Department for
Business, Energy
& Industrial Strategy

SMART METERING NON-DOMESTIC 'EARLY LEARNING' RESEARCH

Annex 1: Cluster 1 - Higher energy, customer facing chains

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School House, Norbury
Bishops Castle
Shropshire SY9 5EA
Phone: 020 8567 6974
www.creativeresearch.co.uk

Chiswick Gate
598-608 Chiswick High Road
London W4 5RT
Phone: 020 8742 2211
www.accent-mr.com/

Author: Dr. Steve Griggs, Creative Research

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The views expressed in this report are those of the authors, not necessarily those of the Department for Business, Energy & Industrial Strategy (nor do they reflect Government policy).

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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 premises.[1] This report focuses on Cluster 1 - a sample of higher energy consuming, customer facing chains.

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, p47.

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.

Method[2]

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.

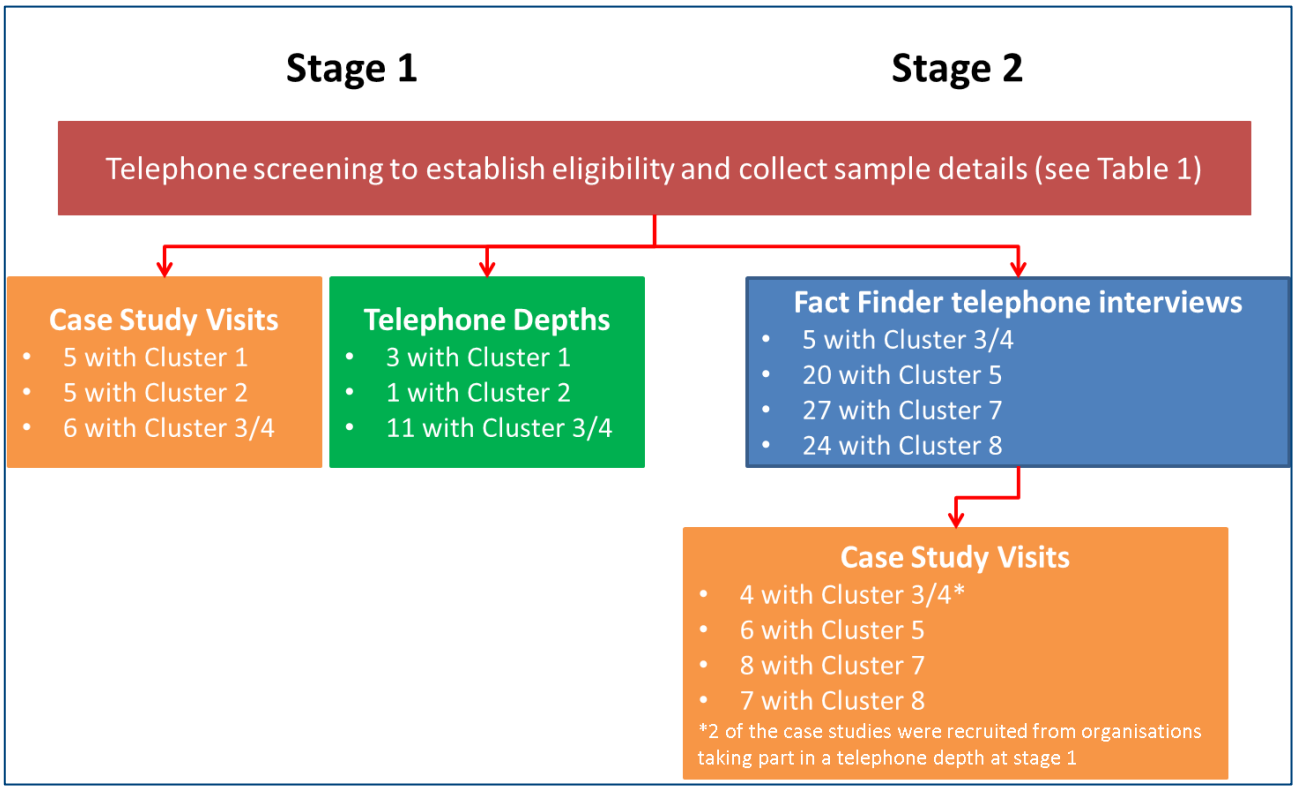


Figure 1: Flow chart of research method

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 3/4[4]. 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 8[5], 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 1 Sample

A total of eight organisations took part in the research. Five energy management decision makers took part in the case study visits and a further three took part in a telephone depth interview. A total of six other members of the case study organisations also participated in the case study visits: one additional energy management decision maker, three implementers of such decisions and two users of energy. Two further interviews were conducted with energy consultants for one of the case study organisations.

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.

A summary of the sample is provided in Table 1.

[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: 8, of which, five were case studies

Region			**Locus of control**		
East	-		Individual site	1	(1)
E Mids	1		Head office	7	(4)
London	-				
N East	1		**Tenure***		
N West	-		Owner occupier	5	(4)
S East	3	(2)	Tenant	2	(1)
S West	-		**Energy bills**		
W Mids	-		Paid direct	8	(5)
York & Humber	-		Included in rent	-	
Scotland	3	(3)	**Energy types**		
Wales	-		Electricity	8	(5)
Size of organisation (total employee number)			Gas	6	(3)
Sole trader	-		Other	-	
Micro (<10)	-		**Type of meter**		
Small (<50)	2	(2)	Smart/advanced electricity	7	(4)
Medium (<250)	-		Smart/advanced gas	3	(1)
Large (250+)	6	(3)	**Importance of reducing energy use**		
Number of sites			High	6	(4)
<100	3	(2)	Medium	2	(1)
>100	5	(3)	Low	-	

* One respondent taking part in a depth interview did not nominate a specific site as he was not sufficiently familiar with individual sites.

