



Department for
Business, Energy
& Industrial Strategy

SMART METERING NON-DOMESTIC 'EARLY LEARNING'

Annex 3: Clusters 3 & 4 – Small, customer
facing independents



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Introduction

This is one of seven cluster specific annexes which, together with the main report and the technical report, sets out the findings and conclusions from research designed to provide ‘early learning’ in relation to the installation and use of smart meters in non-domestic premises¹. This report focuses on Clusters 3 & 4 – findings from a sample of small, customer facing independent businesses.

Background

Smart Meters are the next generation of gas and electricity meters. They offer a range of intelligent functions and provide consumers with more accurate information, bringing an end to estimated billing. Consumers should have access to near-real time information on their energy consumption to help them control and manage their energy use, save money and reduce emissions.

The Government mandate technically defines a smart meter as one that is compliant with the Smart Meter Equipment Technical Specification (SMETS) and has a specified range of functions including being able to transmit meter readings to suppliers and receive data remotely. Energy suppliers are required to take all reasonable steps to install smart meters in domestic and smaller non-domestic sites by the end of 2020. The exception to this is in smaller non-domestic sites where advanced meters may remain in place for their lifetime if they were installed before October 2017 for larger suppliers and February 2018 for smaller suppliers.

As a minimum, an advanced meter can store half-hourly electricity and hourly gas data, to which the customer can have timely access and to which the supplier can have remote access. The vast majority of meters installed at sites included in this research were likely to be ‘advanced meters’ rather than SMETS compliant meters, as at the time the roll-out was still at an early stage and the majority of meters being installed in affected sites were still ‘advanced meters’. These meters would have had some, but not all, of the additional functions found in a smart meter that meets the Government’s technical specification. For ease of reference, the term ‘smart meter’ is used to refer to both ‘advanced’ and SMETS compliant meters in this report unless otherwise specified.

¹ A list of the full set of reports is provided in the appendices; see List of Reports, p43.

The non-domestic roll-out will cover around two million sites. These sites are very varied; they include private and public sector organisations, and range from small shops to chain stores, from small industrial units to schools.

Aims and Objectives

The aim of this work was to improve the evidence base on how and why smart meter data is or is not being used for energy management in relation to non-domestic sites, as well as the pathways, enablers and barriers to energy saving using such data.

The objectives of the research were specifically to;

- i. explore how 'smaller non-domestic sites' use energy and make energy related decisions
- ii. understand the ways in which smart meter data is being used for energy management in relation to 'smaller non-domestic sites', as well as the current types of benefits being realised
- iii. develop an understanding of the (actual or potential) pathways, enablers and barriers to energy saving in smaller non-domestic sites using smart meter data; and what further action may be required to maximise benefits.

Method²

In summary, 107 organisations took part in the research. The research involved 41 case studies of sites, the majority of which had smart meters installed. The aim was to include only organisations that had had smart meters (advanced or SMETS compliant) installed and to provide breadth in terms of geography, organisational size and cluster, tenure, energy use and experiences of using information from advanced or smart meters. There is further detail on sampling below and in the Technical Report.

Each case study consisted of a site visit and one or more interviews with key individuals from, or associated with, the organisation to which the site belonged. In addition 91 organisations took part in a telephone interview to add breadth to the findings (25 of these also took part as a case study).³

A typology of nine clusters was developed before the start of this research and this guided the case study selection. This was based on nine broad clusters of sites which are defined with respect to a number of key characteristics – those most important characteristics

² A fuller description of the research methodology can be found in the Technical Report.

³ A further interview was conducted with an energy consultant employed by a landlord whose portfolio included ports, airports, shopping/retail malls, offices, retail and studios. The interview focused on a site that provided private sector businesses with professional office-based services. The aim had been to arrange a case study visit with one or more of the tenants but this proved impossible within the timeframes of the research.

which help to differentiate the clusters are: public vs. private sector; relative energy intensity; independent vs. multi-site organisation; whether or not customer facing.

In designing the case studies, some clusters were grouped together where the similarities were greater than the differences (e.g. low and high energy consuming, small customer facing independents). In addition, two clusters (e.g. lower energy consuming, employee only, limited use sites, such as warehouses, and non-buildings, such as phone masts) were excluded entirely based on a combination of assumed low prevalence within the actual non-domestic population and practical considerations about ease of access, given time and budget constraints.

The research was conducted in two stages; this allowed the methodology to be refined after Stage 1 to reflect lessons learned. The phasing also helped with practical constraints around resourcing and recruitment, for example those clusters that were more difficult to recruit were covered in Stage 2 of the research. The two stages of research are illustrated in Figure 1.

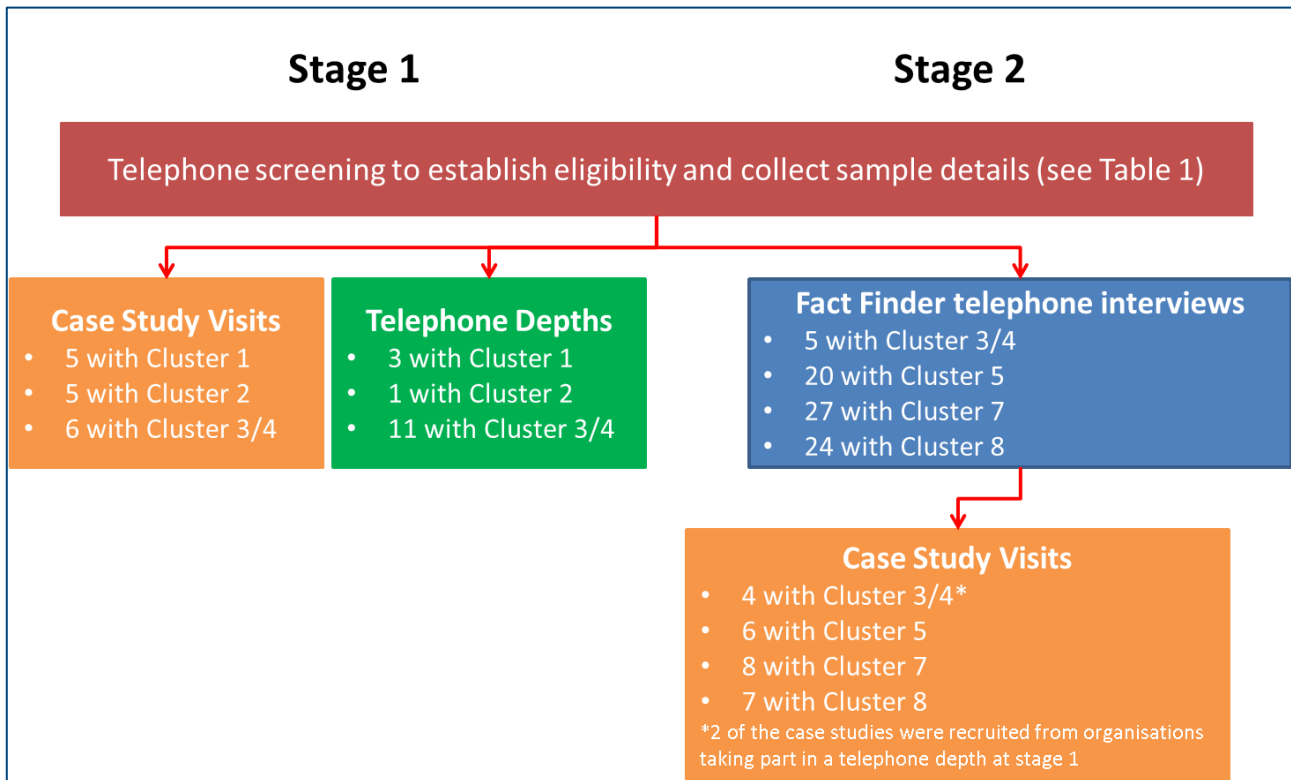


Figure 1: Flow chart of research method

Stage 1 comprised:

- initial **telephone screening** with decision-makers for an organisation's use of energy to establish their eligibility and collect basic sample details.
- **case studies** with clusters 1, 2 and 3/4. Each case study involved a visit to the case study site during which observations and interviews were carried out with a mix of internal and external actors. Internal actors included decision makers, implementers of energy management decisions, and users of energy. External actors included landlords, managing agents and energy consultants. These interviews lasted between half and two hours.
- 15 telephone **depth interviews** of 1 hour duration were conducted with energy decision makers from additional organisations spread across clusters 1, 2 and 3/4⁴. These interviews were conducted to provide additional information to support the case studies.

⁴ Cluster 1 – higher energy, customer facing chains; Cluster 2 – schools; Cluster 3/4 – Small, customer facing independents.

Stage 2 comprised:

- initial **telephone screening** with decision-makers.
- 76 **fact finder interviews** with decision-makers spread across clusters 3/4, 5, 7 and 8⁵, including some landlords; this involved a 30-40 minute telephone interview to gather factual information from a wider sample to add breadth to the findings, and to recruit sites for the case study stage.
- **case studies** with clusters 3/4, 5, 7 and 8.

The main difference between Stage 1 and Stage 2 in terms of the method was that Stage 2 began with fact finder interviews designed to gather factual information by telephone in advance of the case study depths, enabling the research team to achieve more focused case study interviews. The fact finders also had the additional benefit of allowing a wider range of organisations to be covered, providing a broader picture of each cluster targeted.

The case study approach enabled an in-depth exploration of how different organisations manage their energy and the various factors that influenced this. It involved the use of semi-structured discussions so that issues could be explored as appropriate.

Cluster 3/4 Sample

The findings for this cluster are based on 10 case studies supported by 12 depth interviews. 12 energy decision makers took part in a face to face interview as part of a case study; 4 of these also took part in a fact finder telephone interview in advance of a case study visit; 1 implementer and 2 landlords also took part in the case studies. A further 12 energy decision makers only took part in a telephone depth interview.

