups were generally in favour of smart meters as a way of providing consumers with more accurate and detailed information, some were concerned about how suppliers will use the energy consumption information they will receive and felt that this could be an invasion of privacy **[xix]**.

There may therefore be a need for Ofgem and/or government to provide clear rules on:

- data capture - what data is allowed to be captured, stored on databases and for what purpose;
- data use - how the data is used;
- data storage - how the data is stored; and
- data sharing - what and how the data is shared with third parties.

Some key questions to be addressed are:

- should the rules limit data capture to only that which is absolutely necessary for the proper functioning of the service?;
- should the rules limit data use in any way?;
- should the rules provide limitations on data storage?; and
- should the rules provide further guidance on data sharing?

Ownership of data - energywatch considers 'ownership' of data (generated by smart meters) as a matter that will need addressing by government and that consumers should be deemed the 'owners' of data and given rights as to how it is used and transferred **[xx]**. Ofgem have also raised the issue of ownership of data with the Department for Business, Enterprise and Regulatory Reform (BERR).

Interference with home wireless networks - The potential for communications between the smart meter and display (and gas and electricity meters in linked solutions) to interfere with an existing home wireless network. The Energy Retail Association say "the security solution for local communications with a smart meter will need to be flexible and cognisant of the types of devices that could connect to a 'home network'". This may mean a lot of work with such households to reassure them that they won't have problems. This may be easier to address in the competitive rather than franchise model.

Apart from the home networks issue noted above, the model adopted for roll-out of smart meters will make no difference to data protection and security – the law will apply equally and systems to protect data will be similar. Under a franchise model, data will be accessed by franchisee and the supplier. Under a competitive model, although in theory it could all stay with the energy supplier, in practice some, if not all energy suppliers, will contract out so there will also be two organisations involved.

Conclusion on data protection

Although the existing data protection laws cover smart meters, there are some important issues to resolve around data capture, data use, data storage, data sharing and data ownership. Provided these are addressed, data protection laws will be adequate for a smart meter roll-out.

Key recommendations on data protection

Together with the Information Commissioner's Office, Ofgem and the government need to look at data capture, data use, data storage, data sharing and data ownership issues to ensure consumer protection is adequate. These considerations should also be part of the wider consultations on data sharing and the review of the European Telecoms package including the European Privacy and Electronic Communications Directive (EC 2002/58). Energy suppliers need to continue their work on data security and ensure that potential conflicts between home networks are avoided or effectively managed. They need to provide consumers with adequate information and clear procedures for resolving problems.

Prepayment meters

Prepayment meter usage

There are 2.3 million gas prepayment meters (eleven per cent of domestic gas customers) and 3.6 million electricity prepayment meters (14 per cent of domestic electricity customers). More than 30 per cent of single parent households, the unemployed and those with long term illness or disability use a prepayment meter for gas and/or electricity. Prepayment use is relatively low in households with older people - 7 per cent for pensioners dependent upon state benefits. Twenty-five per cent of the fuel poor use pre-payment meters, while 75 per cent pay by either standard credit or direct debit **[xxi]**.

Prepayment meters cost more than credit meters and have higher servicing costs, although these are offset to some extent by the cash flow advantages to energy suppliers and the elimination of debt. Ofgem estimate the higher costs are £85 compared to direct debit and £65 compared to standard credit for a household with both gas and electricity on prepayment **[xxii]**. However, differentials are significantly higher – prepayment customers paying £140 more than direct debit customers on average and £195 more than online direct debit tariffs **[xxiii]**. Prepayment meter customers are less likely to switch supplier and if in debt they can be prevented from switching. Although only around 15 per cent of gas prepayment customers are in debt at any one time, two-thirds initially have a prepayment meter fitted because they are in debt **[xxiv]**. For every prepayment customer that wishes to switch, energy suppliers need to check whether they have a debt which represents another cost.

By way of comparison, it is worth noting that generally prepay mobile phones are more expensive and have higher per call charges than phones supplied on contracts. Prepaid customers are generally less valuable to mobile phone companies because their average monthly spend is £24.27, compared to £44.18 for contract customers **[xxv]**. Although the average spend of gas and electricity prepayment customers is only slightly lower than that for direct debit customers, their lower income profile may make them similarly less valuable for cross selling. Therefore, whilst improvements in technology may tackle some of the causes of higher charges, there are also other factors causing the differentials between prepayment and direct debit.