Most of the information in the table relates to a single case study site (the telephone depth interviews focused on a single site which then became the case study site where the participant agreed to take part in this element of the research). The exceptions are ‘size of organisation’, ‘number of sites’,’ and ‘the importance of reducing energy use’, which apply to the chain as a whole. The individual cells of the table show both the overall number of organisations in the cluster 1 sample and, in brackets, the number of these taking part as a case study.

Interpreting the Findings

The findings in this report provide insights into how different cluster 1 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 lower energy consuming, customer facing chains. 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 this cluster (or the other clusters). 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 higher energy consuming, customer facing chains, 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 the eight organisations from this cluster that took part in the research. Where findings only relate to one or more of the five organisations that also took part in a case study, this is indicated in the text.

Nature of Business

Business type

The sample included two coffee shop franchises, two pubs with restaurants (one also had guest rooms), two restaurants and two bakeries; one of these was a traditional bakers with two shops, and the other operated a chain of bakery shops with cafés.

Business size

Six of the organisations were large and two were small businesses (defined in terms of the number of employees), although the individual outlets were all small or micro[6]. The number of retail outlets in each chain (excluding head office and other non-customer facing units, such as warehouses) varied from just two to 5,500. Five of the organisations were chains with more than 100 outlets while the remainder had fewer outlets.

[6] Microbusinesses are defined as those that have <10 employees; small businesses have < 50 employees, medium businesses have 50 – 249 employees, large have 250+ employees

Business operating hours

Although the precise opening hours varied within the sample, most of the businesses were trading six or seven days a week including evenings.

Nature and Management of Buildings

Tenure

In most instances the outlet chosen as the focus of the research was owner occupied, and only a couple were in leased premises, although some of the chains also had other premises that were leased. One respondent taking part in a depth interview did not focus on a specific outlet as he was not sufficiently familiar with any of them. The tenants in the sample were responsible for paying their own energy bills[7].

Condition and management of buildings

The sites that were the focus of the case study visits and depth interviews were typically at least 30 to 40 years old or older. They often had a mix of older and more recently refurbished elements. For example, a pub with rooms comprised a converted 17th century coach house with the adjoining stable block converted to provide hotel rooms.

The buildings that were owner occupied often had offices or flats in addition to the public facing areas. These were sometimes used by the business itself (e.g. as offices or for staff accommodation) or were let out.

In a couple of cases, there was some evidence of buildings being maintained in a systematic way but there was no evidence of any formal buildings management in other case study sites. Most were not using any Building Management System (BMS).

Environmental policy and energy audit

A couple of the organisations in the sample reported that they had an environmental policy and another indicated that they had an informal policy. A similar number reported having had an energy audit carried out.

Energy Use

Types of energy and meters

Most of the organisations were using both electricity and gas; the two coffee shop franchises were using electricity only. In every case, there was a single meter for each type of energy. No instances of multiple or sub-metering were recorded. With the

[7] 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.

exception of one of the coffee shop franchises which had a traditional electricity meter, all of the organisations had a smart/advanced electricity meter[8]; three of the six organisations with gas also had a smart gas meter. None of the sites were generating energy themselves.

Energy intensity and main uses of energy

All of the organisations were involved in energy intensive operations, typically due to the fact they were using a large number of relatively small, but energy intensive, items of equipment. The case studies were asked to provide details of their annual energy consumption. This varied considerably from just 65,000kWh to 575,000 kWh.

The precise nature of the equipment being used varied from one site to the next with multiple items of equipment, such as several freezers and fridges, sometimes being used in a single site. The main uses of energy are summarised in Table 2.

Table 2: Main uses of energy

Food and drink preparation	coffee machines, grinders, blenders, microwaves, grills, char grills, pizza ovens, slow cook ovens, prover and retarder ovens, rotisserie ovens, thermal and normal convection ovens, pie makers, hobs, deep fat fryers, kettles
Cooling	fridges (open and closed), freezers, chiller cabinets, refrigerated sandwich preparation benches, ice machines, extraction units, remote beer cooling systems
Heating	air conditioning, electric heaters, boilers (heating and hot water), water boilers, electric door heaters
Washing/cleaning	dishwashers, glass washers, hand dryers, washing machines, gas powered air curtains (to keep insects out)
Lighting	mainly a mix of LEDs, fluorescent and halogen
IT	computers, tills, security systems, phone systems, music systems

Variation in energy consumption

Consumption patterns were said to largely reflect trading hours; within this, there may have been some variation by time of day (e.g. peaks at breakfast time, midday and early evenings for those serving meals) and by day of the week (e.g. Friday evenings, Saturdays and Sundays often represented busier periods). When it came to food preparation, energy consumption was not especially linked to seasonal weather patterns. Some seasonal variations due to heating requirements were reported although those sites where air conditioning was used to provide both heating and cooling may not have experienced marked seasonal differences.

[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).

Energy as a proportion of total operating costs

The small bakery chain considered that their energy represented a 'high' proportion of their total operating costs. This may be because the bakery was in operation from 0430 - 1900 every day of the year except Christmas Day and Boxing Day (although the shop was only open from 0600 – 1800).