A summary of the Cluster 3/4 sample is provided in Table 1 below. The individual cells of the table show both the overall number of organisations in the cluster 3/4 sample and, in brackets, the number of these taking part as a case study.

⁵ Cluster 3/4 – Small, customer facing independents; Cluster 5 – Lower energy, customer facing chains; Cluster 7 - Higher energy, employee only sites; Cluster 8 - Offices

Table 1: Sample summary

Total sample: 22, of which, 10 were case studies

Region		Locus of control	
East	-	Individual site	22 (10)
E Mids	3 (1)	Head office	-
London	2 (1)		
N East	-	Tenure	
N West	2 (1)	Owner occupier	14 (6)
S East	3 (1)	Tenant	8 (4)
S West	3 (2)	Energy bills	
W Mids	2	Paid direct	22 (10)
York & Humber	2 (2)	Included in rent	1* (1)
Scotland	2 (1)	Energy types	
Wales	3 (1)	Electricity	22 (10)
Size of organisation (total employee number)		Gas	7 (9)
Sole trader	2	Other	3
Micro (<10)	18	Type of meter	
Small (<50)	2	Smart/advanced electricity	22 (10)
Medium (<250)	-	Smart/advanced gas	1 (1)
Large (250+)	-	Importance of reducing energy use	
Number of sites		High	17 (9)
single site	21 3	Medium	3 (1)
2+ sites	1 2	Low	2

* The heating costs were included in the rent but other energy costs were paid directly to the energy provider

Broad quotas were set to ensure the sample included a spread of organisations in terms of business type, energy use, location and tenure. Information was also recorded about the size of the organisation (based on number of employees), the number of sites within each chain, whether responsibility for energy management was focused at the individual sites or head office, how energy bills were paid, the types of energy and meters in use, and the perceived importance of reducing energy consumption.

Interpreting the Findings

The findings in this report provide insights into how different cluster 3/4 organisations in the sample were currently managing their use of energy, the things that get in the way of them being more energy efficient, and some of the ways of trying to overcome these barriers. As such, they are indicative of the broader picture in terms of small, customer facing independent businesses. Nevertheless, care is needed when trying to generalise to the wider population.

This is a qualitative study which means the opinions of a relatively small number of people have been explored in considerable depth. Not only is the sample small, it is not designed to be representative of the full range of organisations that meet the criteria for each cluster. Some organisations were purposively selected to learn from examples of best practice,

and although a range of more 'typical' organisations were also included in the research, the sample is not designed to be statistically representative of the wider population.

During the case study visits and the telephone depth and fact finder interviews, the researchers used topic guides and supporting stimulus materials to ensure that the relevant issues were covered; they also followed up particular points to ensure the point being made was understood, and they may also have explored relevant additional points that were made by the participants. In addition, they used an observational record sheet to observe how energy was being used.

Each case study was written up in detail using an analysis template. The answers to the fact finder and depth interview questions were cast into a matrix with the rows as the questions and the columns as the organisations. Findings from both data sets were used to identify the key themes and issues.

The views of different actors from the same case studies and fact finder/depth interviews have been used to 'triangulate' the findings from individual case studies. A similar triangulation process was used to compare and contrast the findings both within and between the different clusters.

With a few exceptions, answers were not recorded in the form of tick boxes or head counts since the aim was to explore the range of opinions expressed and actions taken rather than to 'measure' how many participants had expressed a particular view. One reason for this is that people do not always express their answers in black and white terms. Another reason is that it is not possible to explore every issue in every interview. Some issues may only have arisen in certain interviews.

In analysing the data, one of the things that has been looked for is where there is a consensus of opinion or a similar view on an issue and this is expressed using language such as 'all', 'most', 'widespread', 'widely held', 'many people', etc. However, it is also important to look for the range and variety of opinion that is expressed; these might be opinions offered by just 'a few' participants as well as those opinions mentioned by 'some' of the sample (i.e. more than a 'few' but less than 'many'). It is also useful to report things that may only be mentioned by one or two people if these seem to offer relevant and insightful observations. This would normally be made clear by stating something along the lines 'one participant said...'

Use of terms such as 'most' or 'few', etc., relate only to the sample under consideration and should not be taken to imply 'most of members in the total population'.

Report Structure

The next chapter (Key characteristics, energy use and the role of potential influencers) provides a summary of the key characteristics of the sample, how energy was being used, and who was influencing its use. This is followed by a consideration the energy efficiency culture found within small, customer facing independent businesses, along with the range of energy efficiency measures that had been adopted. The factors that were driving energy efficiency, the potential triggers and the barriers to (greater) efficiency are also set out (Energy Management). The chapter headed 'Smart Meters' summarises the reasons why

smart meters had been installed, why some organisations were not using their smart meter data, and the experiences of those that were using their smart meter data. The reactions of non-users to a number of products and services intended to help organisations get the most from their smart meter data are considered, along with possible ways of encouraging greater engagement with smart meter data among non-users. The final chapter sets out the conclusions of the research (Conclusions).

Verbatims are used to illustrate some of the findings and are shown with the cluster number, the type of organisation and the role of the individual providing it (DM: decision maker; I: implementer; U: user; LL: landlord/managing agent; EC: energy consultant).

Key characteristics, energy use and the role of potential influencers

This chapter provides a summary of the key characteristics of the sample, how energy was being used, and who was influencing its use.

The findings provide a description of what was found in the case studies and wider interviews, illustrate the diversity of different behaviours and views, and provide a more in-depth explanation compared to a quantitative survey. This information provides important context for the findings in later chapters which describe energy management activity and associated influences, and experiences of smart meters.

The research was not designed to provide answers to 'how many' type questions and the findings should not be interpreted as indicating the prevalence of such behaviours and opinions within the wider population of non-domestic energy consumers operating from smaller sites. References to the sample refer to all 22 organisations that took part in the research. Where findings only relate to one or more of the 10 organisations which also took part in a case study, this is indicated in the text.

Nature of Business

Business type

The sample included four restaurants (two with guest rooms), two convenience stores, two cycle retailers, and one each of the following types of business; café, dry cleaner, ethnographic textiles and art retailer, florist, garage repair business, gym, hair salon, hardware store, hotel with restaurant, laundrette, motor factors, optician, picture framing business with gallery and shop, and an audio, TV and computer repairer.

Business size

Eighteen of the organisations were micro-businesses (with fewer than 10 employees), two were classed as small businesses (with fewer than 51 employees) and two were sole traders. All but one operated from a single site; the exception, the owner of a laundrette, operated another laundrette business in the same town.

Business operating hours

There was considerable variation across the sample, with some operating for five, six or seven days a week with different opening and closing times. In a couple of cases, their operating hours were seasonal; for example, the hotel closed from October to Easter

although the restaurant would take occasional bookings over this period. One of the restaurants was open seven days a week in June, July and August, five days a week during the spring and autumn and three days a week in the winter; however, these were exceptions.

Nature and Management of Buildings

Tenure

14 of the businesses were owner occupiers and eight were tenants; four of these took part in case study visits. The length of the lease varied from 24 years to an annual rolling agreement. The typical arrangement was for the landlord to be responsible for external works and buildings insurance (recovering costs via a service charge) and the tenant being responsible for internal works, including energy management.

The tenants in the sample were responsible for paying their energy bills⁶ although, in one case, the heating and hot water were provided by the landlord (the local authority) for which a flat rate fee was charged. In a small number of cases, the organisations were renting out part of their premises, in some instances, the energy supply and the bills were being shared, typically based on a proportion of the site occupied irrespective of consumption.

Condition and management of buildings

Not surprisingly, the businesses were operating from widely varying types of buildings, ranging from four 18th century cottages that had been knocked together to form a restaurant, to buildings that were some 30 or more years old. Many were part of a terrace of retail units, often with flats above. This meant some were considered relatively easy to heat and/or cool. However, more typically, participants spoke about their premises as posing challenges in terms of energy management and very often the challenges were not being overcome. None of the buildings had any form of Building Management System (BMS)⁷ in operation.

Some of the buildings were in a poor state of repair and any maintenance tended to be approached in the same way as energy management, often by the business owner or a family member or a friend who was a tradesperson, and on a reactive basis.

Environmental policy and energy audit

Only a couple of the organisations reported having some form of environmental policy in place. In one of these, a restaurant, the owner could not find a copy when asked; she reported that she had never been asked to show it to anyone before. In the other case, the

⁶ This may not reflect the wider situation. Attempts were made to include in the research some landlords who were managing multi-occupancy sites and where the landlord was responsible for energy bills. In the event, this proved to be very difficult.

⁷ A Building Management System is a control system that controls and monitors the building's mechanical and electrical equipment such as ventilation, lighting, power systems, fire systems, and security systems.

owner claimed to have an informal 'policy' but on being asked about it, it mainly related to recycling rather than energy.

Very few of the organisations had had some form of energy audit. One was in the process of installing LED lighting as a result of an audit conducted some three years ago. Another organisation had recently had an EPC prepared as they were planning on selling the business, while another reported having an energy audit carried out over 12 years ago but said this had been carried out by an organisation in an attempt to get them to switch supplier. One of the restaurateurs had themselves conducted a form of energy audit; a retired electrician friend had helped her switch off all the electrical appliances and then turned them on one at a time to see how much energy each used.

Energy Use

Types of energy and meters

Many of the organisations were using both electricity and gas, although a small number were only using electricity. All the electricity meters, but only one of the gas meters, were smart/advanced electricity meter⁸. Most businesses in the sample had a single meter for each energy type. No examples of sub-metering were recorded although there were some examples of multiple meters, usually for historical reasons. None of the sites were generating energy themselves.