In Northern Ireland, keypad electricity prepayment meters have led to costs savings and lower prices for prepayment customers. Customers with keypad meters pay a 2.5% discount, relative to the standard credit tariff – though they still pay 1.5% more than those on direct debit. However, the scope for similar savings in Great Britain is lower because most of the prepayment meter stock is key or smart card that allow transfer of tariff changes and meter reading data at the payment point. In this sense, key and smart card meters are 'semi-smart' **[xxvi]**.

Costs and issues

Newer technology could reduce the costs of prepayment. This could be done through:

- **Eliminating the need to insert a card or key into the meter –** Breakages and loss of cards or keys lead to costs of replacement, risks of fraudulent use and in some cases necessitate a visit (for example to repair a meter). Transco undertake 1 million visits a year at a cost of £50 a visit.
- **Eliminating misdirected payments –** Some customers continue to use the old suppliers' key or card when they switch supplier. This is a significant operational cost – estimates put the value of payments sent to the wrong supplier at £150 million a year **[xxvii]**.
- **Eliminating the need to visit the property to change the meter from prepayment to credit and vice versa –** About ten per cent (600,000) of the prepayment meter population changes each year. An electricity smart meter that can be remotely switched between credit and prepay costs little more than a credit smart meter. In gas, the differential is greater but it may be cost effective to fit combined gas credit/prepay meters, in areas of high prepayment use (for example, social housing estates).
- **Having a greater range of options to top up credit.** These would include: Paypoint (or similar), phone or internet, supermarket checkouts and cash machines. This greater range of payment options offers the potential to make prepayment more attractive (more like "pay as you go" mobile phones).

Logica CMG estimate suppliers could save up to 30 per cent of the cost of managing prepayment through smart technology **[xxviii]**. However, costs might not fall as much as might be expected if prepayment meter customers still buy credit frequently. An expansion of payment options could also raise costs as these would be spread over fewer customers than for mobile phones.

The proportion of customers using prepayment meters is likely to increase with the introduction of smarter forms of prepayment. Energy suppliers are likely to switch customers to prepayment earlier – before debt has built up significantly. Provided that adequate customer protections are in place (see later section) this should be beneficial both to consumers in debt and to consumers in general. Furthermore, many customers who currently pay their bills in cash on a weekly basis might switch to a more customer friendly form of prepayment.

In Northern Ireland, prepayment use has increased from under ten per cent to over 25 per cent of customers with the new technology. Sixty-five per cent of mobile phone users in the UK are on pre-pay contracts **[xxix]**. It is not likely that prepay for gas and electricity will grow to the mobile phones level (many mobile users are children and teenagers for whom prepayment is particularly suitable). However, energy prepay usage could increase from around 13 per cent of customers at present to perhaps 20 per cent of customers.

Prepayment is not suitable for some vulnerable customers who would have difficulty topping up credit (for example some disabled people). At present, energy suppliers do not fit prepayment meters in these cases and

use other methods to recover debt. The need to visit to change the meter enables these circumstances to be checked. However, smart meters may overcome some of the problems that vulnerable customers have (for example being able physically to top up credit if this can be done by phone).

Emergency credit and soft disconnection

Energy suppliers may also be willing to make emergency credit more flexible with smart meters – as in Northern Ireland. Another option might be soft disconnection – for example reducing load so the customer could just use lights and fridge until credit is topped up. This could be a useful means of avoiding full disconnection, but would require consideration of the implications for consumers. In particular, consumers would need effective information.

The main continuing issue may be for those with mental health problems and learning difficulties. These concerns would need to be tackled through either licence obligations or codes of practice.

The model adopted for the roll-out of smart meters will make no difference to the delivery of smart meters to prepayment customers. The Energy Retail Association say the franchise would enable them to target prepayment customers first, but under the competitive model, energy suppliers are also likely to target prepayment customers early as smart meters offer cost reduction potential.

Conclusion on prepayment meters

Smart meters can reduce costs of prepayment and should help to improve competition in this market**.** Much of the benefit to prepayment customers may be in the form of better and new services rather than substantial price cuts. Some updating of consumer protection measures will be needed.

Recommendation on prepayment meters

Ofgem needs to review the consumer protection measures particularly for vulnerable consumers for whom even smarter forms of prepayment may not be suitable. Advice needs to be provided alongside smart meter installation to avoid self disconnection and rationing.

Customers in debt or with payment problems – remote switching capability

Remote switching (from credit to prepayment and/or disconnection) capability will clearly save the costs of energy suppliers having to get into properties to change the meter and will mean that debts can be recouped sooner. This will reduce energy suppliers' costs and so should benefit all consumers. It should also specifically benefit customers with debt and payment problems as debt build up can be lessened. However, two key questions arise:

- could remote switching capability lead to customers being switched from credit to prepay without the safeguards and processes that currently apply?; and
- could remote disconnection capability lead to customers being disconnected without the safeguards and processes that currently apply?