The other organisations in the sample rated their energy costs as either 'medium' or 'small' relative to their overall operating costs. These ratings were arrived at in different ways, for example one of the restaurant chains said that across all their restaurants they were spending £15m a year on energy out of a total spend of £600m, which works out, on average, at 2.5 per cent. One of the pub chains did not have data for individual sites but they referred to a recent study carried out by the British Beer and Pub Association which detailed the various operating costs of pubs. For a food-led pub, this indicated that food and drink represented about 40 per cent of costs with wages accounting for a further 25 per cent. Although utility bills (which included water) were the third highest cost, it worked out at just over 4 per cent.

Importance attached to reducing energy consumption

All organisations in the sample rated the importance of reducing their energy consumption as either a 'high' or 'medium' priority as it had an impact on costs and profit margins.

Perceived level of control over energy use

The extent to which respondents felt in control of their energy consumption varied. Those who were more confident tended to take the view that control largely meant turning things on and off as necessary. Others spoke about having limited control, largely because they felt equipment needed to be on at certain times and there was little scope to change this. The greatest degree of control was expressed by the participants from one of the restaurant case studies, partly because staff were empowered to take steps to reduce consumption. At the same time, some settings were controlled centrally; staff could ask for these to be changed but they had to phone 'head office' and request it.

Decision Makers and Key Influencers: Internal Actors

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

Role of decision maker

Decision making was largely and, in some cases, exclusively, taking place at 'head office'; the main exception being the small bakery where there was no head office. Some of the participants had a background in, and experience of, energy management which was often indicated by their job titles (e.g. Energy Services Advisor, Head of Energy and Waste Management). Others were owners, partners or business managers who had a wider range of responsibilities with energy management being just part of their role. Although the sample was very small, this seemed to correlate with the business size and suggested that once a chain got to a certain size, there was a need for a dedicated energy manager.

The extent to which the decision maker was working as part of a wider team also tended to correlate with the overall size of the business. In some cases, different members of the team would provide expertise in relation to the supply side (procuring energy) and the demand side (managing energy use). For example, one of the respondents was the head of procurement with responsibility for procuring energy. He was also involved in helping to develop energy management strategies along with the head of retail and the social responsibility team. The participant from one of the restaurant chains was responsible for strategy and engagement with energy saving and worked with their finance team and an energy consultant to procure energy.

Participants may have had reporting requirements to line managers, and some decisions would be taken in consultation with owners or with approval of the board.

Implementers

The larger chains had regional managers who were responsible, amongst other things, for implementing energy management policy. Although the managers of individual outlets may have had responsibility for managing energy consumption, they typically had little direct control other than by managing the behaviour of their staff who were the main users of energy.

Users

Staff in the various outlets were the users of energy. The pub with rooms also had users of energy in the form of staying guests.

Energy Management Expertise

Organisations that employed dedicated energy managers had in-house expertise whereas those who did not would need to source external assistance although, in practice, there was little evidence of this happening beyond seeking the advice of local electricians or shop fitters (see below).

Degree of centralised control/standardisation of energy management

As previously noted, most of the organisations in the sample were classed as large businesses and operated a large number of sites. These organisations were more likely to be associated with centralised control and decision making which included budgeting and financial control arrangements.

In contrast, in the smaller organisations in the sample, both in terms of the total number of employees and outlets, there was less evidence of any form of centralised management. In many respects, the smallest business in the sample shared characteristics with the smaller businesses in other clusters. For example, the owner was the sole decision maker who worked extremely long hours and had very little time or opportunity to devote to energy management. For this organisation, there was no head office. One of the coffee shop franchises occupied something of a middle ground in that they were operating some 40 to 50 sites; although the sites were managed centrally, the business was owned by two partners who between them adopted a fairly hands-on approach, something that was again characteristic of smaller businesses.

Energy targets

> We set targets for all of our smart meter equipped restaurants. [ ] All of our sites are compared and reported on. (C1; restaurant; DM)

Some of the larger chains were setting targets. For example, both restaurant chains and one of the pub chains reported that individual outlets were given an energy target to try and achieve. There was no evidence to indicate staff incentivisation was in place in the other case study sites. For example, the larger of the two coffee shop franchises spoke about energy consumption being a Key Performance Indicator (KPI) and said that each shop was compared with every other shop on a monthly basis. The main way of controlling consumption was through staff behaviour but this was acknowledged to be a barrier, in part because staff were not incentivised to use energy efficiently despite the KPI.

> It's not a priority for them. They get bonused on their food, their sales, their cash management and their brand standards, but they don't get bonused on whether their electric…
>
> **…You said though that there is a KPI for energy?...**
>
> …There is but they're not rewarded for it and they're not penalised. (C1; coffee shop; DM)

Decision Makers and Key Influencers: External Actors

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

Energy supplier

There was no evidence to suggest that energy suppliers were having any impact on energy management practices, for example, by offering advice or information.

Energy consultants

A number of the organisations in the sample had appointed an energy broker to help them identify and negotiate the optimum rates. For those not using a broker, this type of service was of potential interest, if it would be free of charge.

Those organisations that were using their smart meter data were using the services of a data provider (some examples are outlined in Box 1, p33). There were no examples within this sample of energy consultancies being used to provide wider advice or to conduct energy audits.