A small number of the sites were supplementing their heating with other forms of energy; the picture framer had a log burning stove and used off-cuts from his work as fuel; the hardware store sold paraffin and paraffin heaters and used this as a form of heating. One of the restaurants had open fires but these were mainly for aesthetic reasons.

Energy intensity and main uses of energy

The sample included an equal number of higher and lower energy intensity businesses based on the type of operations taking place and the range of equipment being used.

Six of the 10 case study sites provided information about their energy consumption based on recent bills. None had a record of their exact annual consumption available and estimates were arrived at based on the period each bill covered and participants' views about how typical this was. Estimates ranged from 18,000 kWh for one of the retail outlets to approximately 130,000 kWh (for the hotel with restaurant which was closed over the winter although the family still lived on site).

Examples are given in Table 2 of the types of equipment in use across the sample. The list obscures the range of uses of energy. For example, the restaurants were typically using a wide variety of food and drink preparation equipment including a number of fridges and freezers. In contrast, many of the 'low' energy consumers, such as the florist, were mainly using lighting along with some form of heating in the winter.

⁸ For ease of reference, the term 'smart meter' is used to refer to both 'advanced' and SMETS compliant meters in this report unless otherwise specified (please see Background, p1 for further details).

Table 2: Main uses of energy	
Food and drink preparation	ovens, hobs, grills, salamander grills, griddles, electric fryers, deep fat fryers, microwaves, slicing/chopping machines, kettles, coffee machines, toasters, food mixers and blenders, water baths
Cooling	fridges, freezers, air conditioning, drink/beer coolers, extractor units, free standing fans, ice machines
Heating	boilers, gas fires and heaters, fan heaters, air conditioning, log stoves, immersion heaters, paraffin heaters, storage heaters
Washing/cleaning	dishwashers, glass washers, washing machines, tumble dryers, electric showers, hand dryers
Lighting	LEDs, halogen bulbs, spot lights, fluorescent tubes (some low energy), incandescent bulbs
IT	CCTV, TVs, computers, tills, photocopiers, printers, audio visual equipment, servers
Specialist equipment	compressors, ramps, hair dryers, clippers, straighteners, showers, CNC cutters, optical testing equipment, soldering irons, key cutters, hydroponic herb garden with auto watering/lighting, irons, dry cleaning machines, steam cabinet, treadmills

Variation in energy consumption

Participants assumed that consumption patterns were largely driven by their trading hours and volumes (which varied considerably across the sample); they typically felt that any seasonal variation was determined largely by the need for heating and additional lighting during the winter months.

We are pretty steady throughout the day not seeing much seasonal variation, quite consistent throughout the year. The energy goes up a bit in the winter because of the heating. (C3/4; hair salon; DM)

Energy as a proportion of total operating costs

Perceptions as to what proportion of their total costs was taken up by energy varied across the sample. It should be noted that most participants did not have a clear idea of the actual proportion of their costs that was taken up by energy but instead tended to take the view that they needed to adopt a careful approach to running their business, probably because many of them were operating on relatively low margins. Although perceptions correlated to a degree with whether the business had been classed as a higher or lower energy consumer, there was some variation:

- some of the businesses classed as high energy consumers described their energy costs as a medium or small proportion of their operating costs; one business had only been operating for a few months and the owner had yet to see what his energy costs were likely to be
- some of the businesses classed as lower energy consumers described their energy costs as a high or medium proportion of their operating costs.

Importance attached to reducing energy consumption

Despite differences in perceptions of energy as a proportion of operating costs, most of the organisations rated the importance of reducing their energy consumption as 'high'.

Although this was often explained in terms of the impact of energy bills on costs and profit margins, this was also probably driven by the fact that most organisations would not want to admit that reducing energy consumption was considered a low priority; in other words, they may have been giving what they considered to be the 'correct' answer.

It's a high priority because I try to save money on everything as a matter of course. [] We have very low energy usage and are very careful with what we use. (C3/4; optician; DM)

Perceived level of control over energy use

When it came to the degree of control they felt they had over their energy consumption, many participants felt this was limited because they had little choice in the processes and equipment they used. They tended to have a relatively simplistic view of how to reduce their energy consumption, namely to turn off and/or turn down. However, they also felt that this was difficult as they needed to use all or most items of equipment at current levels in order to run the business. As a result, they often felt they lacked control over energy use and unable to take effective action.

None, basically. If something is turned on it's because it needs to be used for running the business. I couldn't turn lights off whilst we are open or anything. Also if you turn something like the fryer off, it takes twice as much energy to get it going again. (C3/4; repair garage; DM)

Interestingly, the sole traders in the sample not only attached a lower importance to saving energy because it was such a small part of their costs, but they also felt that they were largely in control of their energy precisely because they could turn things off if they felt this was necessary.

Decision Makers and Key Influencers: Internal Actors

An internal actor is anyone employed within the organisation who may influence energy management.

I am a director of the company, my main responsibility is guiding the business and I'm responsible for all purchasing for the business. I also work in the shop. I am the sole decision maker for energy management and usage in the company and I am responsible for all facilities management. (C3/4; cycle shop; DM)

Role of decision maker

The main, and often only, decision makers described themselves variously as owners, directors, partners, managing directors and shareholders who had responsibility for just about all aspects of running the business. In some instances, the main decision maker might have been supported by other partners, directors etc. and occasionally by other family members.

I am a partner of the business, my role covers everything really, the day to day running of the business, etc. (C3/4; restaurant; DM)

Implementers and users

The individuals responsible for decision making were also largely the ones who implemented the decisions as well as being key energy users. In most cases, where there were staff, those staff were users of energy but not involved in decision making.

Energy Management Expertise

It was clear from the case study visits that decision makers typically lacked any expertise in relation to energy management; there was also a lack of awareness of where to turn for the necessary help as well as a reluctance to do so (see below).

Decision Makers and Key Influencers: External Actors

An external actor is anyone not employed within the organisation who may influence energy management.

Energy supplier

Apart from the occasional recall of bill inserts, there was little evidence of energy suppliers attempting to engage with these small organisations. Despite having instigated the switch to smart meters for most of the organisations in the sample, the energy suppliers concerned had made no discernible effort to encourage their customers to use the smart meters to better manage their energy use.

Energy consultants

A number of the businesses had been approached by and/or used the services of energy brokers to find the most cost effective tariffs/suppliers with varying degrees of success. There was no evidence energy consultants being used to provide energy efficiency advice.

Trade and professional bodies

There was very limited membership of trade associations or professional bodies, and almost no awareness or reference to such organisations as a possible source of information or advice.

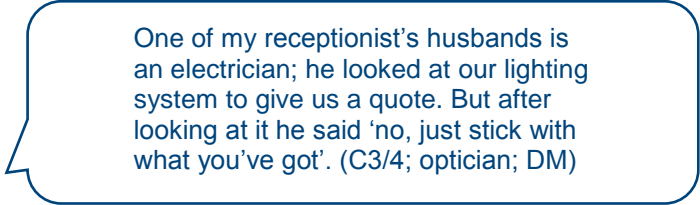
Landlords

One of the tenants described how their landlord had agreed to undertake some energy efficiency improvements in their property before they moved in. Otherwise, there was little evidence that their landlords were involved in encouraging the tenants in the sample to be energy efficient.

When we first moved in, we had a discussion about what was here and how the building was put together. It's got a big folding door, but we have put up a partition with a door in front of that, which has three inches of fibreglass insulation. The landlord did that for us when we moved in as we were concerned about heat loss through the door. The building used to be heated by an old gas heater, so the landlord put in a new combi-boiler and new radiators when we moved in 2011. (C3/4; electronic repair shop; DM)

Other influencers

There was heavy reliance on family members, friends and trusted local tradespeople for information, advice and for repairs and installation work. One of the restaurant owners visited trade shows aimed at the catering and hospitality sector where he had found useful information but this was an exception.



One of my receptionist's husbands is an electrician; he looked at our lighting system to give us a quote. But after looking at it he said 'no, just stick with what you've got'. (C3/4; optician; DM)

Energy Management

‘Energy management’ is used in this report to cover the range of activities that organisations were found to be using to control energy costs, including energy procurement, installation of energy efficiency measures and equipment, control systems and the use of smart meter data to monitor performance. This chapter considers the energy efficiency culture found within the small customer facing (cluster 3 and 4) independents in the sample, along with the range of energy efficiency measures that had been adopted. The factors that were driving energy efficiency, the potential triggers and the barriers to (greater) efficiency are also set out.

These issues were addressed on both an unprompted and prompted basis using a list of items derived from the context map developed as part of the research framework (see Non-Domestic Smart Metering Early Learning Research reports: Main Report). The findings reflect what was reported during the interviews but should be approached with caution as they may not give a full picture of what was being done or why.

Culture of Energy Efficiency

The size of the cluster 3/4 organisations meant that the businesses had few members of staff and the owners were integral to the day-to-day running of **all** aspects of the business, including energy management. Partly for this reason, decision makers typically demonstrated little interest in, or engagement with, energy use beyond expressing concerns about the size of their bills. There was a lack of any proactive, on-going energy management; instead the businesses reacted to events. This was illustrated by the fact that they rarely had service contracts in place and they would typically wait until equipment broke down and was uneconomical to repair before replacing it.

Energy did not appear to be managed as such, other than on a reactive basis. For example, the attitude of the hotelier was summed up by his approach to his bills. He was unsure how frequently he paid them or the amount paid; and seemed to

[Looking at recent bills at researcher's request] I try not to look at them!
[Reacting to the size of the bill] This is ridiculous, that's why I say I try not to look at them. This is showing September to December - I mean when we're closed - and that's 891 quid! (C3/4; hotel; DM)

prefer not knowing.

This culture was not just found among cluster 3/4 organisations but among most of the small organisations taking part in the research irrespective of their cluster they were from.