Energy suppliers will still need to follow existing procedures for debt recovery and disconnection, irrespective of consumers using smart meters. The supply licence conditions governing debt recovery and disconnection, as well as the Energy Retail Association's protocol, are also designed to minimise disconnections or prevent them altogether in the case of vulnerable households.

At present, energy suppliers offer a prepayment meter to customers who have debt problems and have not been able to agree or maintain another suitable payment arrangement. The energy supplier has to gain access to customers' homes to install a prepayment meter or disconnect supply if a prepayment meter is refused by the customer or is not suitable for some reason. This means either that the customer has to allow the energy supplier access or the energy supplier has to obtain a right of entry warrant from a magistrates court. The minimum period of time set out in gas legislation is 35 days – in other words disconnection or the installation of a prepayment meter can take place seven days after the bill has been outstanding from 28 days. In electricity this can take place not less than two working days after the bill has been outstanding for 20 working days.

The warrant application process currently requires the supplier to show that:

- the customer has been given at least twenty-four hours' notice; **and**
- the supplier's representative has asked to be admitted and the customer has refused; **or**
- the premises are unoccupied.

A Court may require evidence of a debt, and of a supplier's efforts to recover debt. Consumers should be advised when and where the supplier will apply for a warrant, and can defend the application. Some households may settle (or contest the warrant if the arrears are disputed) accounts at this stage (although they will still have to pay court costs).

The model adopted for the roll-out of smart meters will make no difference to customer protection concerns arising from remote prepay/credit switch and disconnection ability – the same issues need to be addressed irrespective of the model.

Conclusion on remote switching capability

The reductions in costs should benefit consumers. Most of the existing consumer protections should be adequate except for the final stage of debt recovery/ disconnection, because smart meters will make it possible for energy suppliers to switch consumers to prepayment or disconnect the electricity supply remotely, without visiting premises.

Recommendation on remote switching capability

Ofgem needs to review the legislation, licence conditions and codes of practice governing the final stages of debt recovery/ disconnection, to ensure customers are adequately protected. Ofgem should also review the protections for vulnerable consumers for whom even consumer friendly forms of prepayment would remain unsuitable. Such reviews should be conducted involving full consultation with consumer organisations and energy suppliers.

Vulnerable customers and those with special needs

According to the Energy Retail Association, "Smart metering is a tool that suppliers can use to significantly improve their proactive intervention with low income and vulnerable customers in terms of tariff design, payment options, early intervention, etc." **[xxx]** Smart meters could make it possible for energy suppliers to provide a number of new services that could be of particular benefit for vulnerable customers. These include:

Time-of-use tariffs – Some vulnerable customers may benefit from time-of-use tariffs as many of them are at home in the day-time (such as older people, some disabled, unemployed) and thus would be able to use appliances off-peak. Energy suppliers might consider a new "home-all-day-tariff" for this market.

Accessible customer displays and pre-payment meters - An accessible customer display and prepayment meters that do not require cards/keys to be inserted could be useful for older and disabled people who have problems with inaccessible meters. At present these consumers can have their meter moved free of charge (although it is not always physically possible). With smart meters it is probably only the display that needs to be accessible as the customer would not need access to the meter (except possibly for gas where a button would need to be pressed to restore supply if credit had run out), so this should improve services to customers and reduce costs for energy suppliers.

Instant credit – Instant credit by telephone or over the internet to prepayment meters would be useful as carers and family members could do this remotely for older and disabled people.

Special services for vulnerable customers – Energy suppliers might also offer special services, such as monitoring whether vulnerable households are using enough energy. This could enable notification to be sent to someone else if need be (for example a carer) as a development of priority register services. For those with sight problems there may be technology solutions that can help – such as a talking display. Also, data gathered from the premises of vulnerable consumers could be transferred to a person nominated by the consumer, as is the case currently in relation to bills.

Which of these services will be provided and what they might cost is difficult to predict but the potential is clear and some energy suppliers are already investigating this. However, although smart meters offer potential benefits for vulnerable consumers there could be some risks as well. Those using electric on-peak heating might find it difficult to adjust their times of use to benefit from off-peak rates - it all depends upon how tariffs are designed. Smart meters - particularly with visual displays - can provide much more information to consumers on how much energy they are using and how much it is costing them. Whilst this could reassure some consumers that they can afford the energy they are using (rather than relying on estimated bills), it might encourage some customers to ration their use to the detriment of their health, or to self-disconnect.