Trade and professional bodies

None of the organisations made reference to seeking or getting information or advice from trade or professional bodies.

Landlords

A couple of the case study sites were rented and the bakery with the chain of shops and cafés also had experience of operating from rented sites. Their experience was that

landlords had relatively little impact on energy management except that it could be difficult to have smart meters or methods of micro-generation installed especially in multi-occupancy sites, such as shopping malls.

Franchise owner

A couple of the organisations in the sample were franchises. In both cases, franchise owners were influencing energy management both in terms of various requirements they may set out (such as which items of equipment should be used and how they should be operated) and by providing opportunities for franchisees to network and attend presentations on energy management (see also Key Motivations, p23).

Government

Given that many of the organisations in the sample were classed as 'large' businesses, they were affected by government policies, such as Carbon Reduction Commitment (CRC) scheme and Energy Savings Opportunity Scheme (ESOS)[9] (see also Key Motivations, p23).

Other influencers

The decision maker from the larger coffee franchise said that the firm of shop fitters they worked with was an important influencer; they had been helpful in deciding which LEDs to install. He also sub-contracted their maintenance to another organisation and got advice from them. The owner of the small bakery chain spoke about consulting a local electrician (this reliance on trusted local trades people was again, a characteristic of smaller organisations).

[9] The CRC Energy Efficiency Scheme is a mandatory reporting and pricing scheme to improve energy efficiency in large public and private organisations. The Energy Savings Opportunity Scheme (ESOS) is a mandatory requirement for all large businesses to undertake regular energy audits. Terms highlighted in blue text are defined in the glossary in the main report.

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 higher energy, customer facing chains (cluster 1) 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 DECC research framework which was used to structure this research (see Non-Domestic Smart Metering Early Learning Research: Overview Report). The findings reflect what was reported during the interviews. Whilst they may not give a full picture of what was being done or why, they do provide a useful understanding of relevant issues for the organisations that took part in the research from the perspective of the interviewees.

> We have quarterly champions’ meetings. We try and rotate it around the country, [ ] we go through good and bad restaurants, shall we say, and then get ideas from the champions and hopefully give them ideas to go back to their restaurants with. (C1; restaurant; DM)

Culture of Energy Efficiency

The overall culture of the organisations in the sample with respect to energy efficiency played an important role in determining its approach to energy management.

In the **larger chains**, energy efficiency was often embedded throughout the organisation. The energy managers tended to be the more proactive and motivated decision makers who were only or mainly focussed on energy management. They were also often supported by a network of regional managers whose role included looking to see which of the outlets in their region were consuming a higher than average amount of energy and then meeting with the outlet managers to discuss why this might be and what steps could be taken to reduce consumption.

This was best illustrated by a couple of the restaurant chains, where energy efficiency was embedded across all levels of the business from board to shop floor. In the first case, all members of staff were encouraged to share their ideas, for example, during staff meetings. Members of staff who expressed an interest in energy efficiency were encouraged to become 'energy champions' who met regularly to discuss ideas and share best practice.

A similar approach was being adopted by the other restaurant chain. Each restaurant received a weekly report on its energy use and had to decide three areas it would focus on for the next week to see if they could make savings. Area managers chose a restaurant to focus on and offered the staff 'top tips' to help them. Each restaurant had a nominated 'footprint leader' who took ownership of energy use. The operations team at head office distributed a newsletter which identified the top and bottom performing restaurants and included tips on energy saving.

All except one of the larger chains in the sample was using smart meter data as part of energy management[10]. Smart meters represented one of the tools which enabled them to put their approach to energy management into practice (for further details, see Users of Smart Meter Data, p33).

The size of the business could also have a bearing on how familiar the decision maker was with individual sites; for example, the decision maker for the chain of several thousand pubs had only visited the case study site on one previous occasion and the decision maker for the bakery with a large chain of shops and cafés did not nominate a case study site as the focus of the depth interview as he was not sufficiently familiar with individual outlets.

In the **smaller chains**, although considered important, energy efficiency was not embedded within the wider organisational culture. Energy management was the responsibility of either the owners or a senior manager but this was not a full-time role; indeed, the individuals concerned often spent only a small proportion of their time on energy management. The two smaller chains in the sample were not using their smart meter data (see Non-users of Smart Meter Data, p32).

Energy Efficiency Measures

During the case study and depth interviews, respondents were asked to outline the main energy efficiency actions that they had put in place. The responses are summarised below. These should be approached with caution as they may not give a full picture of what was being done – they were simply what was recalled during the interviews.

[10] The recruitment process sought to actively identify organisations that were using their smart meter data so this may not be a typical of all larger chains in cluster 1.

Between them, the case study organisations had implemented a wide range of actions to try to better manage their energy consumption although the extent of this varied. The restaurant chains were the most proactive organisations in the sample and had put in place a greater number of actions while the small bakery chain had carried out very few. The decision makers from a couple of the larger chains spoke about trialling measures before rolling them out across all their sites.

> I have an R&D budget so I have trial restaurants where the manager is really into energy management, so I [ ] arrange to get it installed, and then we monitor it before and after. (C1; restaurant; DM)

It should be noted that in most instances, having access to smart meter data was not the reason why various actions had been taken; however, where organisations were using the data, it enabled them to evaluate the impact of their actions (see Users of Smart Meter Data, p33).