Energy Efficient Measures

Although reducing consumption was important to nearly all the sample, in most cases, they were not taking any steps to try and establish how they could do this. A notable exception was the owner of one of the restaurants.

Working with her electrician, she had attempted to carry out a form of energy audit by systematically turning off all of the electric appliances and then turning them on one at a time. This had allowed her to identify that the beer cooler and pumps used a lot of electricity. She stopped selling draught beer, replacing it with cans of beer that were kept in a fridge, which was cheaper to run.

Before I had the smart meter I turned all the electric off everywhere because obviously I can disconnect all the building and the amount of electricity that was whizzing round - I thought, 'that's crazy'. I do checks. (C3/4; restaurant; DM)

During the case study visits, decision makers were prompted for various things they could look to change or invest in. Apart from monitoring their bills and occasionally checking to see if there were cheaper suppliers and/or tariffs, participants were often doing very little other than changing (some) of their light fittings and/or bulbs for low energy ones. One of the reasons cited by several participants was that they 'knew' what accounted for their energy consumption, it was largely 'common sense' and they had 'little option' but to continue using energy in the same way as their business operations required it. Nevertheless, across the sample, decision makers described a variety of actions they had taken to try and make their businesses more energy efficient.

A number of the steps had been carried out over a period of time (sometimes years) and energy efficiency was often not the primary motivation; for example, action had been taken as part of general maintenance or where equipment had broken down. Where improvements were being implemented, they were often being done gradually, presumably for financial reasons. Furthermore, some basic energy efficiency measures had either not been done or been poorly done e.g. poorly insulated hot water tanks. Even where participants knew they had old and inefficient systems they had not always taken action.

The other thing I could do which I do know is, my boilers are old and boilers now are much more efficient. But having said that, my plumber can fix these boilers, I can keep them going. Some of the new ones once they've gone, they've gone, that's it. So [the plumber] said, 'keep it'. I know he's not paying the gas bills but I don't know how much difference it would make. If I knew how much difference it would make, you know if it was like 50% or 100% more efficient, it might be worth thinking about it. But it would be expensive. (C3/4; hotel; DM)

The various actions have been grouped into two broad categories: things organisations could change and things they could invest in.

Things that could be changed

- **Tariff and/or supplier⁹**: a number of the businesses had looked to see if they could get better rates by changing supplier but, as many were deterred from this due to previous negative experiences (see Barriers, p24). For this reason, another common strategy was to remain with the same supplier but to try to negotiate the 'best' rates.
- **Energy source e.g. switch from electricity to gas**: in most cases, switching energy source had not been considered or considered and rejected as not feasible. The hairdresser had chosen to switch from gas to electricity while one of the restaurants had switched from a gas to an electric induction hob; they hoped this would result in a net energy saving as the induction hob only consumed energy when it was in use whereas the gas hob was on all the time. They had also noticed that since they had switched hobs they did not have to use the extraction unit to keep the kitchen temperature at a comfortable level.
- **The things produced or sold**: again, this was not something most businesses had considered and when asked about it, was largely rejected. A couple of the restaurants in the sample had taken this into consideration. As noted above, one had recently stopped selling draught beer and was now selling beer in cans which enabled them to replace a cooler with a fridge which was cheaper to run. Another took energy efficiency into account when planning menus.
- **Timing; e.g. to take advantage of E7 type tariffs¹⁰**: typically, participants felt that their use of energy was largely driven by their business hours. Those businesses that were on an E7 type tariff did not appear to be taking advantage of it.
- **Production processes e.g. change the timings of the heating system**: any actions here tended to consist of manually turning things down or off during less busy periods. The chef of the hotel outlined how food was plated and then microwaved just before being served to avoid the need for warming ovens or infrared lamps. They also used to launder all the guest linen in-house but they now hired their bed linen on a contract which included the laundry as this was cheaper. They continued to launder towels and pillow cases which were changed every day; they had reduced the number of pillows per bed which had reduced the number of pillow cases to launder.
- **Behaviour e.g. incentivise and/or train staff and/or customers to use energy more efficiently**: although this was described as a common method of trying to manage consumption, there were few, if any, examples of it happening. For example, in the case of the hotelier, the extent of staff involvement was to turn off radiators in empty guest rooms. This was something he seemed to monitor, albeit in an ad hoc way. He had noticed that when staff were cleaning rooms they left the bathroom lights on (which activates the extractor fans) until they had finished cleaning all the rooms because they would vacuum all the rooms in one go. He had asked them not to do this.

⁹ Strictly speaking, reviewing tariff and/or supplier is not an energy efficiency action but a cost saving action however it is included here as it was reported to be something many organisations were doing. Indeed, the primary motivation for any energy efficiency was to try and reduce energy costs (see Key Motivations).

¹⁰ Economy 7 type tariffs provide cheap off-peak electricity during the night.

This was confirmed by the owner's wife. In addition, she said she had prepared a laminated list of tasks which included things like switching off everything, but when the researcher asked to see a copy, she was unable to find one and suggested the staff probably relied mainly on memory. Where customers (guests) were using energy, attitudes and efforts to involve them in conserving energy varied but were limited. The owner of one of the restaurants with rooms spoke about encouraging guests to reuse towels.

Things that could be invested in

- **New and/or refurbished premises:** although there were examples of premises being refurbished as part of on-going maintenance (see Other Drivers, p22), including investment in measures such as double glazing some years previously, there were no examples of organisations seeking to refurbish their premises in the same way that, for example, cluster 1 organisations (higher energy consuming chains) were doing.
- **Improved building insulation:** a number of organisations in the sample had looked to insulate roof spaces. One of the restaurateurs was gradually replacing single glazed windows with double glazing while another was in the process of installing under-floor insulation; one of the convenience stores had implemented a number of actions as illustrated in the quote.
- **New and/or refurbished equipment:** there was some evidence that energy efficiency was taken into account when equipment was replaced. The convenience store referred to above had replaced some of its open fridges for ones with doors. However, factors other than energy efficiency often took precedence.
- **Servicing existing equipment:** in most instances, equipment was not being serviced on a regular basis and anything that was being done was carried out in-house. More specialist equipment was sometimes being serviced regularly as were certain items in at least one of the restaurants.

We had the windows removed in the shop for more shelf space, we had the roof space insulated, and had wooden slating installed on the roof to keep the heat in. We also have a porch with two sets of doors to use as an air trap. We were going to upgrade to automatic doors but we put a hold on that after the flood. (C3/4; convenience store; DM)

Well I look for the energy rating first, you know, if it's A, B, C, D and I usually go for the best one. It doesn't always pay to buy the cheapest. I mean some of the cheap ones have got good ratings so I always look at that. (C3/4; restaurant; DM)

We need to buy some new refrigeration for the kitchen this year and if I'm honest, it will be on price as opposed to efficiency purely because there can be a massive gap. I've just been doing a price comparison for a three door under-counter refrigeration unit and the best energy efficient ones are around £4,000 whereas I can buy one that's not as energy efficient for £750. We just don't have the capital to buy a Rolls you know what I mean? (C3/4; restaurant; DM)

- **Improved heating and/or cooling:** one of the retailers had installed a new boiler five years ago and believed it was a more

All of my optician's equipment is serviced regularly. (C3/4; optician; Royce when all I can afford is a Ford, DM)

energy efficient model (he referred to it as an Eco Save boiler); this was prompted by the old boiler breaking down. One of the bike shops was in the middle of upgrading their storage heaters. As well as investing in fridges with doors, the convenience store had had the cooling units from their fridges and freezers moved outside to combat over-heating in the store.

- **Improved lighting systems:** many of the businesses were in the process of changing their lighting to more energy efficient forms which meant they often had a mix of lighting. Others were yet to be convinced of the benefits of LED lights. A retailer with a very old lighting system had experienced difficulty finding replacement bulbs and had asked a lighting company to look at his lighting system two or three years ago. They told him about LED

We have slowly been replacing the light fittings with energy saving bulbs, but we're a long way from finished. [] We also have outdoor lighting that runs down the front of the property. It used to be coach lights outside and spotlights on the signage but we had a lighting specialist come in and replace everything with two lights on the signs which he said use less electricity. I haven't got a clue what they are. They're like two big spotlights and there's an on/off switch in the porch. [] At the back we have halogen security lights on a sensor, but the newest one at the back door is energy efficient. [] I have done things like putting a timer switch on the lights in guest corridors, which gives them two or three minutes to get to their rooms. There is also a motion sensor so it won't turn off if there is someone there. (C3/4; restaurant: DM)

lighting which he experimented with but he did not feel he was getting enough 'spotlight' on the display items so he did not upgrade any of the other lights.

- **Micro-generation e.g. solar panels: there were no instances of organisations investing in micro-generation.** Various reasons were given:

- a tenant did not own the property and there was no roof that 'belonged' to the business as there were flats above the shop
- being nervous about investing in a new technology
- a perception that their building was not suitable
- an assumption that there will be a long payback period
- on aesthetic grounds

I would love to have solar panels, but where am I going to fit them? I haven't got a rooftop where I could put solar panels. (C3/4; laundrette; DM)

And again I thought, 'no, I'm quite happy'. I prefer the gas, it's easier and I know it works. That's the reason I didn't do it. (C3/4; hotel; DM)

- a perception that it is no longer worth doing because of the decrease in the feed-in tariffs
- planning restrictions.

Now the government subsidies have dried up and the tariffs they pay have dropped, it's not worth it. A few years ago I think I would have made money from solar panels feeding electricity back into the grid, but the amount you get now has dropped so it's not worth it. (C3/4; picture framer; DM)

I don't think we would be allowed to have solar panels. The council want all of the shop fronts refurbished so they look Victorian, so I don't think they'd like that. (C3/4; optician; DM)

Irrespective of which actions they had taken, participants were unable to establish what impact these had had on their energy consumption or costs.