Prepayment meter users are generally more aware of how much they are spending than those who pay by other means; because they know how much credit they need to put onto the meter each week. Thus prepayment meter users already have some of the information that more consumers would get with a smart meter (albeit that the smart meter would provide more sophisticated information on hourly and daily costs).

Self-disconnection for prepayment meter users is defined as interruption to supply because the card has not been charged and inserted into the meter. Self-rationing is defined as the respondent not being able to afford sufficient fuel to heat the home (it can also occur amongst consumers on standard credit tariffs). A 2001 survey found that a quarter of prepayment consumers had self-disconnected in the previous year **[xxxi]**. Most of those who had self-disconnected had done so more than once and some more than twenty times. Most of those who had self-disconnected attributed this to having forgotten to recharge the card, rather than to shortage of money. However self-disconnection for money reasons clearly is a significant problem for a minority of prepayment users. Most households surveyed tried to economise on their use of fuel; only 27 per cent of consumers neither self-disconnected nor self-rationed. Pensioners were least likely to self-disconnect or self-ration. Households with both gas and electricity prepayment meters were most likely to both self-disconnect and self-ration **[xxxii]**.

These concerns have been raised by a number of respondents to the BERR consultation, as this quote illustrates: "…for those consumers who already ration their energy use, smart meters may act as an additional signal that they should reduce their consumption further. This additional rationing may place some customers at risk, for example if they cut back on their heating as a result." (Quote from Scottish Power submission in response to Question 10.44).

Conclusion on vulnerable consumers

Smart meters will have the potential to provide some valuable new services. However, because they can provide more information on energy costs, they could increase the incidence of self-rationing and self-disconnection amongst some vulnerable households, unless other action is taken.

Recommendation on vulnerable consumers

The government and Ofgem should require energy suppliers to provide effective energy efficiency advice - encouraging people to take up energy saving measures. This should be provided alongside smart meter installation, particularly to vulnerable and fuel poor households to help avoid the risk of self-disconnection and rationing. Energy suppliers could do this themselves (as part of their energy saving activities) or involve relevant agencies, such as the Energy Efficiency Advice Centres and EAGA, the insulation installer.

New tariffs

Key consumer considerations on new tariffs

Currently, domestic tariffs for gas and electricity are flat, averaged across the day and year and do not directly reflect the costs of producing, transporting and supplying power and gas **[xxxiii]**. Meters which record energy-use by time-period, open the way for energy suppliers to introduce time- or volume-related tariffs, just as for phone charges.

If consumers respond to these price signals, either by changing the pattern of their energy-use or by reducing their energy demand altogether – it may eventually allow some parts of the energy supply system to be operated or to be planned differently and create potential cost-savings. Some of these savings may fall to energy suppliers, who may then choose to share some of these savings with their customers.

By creating a price-related demand response, variable tariffs will impact throughout the energy market – on energy suppliers, networks, generators, the system operator – as well as on consumers. Major considerations for consumers include:

Economic efficiency – There will be winners and losers in moving from flat tariffs to more cost reflective ones. For example, consumers with high peak-use are presently subsidised by consumers whose usage is mainly at lower-cost times.

Fairness – Tariffs which increase, either with volume or at peak times, will benefit those consumers able to respond by reducing or shifting their load. Consumers with inflexible consumption, including some fuel-poor and vulnerable, may be disadvantaged.

Environment – If new tariffs reduce energy use, carbon emission benefits should follow **[xxxiv]**. Tariffs designed to reduce system peaks (to avoid or delay new investment in plant or networks) could have some energy demand-reduction effect too. However, energy use could increase if off-peak/standard tariffs are low. This could result in higher emissions.

Security of supply – Peak-related tariffs can improve system security by flattening demand peaks.

Impact on bills – Impact on bills will depend on how the tariff is structured. Peak-related tariffs could reduce the average bill if a consumer used the same amount of electricity or gas but at cheaper off-peak times (or even used a little more) **[xxxv]**.

There is a need for clarity about the objective in offering new tariffs. This could be peak-load-shifting, energy or carbon reduction, lower average bills or some combination. In most overseas trials (Ontario, California, Australia and Norway) the main goal of new tariffs has been to reduce electrical peak-load – caused by summer air-conditioning, or, winter space and water-heating **[xxxvi]**.