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

- Most of the organisations were reviewing their **tariff and/or supplier**[11] although the frequency with which they did so varied. Some had appointed a preferred supplier across all their sites. The small bakery chain shared many characteristics with many of the smaller organisations in other clusters, including a reluctance to switch supplier because of previous negative experience.

- One of the pub chains had **switched from electricity to gas** by installing equipment that ran off of gas where possible to take advantage of the lower cost. The decision maker for the large bakery chain spoke about how in the 1990s they had started trying to convert much of their electrical equipment to gas, as this would have been cheaper to operate, but they found that a large proportion of small high street outlets did not have a gas supply. Even today, only around a quarter of their stores had gas.

  Changing energy supply was not an option for the coffee shop franchises as they only had electrical equipment. Many of the other organisations either had not considered it or felt it would require them to replace lots of equipment to take advantage of it.

[11] 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).

- For most participants, **changing the things they produced or sold** was not considered to be an option available to them. In the case of the franchised chains, they had little control over this. However, a couple of the organisations, a pub and a restaurant chain, had made changes to their menus based on energy consumption considerations.

- A commonly held view was that energy consumption was driven by each outlet's opening times and there was little scope to **change timings**.

- The extent to which organisations had changed **production processes** with a view to being more energy efficient varied. To a degree, this depended on the types of controls that were in place. One of the restaurant chains had introduced a range of actions which had reduced their consumption including turning off some of the grills on less busy days and changing the method by which grills were heated up. They were currently trialling more efficient ways of variable extraction in 20 stores and if this proved successful, they would roll it out to more restaurants.

  > We are trialling in some restaurants down south control of the extract so that it only operates when we're actually cooking – when there's food on the grill, and that's showing amazing results. One restaurant has reduced its consumption on the extract by 5 per cent. (C1; restaurant; DM)

  The bakery with the chain of shops and cafés was emptying and turning off some fridges at night and others were automatically turned off.

- **Encouraging staff to use energy efficiently** was often one of the main, if not the only method, being adopted by some organisations; it was also a method that was often somewhat 'hit and miss' as staff often forgot to follow certain practices. The restaurant chains in the sample had put in place staff training as well as other measures to encourage staff to adopt appropriate behaviours[12], for example;

  - appointing members of staff as energy champions or footprint leaders

  > There's a forum on our intranet that I'm quite active in. All the [energy] champions will do that – even people that aren't champions that are just really interested in it – they'll go on there and they'll ask, you know, 'can I have solar panels? What's the benefit of this, that and the next thing?' That's really good, to bounce ideas off of each other. (C1; restaurant; I)

[12] Again, this may not be typical of all restaurant chains as the recruitment process actively sought to find organisations that were adopting best practices.

- providing an online forum which all staff could use to put forward their ideas (not just in relation to energy)
- using automatic settings on certain items of equipment (such as extraction units) that could be overridden but only by seeking permission
- supplying individual restaurants with 'save energy' signs which indicated how long different items of equipment took to reach operating temperature
- expressing the value of energy saving in terms that made more sense to their staff such as how many cappuccinos or full English breakfasts they would have to make to generate the equivalent profit from energy saving actions
- challenging existing practices.

> We are challenging the restaurants on their use of freezers. The chefs tend to hoard stock from old menus, it gets stored until it goes out of date then chucked out. (C1; restaurant; DM)

The other organisations in the sample were not actively involving staff in decision making and some had been taking steps to reduce the ability of staff to actively manage their use of energy as they felt this was a more effective approach to controlling energy use.

> The management teams at the pubs themselves have very little input into energy management. We will of course take their opinions and suggestions into account if there is something they bring up, but generally it's a decision we'd make at head office. If we want to do something like installing LED lights, we'd look at the business case, decide if it's right and get feedback from the site staff. [ ] Sometimes the manager on site can be the main barrier to making savings. If things are managed in the wrong way, such as managers overriding the BMS system or using it incorrectly. (C1; pub with restaurant DM)

Things that could be invested in

> We do have a programme of refurbishment which is a bit like painting the Forth Road Bridge. We cycle through a shop every 7 or 8 years. When we do refurbish a shop we make sure we install the latest energy saving initiatives that we understand would be suitable. (C1; bakery with shops/cafes; DM)

- **Opening new or refurbishing existing premises** was an opportunity that most of the organisations were using to review the energy efficiency of their outlets.

- The extent to which **building insulation was being improved** varied across organisations; there was also considerable variation in terms of which of an organisation's individual outlets were having improvements made. For example;

  - the original structure of one of the pubs that was the focus of the case study visit was a traditional building which included period style, single glazed windows. The extension had double glazed French doors. Despite being a relatively new build, the extension was a particular problem in terms of heating due to poor insulation
  - the other pub chain had chosen not to upgrade the insulation at the case study site as they expected to get a better ROI by targeting other sites
  - as a rule, the restaurants of one of the chains were insulated to 'enhanced regulations' (said to be 'building regulations +20 %') although the case study site, which was in a Victorian building, had not been insulated to this level.

- Buying **new or refurbishing equipment** was a further opportunity to review and improve energy efficiency which most of the organisations in the sample were taking advantage of although this was sometimes being done to comply with a franchise agreement; the smaller coffee franchise had installed energy efficient fridges for this reason. Moreover, energy efficiency was not necessarily a priority when purchasing equipment as other factors were taken into consideration, such as purchase price and how quickly something reached operating temperature, amongst others.