I wanted to have my gas and electric from the same supplier. It makes life a bit easier. I can't remember if we saved any money. (C3/4; optician; DM)

I've not had a chance to sit down and look at the figures since we got the induction hob and convection oven, as they were installed in March and I'd need to look at the year's bill compared to last year. But I'd expect my gas usage to have reduced significantly and hopefully the electricity usage will go up, but not as much as the gas has dropped. (C3/4; restaurant; DM)

I have replaced the bulbs in all of the spotlights with energy saving ones. They are bayonet fittings so LED's would be better still, but it's the cost of having them installed compared to what I'd save. I haven't looked at the figures on that to see if it would be worth it. I replaced the bulbs as each one blew so I didn't see a noticeable change in usage. (C3/4; florist; DM)

Key Motivations

The term **key motivations** is used to refer to the key internal motivating factors behind an organisation's energy efficiency efforts. **Other drivers** is used to refer to any other influence on energy management activity. **Barriers** refers to anything that could make it difficult for an organisation to become (more) energy efficient. **External factors**¹¹ could also have an impact on approaches to energy management. The relationship between these various factors in cluster 3/4 are summarised in the pathway summary map

¹¹ A number of external factors, such as climate change, energy prices, company reputation, etc. were relevant to how an organisation manages its energy. In some cases, these factors motivated organisations to become more energy efficient (e.g. compliance with government policy initiatives where applicable) or were a driver/trigger (e.g. increases in energy prices) but they could also be a barrier (e.g. planning restrictions).

Figure 2, p35). The same key motivations were found to be operating across the organisations within cluster 3/4.

- The single over-riding motivation among cluster 3/4 organisations for reducing their energy consumption was **to reduce their costs** and thereby increase their profits.
- Several of the businesses spoke about the impact of external factors arising from the fact they operated in very **competitive sectors with a resulting pressure on their profit margins** but there was little evidence that this had resulted in efforts to make them more energy efficient; indeed, if anything, this was a barrier to action. For example, the owner of one of the bike shops spoke about the challenges of running a retail business since the advent of the internet which has put a considerable squeeze on margins. This had meant he had not been able to afford to make investments in the premises to date.
- Participants often spoke about the importance of **trying to do one's bit in terms of CO₂ emissions and climate change**, and **to be seen by customers as a responsible organisation**. This seemed to reflect the owners' personal values. However, with one or two exceptions (such as a restaurateur who had chosen his energy supplier and tariff in part because it was based on a high proportion of renewable energy), there was nothing to suggest that the businesses were actively managing their energy primarily to reduce their carbon footprint. For example, the owner of the laundrette was very keen to install solar panels and was frustrated that, as a tenant, she felt unable to do this. As the quote illustrates, while solar panels were seen as environmentally friendly, her main motivation was lower costs and higher returns.

I think they're more environmentally friendly and I'd like to get some money back as well if I could! (Laughs). And at least my electric would be paid for. It's something I'm very keen on because I think it would really benefit a business like myself. (C3/4; laundrette; DM)

Even where a pro-environment positioning was important to a business, financial considerations could prevent energy efficiency measures being undertaken. The owner of one of the cycle shops described reducing CO₂ emissions and being seen as a responsible organisation as very important partly because he felt that anyone who was a keen cyclist would also be very concerned about the environment. Although he had plans for a major refurbishment, he currently lacked the funds to undertake the work.

To reduce our costs – 100 per cent. CO₂ emissions absolutely. Definitely very responsible. (C3/4; cycle shop; DM)

Other Drivers

There were relatively few other drivers for cluster 3/4 businesses and only one of these appeared to characterise this cluster in comparison with other clusters (see

Figure 2, p35 for a summary).

Drivers that characterised cluster 3/4 organisations

- **Third party recommendations:** the recommendations of friends who were local tradespeople were sometimes a trigger for action. In contrast, there was a mistrust of specialist energy advisors (see below under Barriers).

My friend is an electrician and he said, 'come on, we'll do a test'. So I've just changed the lighting in here, I've had these [points to LED spotlights] put in. They use a lot, lot less. [] He's [electrician friend] very energy efficient and he'll say to me, 'oh, you can do without that in here and you could do without this and cut that out'. (C3/4; restaurant; DM)

Drivers that applied to cluster 3/4 organisations, but also to other clusters

There were three drivers that were common to organisations in all or most clusters.

- **Increases in energy prices and contract renewal:** increases in costs over recent years meant that energy prices were a major concern for many of the businesses and some of them had changed supplier in an attempt to lower their energy bills. However, several of the businesses spoke about their negative experiences when they had previously switched supplier and, for them, this was more of a barrier than a trigger (see Barriers, p24).
- **Moving or refurbishing premises:** many of the businesses in the sample had been operating from their current premises for several years and there were few examples of premises being refurbished as a consequence of a business moving. In some cases, they may not have undertaken any refurbishment for some time. Nevertheless, a number of participants described various refurbishments that had been carried out as part of the

It is a high priority for us to save energy. The cost of energy has practically quadrupled over the last four, five, ten years. It is becoming a big issue for us to manage that and get the best deals possible for our electricity and gas. (C3/4; restaurant; DM)

If my room price had gone up with my electricity and gas price, I'd be charging about £300 instead of £90 to £100. So it's become a big part of it and it's become something that you can't really control either. (C3/4; hotel; DM)

Well obviously everything would be insulated, all new windows, all new super thick glass, insulation glass, the roof would all be properly lagged, we'd be changing to a new style possibly of solar panels and yeah, just make sure that from the base up if we were changing something and it was getting to a more sustainable future. [] Yes we had plans drawn up and we're just going through the actual costings, we've had the initial costings done and then we're speaking with the various companies to see what they could supply. (C3/4; cycle shop; DM)

on-going maintenance of their premises and the electronic repairers outlined how their landlord had made changes to their building prior to the lease commencing (see Landlords, p14). In some cases, businesses were planning to undertake refurbishment work at some point in the future; for example, the cycle shop referred to above was in a poor state of repair and the owner had had plans drawn-up for refurbishing the building which included making it more energy efficient. However, he needed to attract financial support before he could progress the work.

We've moved a few times, lastly in 2005, but we didn't take much notice of energy management; there was a better state of the economy then. (C3/4; restaurant; DM)

- **Equipment refurbishment/renewal:** items of equipment were generally only replaced if they broke down and it was not economical to repair them. While participants often said that they would take into account the energy efficiency ratings when choosing new items of equipment, other factors typically took priority.

Barriers

See

Figure 2, p35 for a summary of the barriers found to be operating in cluster 3/4. While there were relatively few 'triggers', there were a large number of potential barriers. With one possible exception, these were shared with other organisations from across the six clusters, especially other smaller businesses and businesses that were not using their smart meter data.

I would look more to the temperature control part of it reaching a certain limit [i.e. the speed with which an oven reaches operating temperature] rather than thinking, 'oh it's going to save me money'. (C3/4; hotel; I)

Barriers that applied to cluster 3/4 organisations, but also to other clusters

Only one barrier appeared to apply, in particular, to cluster 3/4 (although it is probably not unique to this cluster and may apply, at least in some degree, to smaller organisations in other clusters):

- **Experiences of energy contracts and switching supplier** (see Footnote 9; p18): a number of decision makers spoke about how they had switched supplier on previous occasions only to feel their energy costs had increased rather than come down. As previously noted, many of them therefore took the view they were better off staying with their current provider and trying to negotiate the best rates at contract renewal. This attitude is very similar to that of many domestic customers; indeed, the attitudes of the decision makers may have been influenced as much by their own experiences as domestic consumers as much as they were by their business experiences.

[We switched] three years ago with negligible savings. I was tricked into switching but when I complained they reviewed the call and said they hadn't done anything wrong. I now won't do anything like that over the phone. (C3/4; picture framer; DM)

Common barriers

All other barriers were found across all the clusters:

- **Staff compliance:** all those organisations in the sample that had staff relied on them to use energy efficiently and, at the same time, they acknowledged that this was an on-going challenge. None of the organisations had a formal policy relating to staff use of energy, instead there was an expectation that staff would use it wisely with verbal encouragement being used to encourage this. Nevertheless, staff compliance was often a barrier, although it is worth noting that this was not raised to the same extent that it was by some larger businesses, possibly because participants had fewer staff and a much more hands-on form of management.
- **Condition of buildings:** as previously noted (see Condition and management of buildings, p10) many of the organisations occupied buildings which posed challenges in terms of effective energy management and while some attempts had been made to address these, for many it was an on-going and unresolved challenge.
- **Buildings leased, not owned:** this only applied to the tenants in the sample. Various aspects about the lease agreement had an impact on the businesses' willingness to invest in energy efficiency measures including; the length of the lease, the need to get the landlords' agreement before certain measures could be taken, the requirement to return the premises as an empty shell and potentially, having to dismantle improvements/changes on leaving. This was one of the reasons, for example, that these organisations had not invested in micro-generation.

We don't have a policy specifically targeting our [commercial] tenants. (C3/4; laundrette; LL)

The extent to which landlords were engaging with their tenants about energy efficiency varied. For example, a local authority confirmed that they did not see themselves as having a role. A large, commercial landlord reported that their role in managing properties depended on the type of lease. Some 10 per cent were managed properties where the landlord provided all the maintenance and upkeep, down to changing the light bulbs. They also took ownership of energy procurement and accounted for this in the service charge. However, for most of their properties, their only involvement in energy was where they were paying for energy used in the common parts.

Nevertheless, even where the tenant was responsible for energy management, the landlord saw their role as facilitators, sharing expertise and know how, and were open to helping tenants achieve energy efficiency. However, they were currently focusing their efforts where they felt they could achieve the greatest savings, namely their multi-let properties. In contrast, their retail outlets, many of which were let to cluster 3/4 organisations, were not currently being targeted, in part because, in the landlord's opinion, energy efficiency was not valued by these tenants.