Types of new tariffs

Many new tariffs are possible, but broadly they can be grouped (by increasing cost-reflectivity) under four headings:

Block / Tiered tariffs – Payment for fixed-blocks of energy at pre-agreed prices. Price-blocks can be evenly spread, or not, and can increase, or decrease. First block can be higher-priced to cover fixed costs, or lower-priced to ensure a basic supply. Could be an effective tariff for reducing demand – but would not impact on daily or seasonal peak-use. Impact on fuel-poor or vulnerable customers would need a thorough understanding.

Time-of-Use tariffs – Differing unit-price for different pre-fixed time periods. Time –of-use periods relate to timing of peak system demands over the day, week or year, and could change seasonally.

Critical Peak Pricing tariffs – High per-unit price for usage during periods nominated by the supplier as 'critical peak periods'. Critical peak days are not designated in the tariff, but notified, usually at short-notice, up to a pre-agreed number of days per year. A typical critical peak price ratio is 5:1 (or more) against the standard tariff. There are many variations of critical peak pricing, including rebates for customers who keep demand below a pre-agreed target.

Real-Time Pricing tariffs – Unlikely to be offered to small users. Varies continuously through time rather than a pre-fixed tariff (as per time-of-use tariffs). Directly links to the wholesale real-time energy system price.

Energy suppliers in Great Britain may wish to promote time-varying tariffs which:

- more closely match their underlying costs and their retail offers;
- promote retail competition by differentiating tariffs; and/or
- reduce overall demand if suppliers are given a new demand-reduction duty, post-2011.

Consumers can take the benefit of new tariffs by:

- using less energy overall – which will keep down fuel bills and reduce carbon;
- using energy at different times - which could reduce bills but may have an uncertain carbon impact; and
- shifting to different fuels – could reduce bills – but have an unknown carbon effect. For example, with a variable electricity tariff and a flat gas tariff, a consumer may switch some usage to gas for example for cooking or water heating.

The Energy Demand Research Project results should add some insight to consumer responses.

Introducing consumers to new tariffs – Key principles

Understanding new tariffs will be central to consumer acceptance of smart meters. Bills would hopefully reduce and certainly not increase for most consumers. Some important principles will be:

Simplicity – Easy-to-understand tariffs.

Adequate tariff explanation - To enable a clear understanding of the likely effect of a tariff on bills and energy consumption and carbon emissions.

Maximise visual feedback – Colour-codes, lights or other warning systems on displays, meters and mobile phones to aid understanding of tariff structures **[xxxvii]**.

Revert to previous tariff without penalty - if a tariff is unsuitable.

Time to adjust and to develop a learning curve – In Southern California, smart meters are being rolled-out first, and only some months later will consumers be offered critical peak pricing. Consumers without experience of peak-tariffs may be resistant, but may prefer them after experiencing them **[xxxviii]**.

Adequately resourced customer support - to deal with customer queries.

Awareness and information – Pricing and smart-meter awareness initiatives from trusted sources will assist in countering suspicion and resistance **[xxxix]**.

Tariff opt-in – Consumers should opt-in to new tariffs and not be required to take them. This is regardless of whether smart meters are rolled out by a competitive route or via a franchise. Any requirement for consumers either to opt-out of a tariff or to take a particular form of tariff (for example block tariffs to reduce energy demand) would not be acceptable. If a post-2011 supplier obligation requires suppliers to reduce demand, they could be expected to offer tariffs designed to reduce demand.

Customer choice – Customers to retain control and make informed choice between cost, convenience, service and risk of higher bills. Tariffs should be designed to reflect customer needs and what proportion of household energy-use is considered discretionary **[xl]**. For example, time-of-use periods to be offered at times of day when customers can respond **[xli]**.

New tariffs could benefit consumers, energy suppliers and the environment - although there will be winners and losers. Much will depend on how sensitively energy suppliers develop and market new tariffs, consumer willingness to alter usage patterns and consumers' full understanding of new tariffs.

To compliment this paper, the NCC has commissioned a paper *Towards sustainable energy tariffs,* which assesses current and new tariffs against the three pillars of sustainable development: environmental sustainability, social justice and economic efficiency **[xlii]**.

Conclusion on new tariffs

Price and lower bills will play a major part in consumer acceptance of smart meters and new tariffs. There will be more complexity and scope for confusion as a result of different offers for time-varying, peak-related, increasing block or seasonal tariffs. Comparative information about tariff-offers on utility switching sites will be very important to help consumers compare and choose between supplier offers.

To reduce energy use overall (for example not just to achieve peak-price response), a shared goal of carbon reduction would be needed, and is most likely to be achieved by smart meter tariffs in combination with new automated controls for gas-boilers and thermostats.