- **Equipment was generally being serviced** on a regular basis. This was largely done because of the potential impact on the business if equipment broke down and not because it saved energy. Indeed, one decision maker was not entirely convinced that the cost of maintaining equipment was offset by any savings in energy consumption.

- **A range of improvements to heating and/or cooling were being made:**

  - a restaurant chain employed a heat recovery unit over the grill which was used to heat water for staff and customer hand-washing and another heat recovery unit on the dishwasher
  - the bakery with a chain of shops and cafés was exploring the idea of automatic doors to reduce heat loss rather than leaving the doors permanently open. They were also looking to replace their open fronted drinks fridges with ones with doors
  - the manager of one of the case study pubs was aware that some pubs turn off the cellar cooling unit at night. He had not done so as he was unsure how this might impact on the quality of the beer. This was something that one of the restaurant chains was also considering.

> *We realised that we have been really stupid with the beer cellars, as we cool them for the beer but then put the ice machine and the coke machine in them (which expel heat). It's also a huge volume to cool and they are not insulated, so we are looking at that from a design perspective. This issue is inherent in the industry because 10 to 15 years ago you didn't really think that electricity costs much, and it's in the cellar, so you don't really think about it. (C1; restaurant; DM)*

- **Improvements to heating and/or cooling were being made:** with the exception of the small bakery chain, all of the organisations had switched, or were in the process of switching, to LED lighting. Very often, individual sites had a mix of lighting systems, typically LEDs, some linked to motion sensors and, in at least one case, day light dimming, and fluorescent lighting, some with more energy efficient fittings and some older, less efficient fittings.

- None of the organisations was looking at **micro-generation** as a method of reducing their energy costs, although an energy champion from one of the restaurant chains was exploring the possibility of using solar blinds.

> I looked into getting - it's like a really thin solar film on top of blinds – solar blinds. We've got windows just as big as these, and to roll them down during the hot time, sort of the peak times of the restaurant, also coincidentally is at lunchtime, because the sun faces right down into the window. So a lot of people won't sit along the window edge, so if I can put them down. It's one that will actually absorb the energy and turn it into solar energy, and put that maybe in a generator somewhere or a battery. (C1; restaurant; I)

Key Motivations

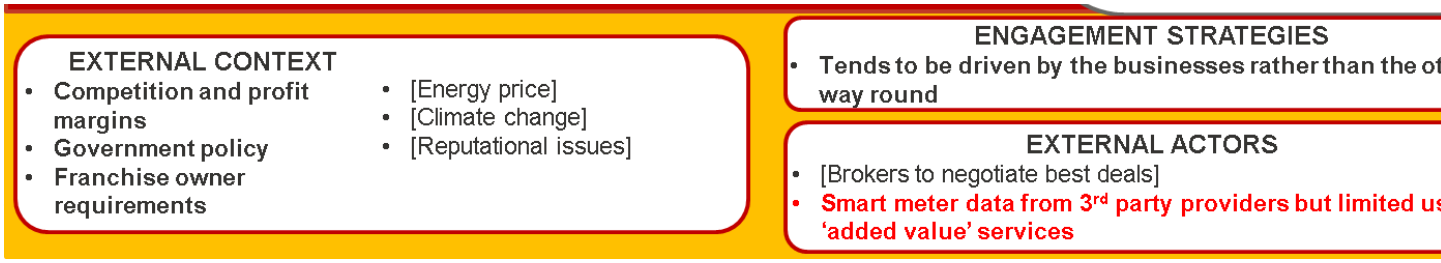


Figure 2**Error! Reference source not found.**, p38 and Figure 3, p40). The same key motivations were found to be operating across the organisations within cluster 1 with the exception of **franchise owner requirements** which only applied to the franchised businesses.

In analysing and reporting on key motivations, other drivers and barriers, we have looked to see if there were differences between those organisations that were using their smart meter data and those that were not. It is important to note that any such differences do not necessarily imply a cause and effect. Organisations that were using their smart meter data tended to be more engaged with energy management; smart meter data might be a tool that they use as part of this, but the use of smart meter data was not necessarily driving these differences. For example, they may employ a dedicated energy manager but they almost certainly had not made this decision because they were using the smart meter data.

- The main motivation was to **reduce their costs** and thereby increase their profitability and competitiveness. This was the case even where energy was perceived to represent a lower percentage of overall operating costs.

> *So accepting that it's not a huge element of your operating costs, how important is it to the business to try to be as energy efficient as possible?...*
>
> *…I think it is. I think any cost that we can save is important because it goes straight on the bottom line. So hugely important. (C1; coffee shop; DM)*

- Being **seen to be a responsible organisation** and **wanting to 'do our bit for climate change'** were often seen as related; one of the indications of a responsible organisation was taking steps to mitigate the impact of climate change. For example, energy management in one of the restaurant chains was the responsibility of the Corporate Social Responsibility (CSR) department. Reputational issues also depended on whether

[13] A number of external factors, including climate change, energy prices and company reputation amongst others, 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) or were a driver/trigger (e.g. increases in energy prices) but they could also be a barrier (e.g. planning restrictions).

the organisation was a household name or had a high street brand to protect. For example, one of the pub chains did not promote itself under the corporate name, largely because most of its outlets were run by tenant landlords, and it did not feel it had a reputation among the general public. While acknowledging the importance of tackling climate change, this was a less important motivator for the smallest organisation in the sample.