We haven't had that much interest from our retailers either. If they came to us and said, 'we'd like to' then... (C3/4; textile/art shop; LL)

- **Energy costs too small/ ROI not worthwhile or takes too long:** despite claiming that energy cost reduction was an important motivating factor in relation to energy management, two barriers mentioned during many interviews were firstly, the perception that energy costs were not high enough to make it worthwhile investing in energy efficiency and secondly, the

The returns on the investments aren't worthwhile. You know, you've got to think of how long you're going to be here for. (C3/4; hotel: DM)

returns on any such investment, therefore, would not be worth having or would take too long to materialise. Even where energy costs were perceived to be high, the inhibiting factor was the perceived cost of the investment and the length of the payback period. In weighing up any ROI, participants took into account how long they were planning on running the business and/or remaining in the property. This presented a further barrier for some as they were planning on retiring within the next 10 years or so.

- **Lack of information, time and expertise:** given that the decision makers were responsible for all aspects of managing and running their businesses, it was not surprising that they lacked information about, and expertise in, energy efficiency as well as

It's a time thing, whilst I am researching that, I could be doing other things. It goes to the bottom of the list if I am honest. (C3/4; hair salon; DM)

the time to acquire these. Linked to this was a perception that energy efficiency was just 'common sense'. For example, the hotelier claimed that he would know how to go about reducing consumption 'if he set his mind to it'; in reality, he was very disengaged and seemed to have limited awareness of the possibilities. Not only did he feel that the cost of making improvements would not result in any significant savings, he equated energy efficiency with colder rooms and water which would not be acceptable to guests.

- **Lack of funds/funding:** this was a constraining factor for many of the businesses within the sample and it explains why they had not undertaken more energy efficiency measures and why those things they had done, were often being introduced gradually. Several businesses had considered installing LED lighting but were put off by the current cost¹². The owner of the laundrette had enquired about business loans but said that interest rates were too high.

We have looked at LED lighting, but at the moment it's too cost prohibitive. We will have to wait for the costs to come down as we have a lot of lighting. (C3/4; cycle shop; DM)

- **Lack of reliable information about energy use and lack of awareness of smart meter data/ability to access it/knowledge about how to use it**

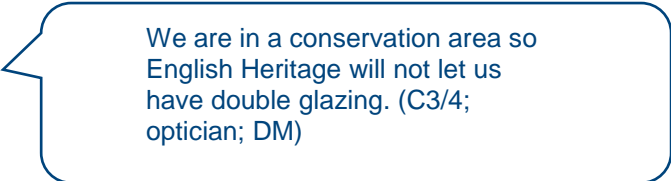
We have the smart meter but I don't really understand it. (C3/4; hair salon; DM)

compounded the situation (see Non-users of Smart Meter Data, p29).

- **Perceived lack of control over energy use/limited scope to reduce consumption:** under the circumstances, it was not surprising that many of the decision makers felt they had little control over their energy use and felt they had few opportunities to reduce it (see Perceived level of control over energy use, p13).

¹² It is worth noting that stage 1 took place during the summer of 2015 and LED lighting may have come down in price since then.

- **Scepticism about achievable savings:** this was often linked to respondents' negative experiences of switching together with an inherent distrust of external expertise (see below).
- **Distrust of advisors and reluctance to pay for advice:** one of the barriers to effective energy management was not knowing how to go about finding a service provider and concerns that even if they did find one, they would end up paying for advice which either related to actions they had already considered and rejected, or actions that would be costly to implement.
- **Planning restrictions:** a number of organisations in the sample spoke about the impact of planning restrictions.



We are in a conservation area so English Heritage will not let us have double glazing. (C3/4; optician; DM)

Smart Meters

Only one of the Cluster 3/4 organisations was using smart meter data to help them better manage their energy consumption. The main reason for not doing so was a lack of awareness that the data existed or how it could be used to support energy management. Some of the businesses were aware that such data was available but were unable to access it. When shown what information was available, reactions were mixed including some who were keen to access it. Levels of interest in added value services were more muted, especially if there was a cost attached to them.

Motivation for Installing

In most cases, the smart meters had been in place for up to one or two years, although one organisation said theirs was installed four or five years previously. For nearly all of the organisations in the sample the smart meters had been installed at the instigation of the energy provider. Typically, respondents reported that their supplier had explained that smart meters allowed for remote reading and accurate billing, but not that they could access their own data or how they could make use of it, or provided a means to access the data. Only one case study participant commented that she had received some information about using her smart meter data but she lacked the confidence to try and use it (see quote on the next page). At least a couple of the decision makers had only found out that they had a smart meter when they were contacted about the research.

Only one business, the laundrette, had requested a smart electricity meter because the premises were not staffed and the owner felt it would make it easier in terms of meter readings. The laundrette also had a smart gas meter but this had been installed at the instigation of the supplier. In two other cases, the meters were already installed when the business moved into the premises.

I think I was advised that they were coming to install it. I don't think I was given a choice in it. (C3/4; electronic repair shop; DM)

The smart meter was installed at the request of the supplier. I didn't think I had much choice about it. They only told me that it gave automatic meter readings, there was no information offered about using smart meter data and I wasn't aware that these features were available. (C3/4; cycle shop; DM)

Users of Smart Meter Data

Only one of the organisations in the sample was using their smart meter data to help them manage their energy and reduce their consumption. The decision maker had a wireless display in her office which she was checking on a daily basis. Unfortunately, the business declined to take part in a case study visit so we were unable to explore in any detail how the data was being used and what impact it had had.

I can monitor our energy usage in real time and identify how much individual items cost to run. (C3/4; motor factor; DM)

Non-users of Smart Meter Data

As noted above, most businesses were unaware that they could be accessing data from their smart meters. Some of the businesses seemed to be aware that their smart meter could provide them with data about their energy consumption, although none of them had been able to access or take advantage of it:

- the owner of one of the restaurants said that the smart meter data would enable her to work out her energy consumption room by room; she was aware that she could access the data from her tablet but she lacked the technical confidence to do so and was hoping her son would be able to help; while her energy provider had sent her information about how to use her smart meter, she had not engaged with this, again due to her lack of confidence
- the decision maker from the one of the convenience stores was aware that the smart meter provided information about usage patterns and assumed it also gave details of the consumption of individual items of equipment. However, she had not been provided with a means of accessing the data remotely and she assumed she would need to access the meter itself which was inaccessible and, she believed, complicated to use, so she had not tried

Well basically what they tell me is that it can tell me from each room what everything is doing and what usage it is. [Energy provider] keep sending me things of how to do it like and I'm absolutely useless, there's no point me telling you. [] So that's why my son said, 'well, it's worth us looking mum, you've got it there so let's see what we can do with it'. Now he's back in the country and living at home, he said, 'we'll sit and have a go at that'. [] I can go in here [points to tablet] and pull it all up on here somehow but I haven't got round to it yet. [] I'm not very clever on this. (C3/4; restaurant; DM)

I know it can do a lot more than I use it for. I know it is remotely read and you can see the peaks and troughs of your energy usage and how much energy specific equipment uses. The meter itself is installed in a cupboard which is quite inaccessible and I need to climb a ladder to look at it. I haven't gone on line to look at it (the data). I wasn't aware of the web portal to look at the data. I just look at the bill. I know there are a lot of options that it (the meter) can display but I don't really understand them as yet and it's difficult to physically get to the meter to work it out. (C3/4; convenience store; DM)

- one of the other restaurateurs had hoped the smart meter would display information about the savings he could make but, when he approached his energy provider he was told he could not access the data because the smart meter had been installed by a different energy company
- the café owner had managed on one occasion to access his data via his smart phone but since then, he has not been able to connect and has given up trying
- yet another of the restaurant owners had tried to access his smart meter data via his online account on the energy supplier's website. However, whenever he had tried clicking on the relevant link, it just buffered and did not open (he demonstrated this to the researcher during the case study visit).

They said we couldn't have an app because it wasn't their smart meter. So none of the companies that I've spoken to have been very forthcoming with how to use a smart meter and how it would benefit us. If anything, they all seem to shy away from the fact that we have a smart meter. C3/4; restaurant; DM)

I managed to connect to the data with the smart phone app once, but the next time I tried, it wouldn't connect to the data provider. I called the provider who told me to uninstall the app, reinstall it and try again. I just tried to do that and it still won't connect (C3/4; cafe; DM)

Reactions to Products and Services

Methods of accessing and using smart meter data

Given the lack of experience in accessing and using smart meter data, as part of the interview, participants were given some information about the type of information that can be accessed, possible ways of accessing it, as well as an indication of how this data could be used to reduce energy consumption (see Box 1).

Box 1: Information shared with participants about data from smart meters

Information from a smart meter can show how much energy you are using and what this is costing. This can be shown in real time, that is, how much energy you are currently using and what it is costing. It also allows you to see how much energy you have used and what it has cost over different time periods e.g. every 24 hours, every week, every month, every year. You can also compare consumption over different time periods e.g. how much the business used this month compared to last month.

Typically, this information can be displayed on a PC/laptop by logging on to a web-based portal. It can also be used to provide a bespoke report on energy use.

The data can be displayed in other ways, using other forms of technology – although these may not always be available at present. For example, it may also be possible to use

- a small visual display that can be positioned anywhere within the business, for example, where employees can see it
- a Smart phone app

Smart meter data can be used to see if consumption can be reduced. For example

- by identifying unnecessary energy use such as unoccupied areas that are lighted, heated or cooled
- heating coming on earlier than it needs to – or other significant energy spend occurring outside normal office hours

Reaction to this information was mixed; for example, while there was some interest in all the different methods of displaying the data, there was little to suggest that one method was preferable over another. A typical cross-section are summarised in Box 2.