Recommendations on new tariffs

Choice of new tariffs should be voluntary and tariffs should continue to be offered competitively. Ofgem should initiate an open debate with consumer bodies, energy suppliers and other stakeholders on the principles underlying new forms of tariff.

Appropriate consumer protections in respect of marketing new tariffs should build on present arrangements. These include the energy suppliers' self-governing code on doorstep selling, updated regulations on unfair trading by phone or internet and, the Supplier Licence condition on marketing to domestic customers [**xliii**].

New services

Together with new tariffs, smart meters will enable a range of new services. Some may be available relatively quickly, some in the longer term as energy suppliers seek to extend and differentiate their service offerings. Some likely developments are as follows:

Electricity and gas sold in combination with other services – Such as broadband or cable packages – perhaps for communications, entertainment and fuel – or with banking, insurance or home-security services. New combined packages, many of which may be e-account based, could be a growth marketing area.

Smarter appliances and smarter homes – Together with smart meters, a variety of in-home wireless controls and sensors may be installed to create smarter homes. This includes individual appliance switching, load-control and thermostat-control **[xliv]**. Consumers want better understanding of, and control over, the consumption of individual appliances **[xlv]**. In-home networks with micro-processor controls could enable this.

Automated and demand-side control – New tariffs facilitated by smart meters, together with new developments in automated control of certain household appliances, (for example, gas boiler controls and thermostats and water heaters) are likely to become available. For the future, time-of-use tariffs facilitated by smart meters could also be important in helping to manage any major increase in electrical load which may result from a radical increase in electric vehicle use.

Additional safety features – Every year there are a small number of electrical fatalities. Smart meters could facilitate additional safety features. For example, a switch with micro-processor controls could provide a very sensitive residual current device facility helping to detect earth leakage.

Energy services packages – Energy services packages could combine smart meters and energy-saving tariffs with, for example, load-management devices, installation of energy efficiency and insulation measures, and, perhaps, heat-pumps, micro-CHP or other micro-generation. Energy suppliers may actively market combined energy service packages of this kind, if they have a new energy- or carbon-reduction obligation post-2011.

Metering for micro-generation – Import and export capability is likely to become a standard functionality of all electricity smart meters without material incremental cost **[xlvi]**, and could enable householders to benefit from the electricity they export. Micro-generation metering will also provide better information to the network operators about distributed generation activity in their area.

Smart water metering - Smart energy meters will mean that an external communications interface is installed in most homes - in effect a 'smart-hub', probably the electricity meter. This would make it feasible to

transmit data from an electronic water meter (where installed) by in-home radio-link to the electricity meter – and route it onward to the water company **[xlvii]**.

Conclusions on new services

Smart meters provide a basic platform from which to build. In time, there are likely to be many new services offered to consumers in tandem with new tariffs that could be of great interest. Adequate information and transparency will be central to consumer protection, especially when a variety of new services may be bundled together. Not all marketing developments will centre around energy efficiency or energy saving, but a post-2011 supplier obligation for either energy or carbon reduction would keep energy-saving firmly to the fore as a main supplier marketing goal.

Recommendation on new services

Ofgem and the consumer bodies need to ensure fairness and to safeguard the more vulnerable. Complaint handling arrangements will need clarity and adequate resourcing. A post-2011 supplier obligation will be core to ensuring a marketing focus on demand reduction.

Conclusion

In an era of rising energy prices, domestic smart meters could play a central role in helping consumers to improve control over their energy use. The potential benefits for consumers are considerable – improved retail competition, accurate bills and the chance to reduce consumption through better feedback. Smart meters, in tandem with other energy efficiency measures, can offer a gateway for individuals to engage with the climate change agenda.

Consumer organisations and the energy industry are united in wanting early indication from government on the policies and measures they propose for delivery of their ten-year smart meter ambition. Costs of a national smart meter roll-out will be substantial. Additional costs to customers should be minimised and the benefits flowing to consumers should be maximised.

A successful roll-out of smart gas and electricity meters to every household will be a huge and complex undertaking. It will need concerted leadership from government and Ofgem, working closely with the energy industry and the consumer bodies. From the very major commercial, technical and logistical requirements through to information and communications campaigns to ensure consumer acceptance, the rewards of getting smart meters right will be very considerable - as will the pitfalls of getting it wrong.

Whichever roll-out approach government chooses, be it competitive or a franchise, some new and enhanced consumer protection measures will be needed. Ofgem will have a major role in overseeing this and ensuring that consumer protection is adequate. Transparency in how the costs are met by consumers of this major investment will be important. For their part, consumer bodies will wish to ensure continued vigilance and appropriately targeted consumer information, advice and education.