- **Government policies** such as CRC and ESOS were having an impact on the larger organisations and provided an incentive to review and reduce their energy consumption. For example, one of the organisations had had an energy audit carried out as part of meeting their ESOS requirements. Another chain said that they would be having a proportion of their outlets audited in response to ESOS. While acknowledging that their organisations were subject to, and influenced by, such government policies, some of the respondents played down their importance. In their view, such policies were not one of the main drivers of their energy management because they would still be looking to reduce consumption without these policies.

- External pressures relating to **competition and profit margins** also had an impact; for example, a restaurant chain spoke about the importance of managing their energy efficiently because of the requirements of some of their investors. In contrast, one of the pub chains reported that although profit margins were important, sales of food and drink represented a much greater opportunity compared to energy to increase their profitability as they bought in bulk at discounted rates and sold to tied public houses at a rate that allowed both them and the publican to make a profit.

- The coffee shop franchises spoke about how the **requirements of the franchise owner** had an impact on their use of energy. The larger chain described how certain items of equipment, such as their coffee machines, were specified by the franchise owner. The franchise owners were said to be very energy conscious and the coffee machines were energy efficient. However, their franchise agreement also stipulated that all coffee machines had to be left on 24 hours a day; the decision maker was unclear why this was. The smaller coffee shop franchise also spoke about getting strong direction from the franchise owner not only in terms of branding issues but also in relation to equipment and processes. For example, they had been required to install LED lighting and energy efficient fridges and the franchise owner set energy consumption targets. Their coffee shops were inspected on a quarterly basis and this included monitoring the ambient temperature.

Franchise owners may also influence their franchisees by providing access to information about energy efficiency. For example, the franchise owner of one of the coffee shop chains arranged a number of franchise meetings each year. The

organisation first switched to smart meters following a presentation by an energy provider at one of these meetings; they also switched much of their lighting to LED after a different presentation.

Other Drivers

Common drivers

There were four drivers that were common to most of the organisations in the sample, irrespective of whether or not they were using their smart meter data. The first three of these were common to all or most clusters; the fourth factor was a characteristic of customer facing chains (clusters 1 and 5). There were also some differences depending on whether organisations were using their smart meter data which are summarised below (highlighted in red in the pathway maps on p38 and 40).

- **Increases in energy prices** were often noted as something that could trigger a review, as was **contract renewal**; for example, one of the restaurant chains was currently reviewing how they procure energy to see if they could negotiate better rates.

> We are in the middle of a store refurbishment programme and are reviewing the energy use of each store as they are refurbished. When we do refurbish a shop we make sure we install the latest energy saving initiatives that we understand would be suitable. (C1; bakery with shops/cafés;

- **Moving or refurbishing premises** presented an opportunity to review energy efficiency. One of the restaurant chains noted that the introduction of ESOS had reinforced the importance of linking energy consumption into their refurbishment programme.
  Nevertheless, energy efficiency was not always an important element of a refurbishment. One of the coffee shop franchises noted that new coffee shops had to be fitted out according to the franchise owner's guidelines and specifications, and existing coffee shops had to be refurbished on a five year cycle. However, the main objective was to meet the branding guidelines rather than energy efficiency.

  There was evidence of some buildings being maintained in a systematic way but most were not using any Building Management System (BMS)[14]. For example, one of the pub chains had BMS systems in some but not all of its outlets (not in the pub that the interview was focused on). The bakery with the chain of shops and cafés had not invested in BMS due to the cost. Instead, they aimed to have a 'last man out' switch to ensure wherever feasible, equipment and lights were switched off at close of business. In most cases, building management was little more than having

[14] 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.

procedures in place whereby different items of equipment were switched on and off and energy efficiency was not incentivised.

- Items of equipment were typically being **serviced and maintained on a regular basis** and kept as long as possible. A further trigger was when **equipment was due for renewal**. For example, if the franchise owner changed the specification to a more energy efficient coffee machine, the decision maker from one of the coffee chains said they were obliged to install these at the time they next refurbished an outlet. One participant spoke about being prepared to pay more for energy efficient replacements however, more typically, energy efficiency was not the most important consideration.

> We make sure new equipment is efficient, but could maybe shop round for more efficient things. The priority is getting the restaurant running. (C1; restaurant; DM)

- **Cross-site comparisons** of energy consumption had also triggered energy efficiency measures especially among those organisations using their smart meter data; where smart meter data were not being used, this was done on the basis of bills.

Drivers that characterised users of smart meter data

Although the numbers are small and therefore great care is needed in interpreting the findings, there was an indication that the larger chains that were using smart meter data to help manage their energy were being prompted to think about their energy consumption by a wider range of triggers. The presence of a **motivated, knowledgeable and empowered decision maker** and an organisational **culture in which the importance of energy efficiency was embedded** were two of the things that seem to lie behind what the most proactive organisations were doing. For example, the decision maker from a restaurant chain was constantly on the lookout for new ideas. They were also more likely to **encourage staff to get involved**, for example, as 'champions' and 'footprint leaders', and to propose ideas for saving energy. They were also more likely to be **sharing best practice** ideas across the organisation as well as individual outlets having **targets set by head office** and being monitored against these.