Box 2: Different reactions to information about smart meter data

Restaurant with rooms

“That would be brilliant; it would help us track it for cash flow purposes. I could see where the peaks and troughs are and plan ahead for future bills. I could work out which were the most expensive things to run. For example I could then choose which oven is best to use to cook particular dishes.

All three [display methods] would be invaluable. Having a report would be great for us to file with our profit and loss and we can show a clearer usage, which would help us when we are buying energy. It would give us more information to shop around in the market place. Having a display in a place where the staff can see it, you can give the staff instructions on how to monitor things. I could show them how much we used last month and say, ‘well, we shouldn’t use any more this month, where are we spending?’ Having it on a smart phone app would mean I can monitor things when I am away.

It would help us save money, it’s a very practical tool, and we would definitely use it. I think I’d be confident using this information once I had training and read the literature.”

Café

“It would be pretty interesting. It would be useful to compare usage over different times. You could also see how much energy things are using. It would confirm to me where I suspect I’m saving and where I think I’m using a lot.

It sounds like a really good idea. I don’t think [the display method] would make a big difference for me though.

The most useful aspect would be turning things on and off so I can see how much energy everything uses. I’d be confident I could understand the data and know how to use it. The only thing that would put me off would be any costs like set-up fees.”

Florist

“It might not make the slightest difference to my use of energy. It might be interesting to look at though. I suppose for a high user of energy it would make them look at why their use was high and identify areas where they could make savings.

If I was more up on technical things, maybe I could use those [methods of display]. I just got a tablet last year so I’m always frightened to break things. I’d need someone to teach me how.

I don’t think it would be any use to me, but I can see how it could be useful to others. People will have timing clocks coming on too soon which is a waste of heating.

I wouldn’t be confident using the data. I’d have to get someone to do it for me or get someone to train me.”

Electronic Repairers

“It probably would be useful, but I collect my weekly consumption data manually anyway so it wouldn’t make a big difference to me. I already use it to ensure there is no large variation in our usage.

For me, probably not useful. I hate mobile phones and will only use them so my wife can get in touch. It might be a bit easier that I wouldn’t have to physically look at the meter, but it only takes me seconds to do manually and it’s a habit now. I don’t think I could gain any more insight to what I am already getting.

I find these kinds of things rather irrelevant in a lot of ways. For me it’s much easier and quicker to just go and look. I think the reasons a lot of things go wrong these days, people just take for granted what you are looking at on a screen. I work on the basis that you need to double check these things anyway.”

Added value services

The four products and services outlined in Box 4 (p42) were briefly explored with the case study organisations at stage 1 (but not in the depth interviews). The key findings were as follows:

- although the **power of attorney** service whereby an organisation could be automatically switched to a cheaper tariff when it becomes available could be seen as a way of avoiding interacting with brokers and energy providers, previous negative experiences were often transferred across; the fact that business customers were locked into contracts was also perceived as a barrier as switching mid-contract could result in charges
- participants often felt that **automated buildings performance evaluation** (a means of comparing a building's energy performance against itself help identify the extent to which energy is being used efficiently) and **pattern recognition** (using smart meter information to identify unusual patterns of consumption) were not appropriate for smaller businesses such as themselves
- in contrast, there was some interest in the idea of a 'smart plug' (a form of **device disaggregation** which indicates the electricity consumption per device.) as this seemed like something that was relevant to their business.

Device disaggregation, which is a terrible expression, but a range of technologies that allows you to understand the electrical consumption per device, that's good. Yeah, because we have so many devices. I mean I already have to have them all tested to check that they're safe, but to have smart plugs fitted that told me how much they consumed would be good as well. (C3/4; textile/art shop; DM)

Willingness to pay for added value services

While some of the ideas were of interest to some businesses, there was no appetite to pay for them.

Conclusions

Summary of Key Findings

Summary pathway maps

A summary pathway map was developed for cluster 3/4 to provide an overview of the factors and contexts that underpinned how these types of businesses were managing their energy (see Figure 1). The map needs interpreting with care as it is based on a small number of organisations.

The map displays a number of boxes that group together various factors that are involved in energy management. The four boxes shown within the central red box relate to those things that are internal to the organisation itself and include important organisational factors, the key motivations for trying to manage energy efficiently, the internal actors that have a role in energy management. The fourth box labelled Energy Management summarises how, if at all, the organisations were analysing their energy use, the energy saving actions that had been implemented and the extent to which the organisations had achieved energy savings and reductions in energy costs.

The boxes labelled Other Drivers and Barriers are shown at the top of the map inside a pink box. They include a mix of internal and external factors that influence energy management.

The yellow box at the bottom of the pathway map summarise things that are external to the organisation and is divided into External Actors that played some role in energy management, together with any particular Engagement Strategies that were being adopted. The External Context box outlines external factors that were relevant to how the organisations managed energy.

Factors that were common to all or most of the six clusters are shown in [square brackets] as they do not appear to differentiate between clusters. All other factors appear to discriminate between at least some of the clusters.

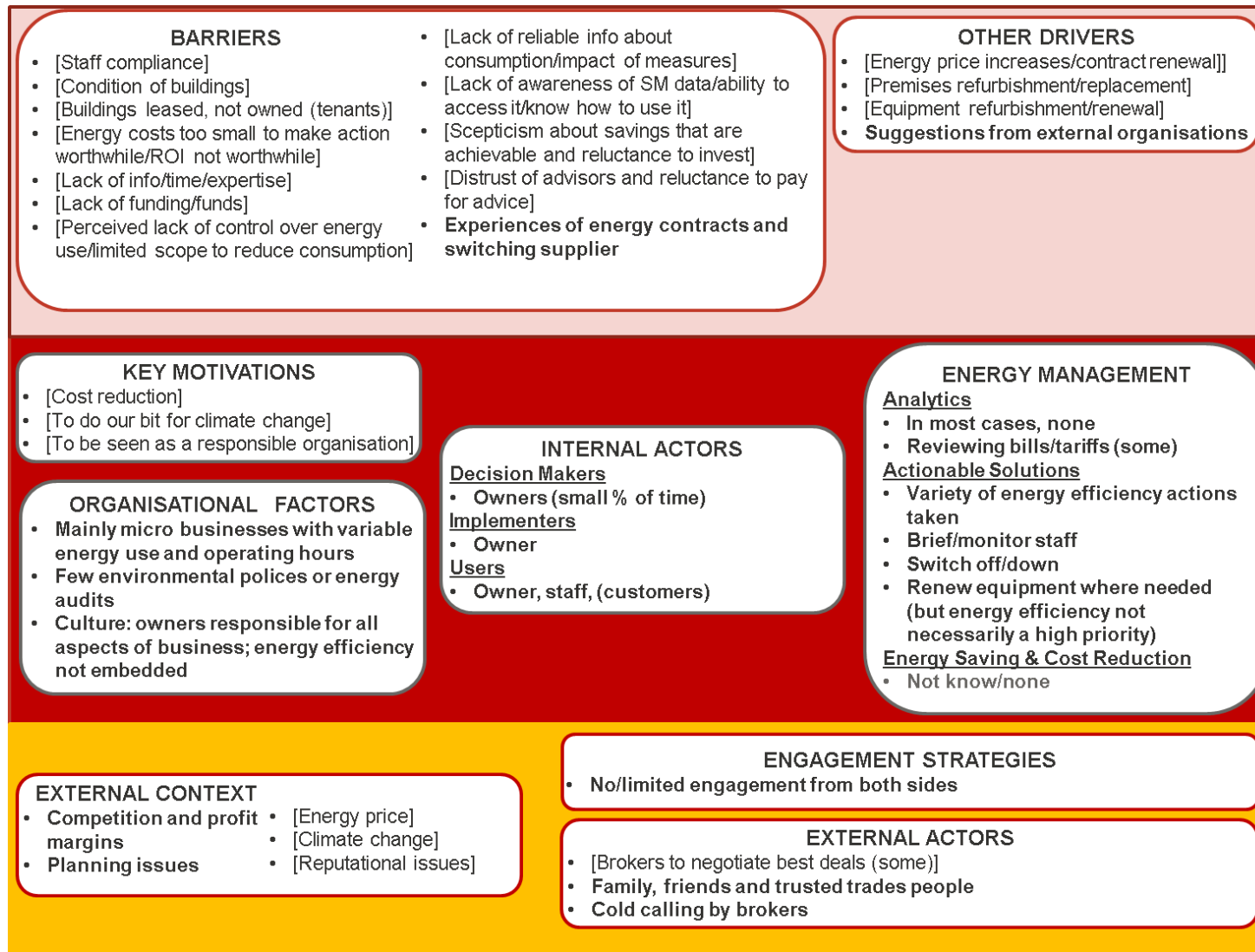


Figure 2: Summary pathway map for cluster 3/4

Cluster Specific Findings on Energy Use, Management and Associated Influences

The size of the cluster 3/4 organisations meant that the businesses had few members of staff and the owners were integral to the day-to-day running of all aspects of the business, including energy management. Partly for this reason, decision makers typically demonstrated little interest in, or engagement with, energy use beyond expressing concerns about the size of their bills. There was a lack of any proactive, on-going energy management; instead the businesses reacted to events. This was also true of many of the other smaller organisations taking part in the research among the other clusters.

Energy use and operating hours varied across the sample dependent on the nature of the business.

There were a number of factors relating to energy management that seemed to apply to this cluster. However, most of these were also found to apply to other organisations from other clusters especially small organisations that were not using smart meter data.

The owners were typically responsible for all aspects of running the business and adopted a 'hands on' approach; this meant they had little time to devote to, or interest in, energy management. Energy efficiency was not embedded within the organisational culture. For example, most did not have an environmental policy and had not had an energy audit.