Lastly, and very importantly, a successful smart meter roll-out will be achieved by energy suppliers working sensitively to meet their customers' needs. A new post-2011 duty on energy suppliers to reduce energy demand would make it more likely that their approach to marketing new smart meter tariffs and associated services is well-aligned with carbon reduction and climate policy.

Appendix

Methodology

This report draws on a number of interviews with key stakeholders from the following organisations:

- Ampy Metering;
- Centrica;
- Department for Business, Enterprise and Regulatory Reform (BERR);
- Department for the Environment, Food and Rural Affairs (DEFRA);
- EDF Energy;
- Energy Retail Association;
- Energywatch;
- Engage Consulting;
- EON.UK;
- Hunton Williams Solicitors;
- National Grid;
- National Energy Action; and
- Ofgem.

In addition, there was involvement in a number of meetings/discussions in the context of the BERR impact assessment.

This study also draws extensively from material submitted to the government's smart-meter consultation: 'Energy Billing and Metering: Changing customer behaviour – a consultation on policies presented in the Energy White Paper (August 2007). Consultation responses can be found at: www.berr.gov.uk/energy/whitepaper/consultations/billing-metering/consultation-responses/

References

i Owen, G and Ward, J. Smart Meters in Great Britain – The next steps. 2007 & Smart Meters – Commercial Policy and Regulatory Drivers. 2006. Sustainability First.

ii Owen, G and Ward, J. Smart Meters in Great Britain – The next steps. 2007 & Smart Meters – Commercial, Policy and Regulatory Drivers. 2006. Sustainability First.

iii Department for Business, Enterprise and Regulatory Reform (BERR) Energy Billing and Metering: Changing customer behaviour – A consultation on policies presented in the Energy White Paper. August 2007. Consultation Responses. October 2007 – www.berr.gov.uk/energy/whitepaper/consultations/billing-metering/consulation-responses/

iv Ipsos Mori consumer research for energywatch (Dec 2007) identifies 'who would pay for this?' as a major question for many consumers.

v Owen, G and Ward, J. Smart Meters in Great Britain – The next steps. 2007 & Smart Meters – Commercial, Policy and Regulatory Drivers. 2006. Sustainability First.

vi Department for Business, Enterprise and Regulatory Reform (BERR) Energy Billing and Metering: Changing customer behaviour – A consultation on policies presented in the Energy White Paper. August 2007.

vii Ofgem. Domestic Retail Market Report. June 2007.

viii Energy Saving Trust (EST) Green Barometer IV Report. March 2008.

ix Ipsos Mori (Dec 2007) for energywatch found that the meaning of kilowatt hours is poorly understood and that consumers prefer data concerning energy usage in terms of its cost in pounds and pence.

x UK Government. Meeting the Energy Challenge: A White Paper on Energy. May 2007. para 2.64.

xi Ofgem cite a 1 per cent reduction in energy use (both electricity and gas) as an illustrative assumption of a 0.36MtC pa saving – 8 per cent of the 4.8MtC domestic carbon reduction goal by 2010. Ofgem. Domestic Metering Innovation. February 2006. p18. para 4.14.

xii Owen, G and Ward, J. Smart meters in Great Britain – The next steps. 2007. Sustainability First.

xiii Frontier Economics and others argue that the franchise model may facilitate earlier and greater environment benefits - but this pre-supposes that a significant proportion of those consumers engage and are motivated to reduce their energy use and also depends on the value of advancing such savings by a few years.

xiv Energywatch. Submission to BERR consultation on billing and metering. 2007. p.8.

xv Energywatch. Submission to BERR consultation on billing and metering. 2007. p.8.

xvi The benefits of smart meters for retail competition were considered in the cost benefit case in the Netherlands and Victoria.

xvii Bridget Treacy, Partner, Hunton Williams. Beware the Data Protection Authorities: Privacy implications of smart metering. Presentation to Metering Europe Conference, Vienna, 4 October 2007.

xviii Energy Retail Association. Smart Metering Operational Framework Proposals. Supplier Requirements. August 2007.

xix Ipsos MORI Social Research Institute, The Relationship between billing and metering. Research Study Conducted for Energywatch. 2007.

xx Energywatch. Submission to BERR consultation on billing and metering. 2007.

xxi Ofgem. Domestic Retail Market Report. June 2007.

xxii Ibid.

xxiii Fuel Poverty Advisory Group. Government's fuel poverty target will not be met. Press Release: 04 February 2008 and Energywatch. £195 power penalty for poorest. Press Release: 05 December 2007.

xxiv http://www.ofgem.gov.uk/Sustainability/SocAction/Monitoring/COPMonitor/Documents1/18330_ExternalReport61206.pdf

xxv J D Power Associates. Monthly spend on mobile rises, 2004.

xxvi Ofgem. Pre-payment Meters. Consultation on new powers under the Energy Act 2004 and update on recent developments. February 2005. 32/05.

xxvii Logica CMG newsletter, Vision Online, Issue 6, 2005.

xxviii Logica CMG op cit.

xxix Ofcom. The Communications Market, 2007.

xxx Energy Retail Association. Submission to BERR consultation on billing and metering. 2007. Qn 10.44.

xxxi Centre for Management under Regulation, University of Warwick Centre for Competition and Regulation, University of East Anglia, Affording Gas and Electricity: Self Disconnection and Rationing by Prepayment and Low Income Credit Consumers and Company Attitudes to Social Action. 2001.

xxxii Centre for Management under Regulation, University of Warwick Centre for Competition and Regulation, Affording Gas and Electricity: Self Disconnection and Rationing by Prepayment and Low Income Credit Consumers and Company Attitudes to Social Action. University of East Anglia, 2001.

xxxiii Except off-peak tariffs for electric heating and hot water, such as Economy 7.

xxxiv Owen G and Ward J. 'Smart Meters in Great Britain - The next steps?' 2007 concluded that a 1-3 per cent domestic energy saving seemed reasonable in a GB context. The carbon benefit of reduced gas-use can be fairly readily calculated. The carbon-benefit of lower electricity-use depends upon the carbon-emissions of displaced generating plant. The carbon benefit of electricity peak-shifting is also uncertain and difficult to calculate.

xxxv NIE Keypad 'Powershift' trial.

xxxvi In the three-year California Statewide Pricing Pilot (2,500 consumers, 2003-06), critical peak pricing prompted reductions of 13 per cent on peak-days; 16 per cent with air-conditioning; 27 per cent combined with automatic thermostat control of air-conditioners; and 43

per cent with a fully automated smart-home 'gateway'. In Norway, in a pilot of 10,000 customers where time-of-use tariffs were combined with automatic load control of electric water heaters, peak demand reductions of 8-9 per cent were shown.

xxxvii Some examples include fridge magnets used in the Norway pilot; a Danish spot-pricing pilot with colour-coded pricing periods (Togeby M. EA Energy Analyses. Denmark); colour-coded days in the former French Tempo-tariff; and, a colour-changing Orb (EEI Report by Brattle. Jan. 2008. App. G. Reference to California Information Display Unit).

For example, a Utility 'Peak Buster Award' in Ontario; awards, competitions and games aimed at demand reduction between cities, streets, schools (Vaxjo, Sweden); web-based smart-meter related home-energy audit (e.g. Denmark – Electricity Saving Trust. Elsparefonden – www.sparEl.dk.

xxxviii Doug Houseman. Cap Gemini. Stockholm Feb 08 and California Statewide Pricing Pilot. An ERA YouGov survey (Feb. 08) found that 53 per cent of people said that new tariff details would be likely to change their energy usage at peak times.

xxxix For example, anti-smart meter campaign in Ontario (OEC), opposing high critical peak pricing prices.

xl For example, Owen & Ward (2007) found that time-discretionary use of electricity in Great Britain is mainly relevant to wet appliances (including tumbler driers), electric showers and a modest amount of lighting. Together these uses accounted in 2005 for about 20-25% of all household electrical appliance use. Around 70-80% of household electricity-use (fridges, freezers, lighting, brown goods) may be non-discretionary.

xli In practice, initially, the underlying structure of domestic tariffs in Great Britain will continue to be shaped by existing profiles for domestic settlement. ERGEG (European Regulators Group for Electricity and Gas). 'Smart Metering with a Focus on Electricity Regulation'. 31 October 2007. p17 and CER, Ireland.

xlii National Consumer Council (NCC) *Towards sustainable energy tariffs,* 2008: www.ncc.org.uk.

xliii EnergySure Scheme**.** Code of Practice for Face-to-Face Marketing of Energy Supply and Consumer Protection (Distance Selling) Regulations 2000 (presently being revised).

xliv EdF, TAHI.

xlv Ipsos Mori. 2007.

xlvi Energy Retail Association Specification.

xlvii Technical, administrative and commercial challenges would arise but these could be resolved. In practice, the commercial issues would largely mirror those where a customer takes their electricity and gas supplies from separate energy suppliers, and uses the electricity meter as the external communications hub.