They were typically operating on low margins and cost reduction was the over-riding driver of any energy management that went on. However, overall there were many more barriers than triggers to energy management.

Although reducing energy consumption was reported to be a priority, in reality this did not translate into action, in part because energy was perceived to be a relatively small proportion of their overheads and organisations were reluctant/unable to invest in energy efficiency measures; lack of funds/funding was a particular barrier.

Although some business owners claimed that they knew how to be energy efficient, this was often based on a simplistic model of turning equipment down/off. Indeed, many felt they had limited scope to control their energy use because they felt unable to turn items down/off as they were essential to the running of the business.

A lack of in-house expertise, coupled with a reluctance to engage with external 'experts', meant that organisations were often reliant on the advice of family, friends, and local tradespeople.

The research identified a single factor influencing energy management that applied, in particular, to this cluster. **Previous negative experience of switching suppliers/tariffs was a particular barrier.** Although not an energy efficiency action as such, reviewing and switching supplier/tariff where appropriate is an important aspect of energy management. Given that the primary motivation for any energy efficiency was to try and reduce energy costs, this reluctance to consider switching reflects a wider attitude within this cluster towards energy efficiency, namely that the negative aspects were perceived to outweigh the potential benefits.

Smart Meters

Only one of the businesses was using its smart meter data to help it better manage its energy. As with all other clusters, the main reason why organisations with smart meters were not accessing and using the data was a lack of awareness that this was possible. Where smart meters had been installed by the energy provider, respondents reported that the reason they gave for doing so was the benefit of having accurate and remotely read bills. With one exception, there was no evidence of energy providers or meter installers attempting to engage customers with the other benefits of smart meters. Indeed, organisations were generally unaware that there was data they could be accessing, let alone how it could be used to help with energy management. Where a decision maker was aware of the availability of smart meter data, they had been unable to access it. This was due to a combination of factors including a means of access not being provided or not working and a lack of confidence to work out how to access the data.

When shown what information was available and how it could be accessed, some of the businesses expressed interest in being able to do so, feeling it could help them better manage their consumption. However, there was little appetite for 'value added services' especially if these attracted a cost.

Research Implications

The Importance of Size and Energy Intensity

The findings indicate that attitudes and approaches to energy management were heavily influenced by the size of the organisations in cluster 3/4; there was some suggestion that energy intensity also made a difference.

All but two of the organisations in the sample were classed as either 'micro' or 'sole traders' which meant they had very few, if any, employees, and this had a pronounced impact on their approach to energy management; indeed, in most cases, energy was not being managed as such other than on a reactive basis.

The owners were responsible for all aspects of their businesses, both in terms of delivering the outputs (selling goods, providing services) and managing operations. They did not have the time or the inclination to focus on energy management more than was absolutely necessary nor did they have the staff to whom this could be delegated. They lacked the necessary expertise but were also reluctant to engage with external 'experts' other than trusted local tradespeople or family and friends. Given their size, they were not affected by various government initiatives relating to energy efficiency, such as CRC or ESOS.

One of the aims of the research, and underpinning the way the sample for cluster 3/4 was structured, was to explore whether organisations meeting the criteria were best considered as a single cluster or whether there were clear differences between the 'higher' and 'lower' energy consumers (based on the types of processes and equipment used), making two separate clusters.

While there was some suggestion that the more proactive organisations were the restaurants and cafés which had relatively more energy consuming processes and

equipment, this was not the case among some of the other 'higher' energy users, (such as the hotel with restaurant, the convenience stores or the hair salon).

Indeed, all organisations in cluster 3/4, irrespective of their energy intensity, tended to demonstrate a greater similarity with other small businesses in other clusters. Compared to the customer facing chains in clusters 1 and 5, and the schools in cluster 2, the smaller businesses tended to share a number of attitudes with domestic consumers (such as their reluctance to switch suppliers). As such, it appears to be best to treat this as a single cluster, albeit one in which it may prove easier to engage with those organisations that are more energy intensive.

Engaging Non-users

As noted, with one exception, organisations in the sample that had smart meters in place were not using the data to help manage their energy. The key learnings from the research about how to engage these organisations, as well as those organisations that have not yet had smart meters installed, are summarised below.

Once decision makers knew about the information that was available from their smart meters, they found this of interest. Not everyone was convinced that having access to the data would result in them managing their energy more efficiently, at least in part because they still lacked knowledge about what steps they could take that would be cost effective. Nevertheless, initial reactions suggested that some businesses could be encouraged to adopt a more proactive approach to energy management. This seemed to apply particularly to the more energy intensive operations that were more likely to perceive their energy costs to be a higher element of their overheads.

If the less energy intensive businesses are to be engaged, barriers that currently inhibit such engagement need to be overcome. Having access to smart meter data was, in itself, unlikely to trigger changes in behaviour as many of the organisations lacked the ability to translate the information into energy efficiency actions.

A common trigger for reviewing energy efficiency was when fitting out a site for the first time or as part of a rolling programme of refurbishment and this represents an opportunity in terms of prompting organisations to include energy efficiency as part of the specification (although these smaller organisations were not refurbishing very often). This was particularly the case with older buildings in need of upgrade. Likewise, energy contract renewal was a time when these organisations were more likely to think about energy management especially where this coincided with an increase in energy costs. Given the reluctance to switch suppliers, smaller organisations might be more receptive to energy efficiency advice as a way of managing energy costs provided this requires minimum investment costs.

One of the measures that organisations from other clusters have been adopting with considerable success (i.e. that has resulted in cost effective savings) was to switch to LED lighting. Although there was some evidence of this happening within cluster 3/4, it was not happening to the same extent and there seems to be opportunity for more businesses to adopt this measure. Not only do decision makers need to have it confirmed that LED lights consume significantly less energy, the other perceived barriers need to be overcome:

- that the investment can be recovered in a relatively short time

Conclusions

- that the quality of LED lighting has been greatly improved and, in many respects, is better than other forms of lighting currently being used by these organisations
- the life expectancy of LED lights is greater than other forms of lighting currently being used
- that the maintenance costs of LED lights are lower than other forms of lighting currently being used.

Organisations in this cluster were likely to pay attention to examples of other similar sized businesses achieving worthwhile savings. In the case of LED lighting, the experience of one of the cluster 5 (lower energy consuming chains, customer facing chains) organisations was relevant. Although classed as a chain, it was a micro-business with just two shops. The owner reported a 46% reduction in energy bills from switching much of his lighting to LEDs and the cost of the investment was recouped in less than three years while the expected lifespan of the LEDs was at least five years.

Appendices

Research Questions

- **How does the population of smaller non-domestic sites covered by the smart metering mandate use energy and make energy efficiency related decisions? How do these uses and decision-making processes vary according to key characteristics?**
- **In what ways do different types (i.e. clusters) of smaller non-domestic sites covered by the smart metering mandate interact with;**
 - **other key influencing actors (e.g. energy suppliers, facilities managers, landlords)?**
 - **other influences on energy management (e.g. energy prices, reputational and/or corporate social responsibility)?**
- **How does data from smart meters contribute or have the potential to contribute to improved energy management, energy efficiency and reduced energy consumption in smaller non-domestic sites? What are the barriers to improvements? How does this differ for different types of smaller non-domestic sites?**
- **Based on an understanding of the support, products and services being (or planned to be) provided to help increase awareness, what is the level of understanding and use of smart meter data within small-non domestic sites? What has been or is likely to be the take-up or response from non-domestic sites?**
- **What are the implications for maximising the benefits of smart meters (in smaller non-domestic sites)?**

Stimulus

Power of Attorney Service

- Cheap Energy Club is an existing 'power of attorney' service for domestic energy customers
- Subscribers enter data including their current supplier, previous consumption, etc.
- They are sent an email automatically once a cheaper deal becomes available
- Smart meters means that accurate consumption data could be used

Automated building performance evaluation

- Smart meter data can be used to compare the current energy use of your business premises with the energy use over time, taking into account weather related fluctuations. This can help identify the extent to which energy is being used efficiently
- Where this reveals that energy is being used less efficiently, the service could provide ideas and advice on what is causing this as well as suggestions for improvements
- By comparing a building's energy performance against itself overcomes the problems of comparing two different buildings
- For example, two hotels, one urban and one rural near to a lake, with a similar building fabric and number of rooms may have a large difference in heating requirements in winter and any benchmarking programme would struggle to account for this

Pattern recognition

- Pattern recognition technology can use smart meter information to identify, for example:
- Heating or cooling comes on too soon or switches off too late
- Boilers, or other heating components such as heat exchangers, are the wrong size for a building
- Building energy management systems have been manually overridden and not re-set
- Insights/recommendations can be sent to building managers and occupants; e.g.
"high gas and electricity consumption indicates that heating and cooling systems are working simultaneously"
"your building's lights are on all night"
"changing your air conditioning filters will pay back in approximately eight months"
"you should change your air-conditioning settings to X today due to the weather forecast"

Device disaggregation

- A range of technologies that allow you to understand the electricity consumption per device. For example, a smart plug that sits between the plug on the appliance and the socket
- This could inform you about items of equipment that are using the most energy, as

well as those using more energy than they should be, such as an air con unit that needs servicing

List of Reports

Non-Domestic Smart Metering Early Learning Research reports:

- Main Report
- Annex 1: Cluster 1 - Higher energy, customer facing chains
- Annex 2: Cluster 2 - Small Public Sector Sites (Schools)
- Annex 3: Cluster 3 & 4 - Small, customer facing independents
- Annex 4: Cluster 5 - Lower energy, customer facing chains
- Annex 5: Cluster 7 - Higher energy, employee only sites
- Annex 6: Cluster 8 – Offices
- Annex 7: Landlords & Tenants
- Technical Report