> I find something I like and then I find the restaurants to trial it in. Word of mouth, colleagues, I belong to various forums, I go to trade shows, seminars, conferences… (C1; restaurant; DM)

Barriers

Cluster specific barriers

One of the barriers was only found in cluster 1 in some of the larger chains:

- The managers of individual outlets typically had responsibility for energy consumption but lacked any decision making authority. Often the only or main form of control they had was to encourage staff to use energy wisely. However, staff compliance, or the lack of thereof, was also perceived to be a significant barrier. For example, the manager of one of the case study pubs said he was told by the decision maker to be responsible for managing energy use, but the manager reported that he was not currently receiving any guidance or help with this and he did not have the authority to make changes that involved any significant use of funds. The only method available to him was to constantly encourage his staff to use energy efficiently. Although he claimed his staff were largely supportive, during the course of showing the researcher around the pub, he noticed several instances of where staff had left items switched on or had changed settings.

> I guess there is a kind of tacit power there to change things if they really need to be done. But when we're talking about major savings, we're talking about major expenditure and whilst I can raise these things and campaign for them or lobby for them, to my seniors, I definitely don't have the power to sign them off. It is very much something that has to be weighed up at a higher level than me. (C1; pub with restaurant I)

Common barriers

A further three barriers were found to be operating across all clusters, including cluster 1:

- The **condition of the building** that the case study organisations occupied had an impact on how easy it was to manage energy efficiently. For example, the main decision maker of the converted 17th century coach house commented that while there was scope to improve the insulation of the buildings, there were other pubs in the estate in a worse condition that would be given higher priority. The decision maker for the chain of bakery shops and cafés commented that energy efficiency was not an especially high priority when choosing sites; the key things were location and footfall.

> We are better in restaurants where we are totally in control, but where we have a landlord or shared services, for example in an airport or shopping centre, it's much more difficult. The landlord does not really have an active role in energy management, but they can be a hindrance in terms of us not having the ability to have the infrastructure exactly as we'd like it. (C1; restaurant; DM)

- Another common barrier, which applied only to the tenants in the sample, was where **buildings were leased, not owned**. Two of the case study sites were rented and the bakery with the chain of shops and cafés also had experience of operating from rented sites. Their experience was that

landlords had relatively little impact on energy management except that it could be difficult to have smart meters (for example, in outlets in shopping centres) or methods of micro-generation installed. In the latter case, this was partly due to the difficulty of getting a return on the investment within the term of the lease as well as the additional complication of having to seek landlord approval.

> We have solar PV panels at our manufacturing facilities but not at our stores because longevity of location means it's not possible to install renewables and we'd need to get the landlords involved. (C1; bakery with shops/cafes; DM)

- **Restrictions due to planning issues**, for example, where a building was listed, was not a factor that had been identified at the start of the research and only emerged during the course of some of the interviews. For this reason, it does not appear on the pathway maps as the issue was only explored in a couple of interviews where it was spontaneously raised by the respondent. It was identified as a barrier by many of the lower energy consuming, customer facing chains (cluster 5) which were located in similar locations to cluster 1 organisations and it probably acts as a potential barrier in both clusters.

Barriers that characterised organisations that were not using their smart meter data

- A number of additional barriers only applied to the organisations in the sample that were not using their smart meter data. The first two barriers were only found to be operating in some but not all clusters, while the remaining five barriers were found across all clusters among organisations that were not using their smart meter data.
- Some of the smaller organisations felt they **lacked the necessary funds** required to make their operations more energy efficient. For the smallest chain in the sample, although they had described their energy as a high proportion of operating costs, the owner's retirement plans meant they were unwilling to consider any investment in energy efficiency.
- **Operational and aesthetic considerations** sometimes took precedence over energy efficiency. For example, the manager of one of the pubs said that one of the first things he did when he was appointed was to replace all the LED lights in the front of house with halogen bulbs in order to create what he felt was the required ambiance. The quality of LED lighting was a common problem and was raised by several organisations in the sample. However, there appeared to be a difference in mind set between those organisations where energy efficiency was embedded into corporate culture and the organisations where this was not

> There is a lot of work that goes into assessing and evaluating pieces of equipment before we actually install them. We've had about four or five different attempts at getting LED lighting in. We knew it was the right thing to do, but it also had to look right as well. (C1; restaurant; DM)

the case. Whereas the latter tended to reject LED lighting as not fit for purpose, the former group had found a way of addressing the problems. In one case, they had experimented with different options until they were happy with the end result, and in another they worked with a manufacturer to develop an LED they were happy with. Given that respondents from lower energy consuming, customer facing chains (cluster 5) were more favourably predisposed to LED lighting, this might suggest there are different needs when it comes to lighting goods in a retail store compared to environments in which food is served and consumed.

- **lack of awareness that smart meter data was available, how to access it or how to use it** (see Non-users of Smart Meter Data, p32 for details of why this was the case).
- Despite the fact that all the organisations within the sample were energy intensive operations, **energy costs were said to be a relatively low percentage of their overall costs** which meant that energy efficiency was not always a priority. Any savings they expected to achieve were assumed to be limited and this meant that **any ROI was likely to be small and any investment would take too long to pay back.** This contrasts with one of the most proactive organisations in the sample who were using their smart meter data. This was a large chain of restaurants and although energy represented only about 2.5 per cent of their operating costs, they were still able to achieve what they considered to be significant reductions in their energy consumption and costs. The organisation was willing to take a rather longer term view, only drawing the line in terms of the payback period at around five years.

> The effort we put in wouldn't generate the return compared to other aspects of the business of food and labour and whatever. Whilst it's always on the agenda, I'd always rather focus on a bigger cost and when they've got those under control, yes then let's have a look at these. (C1; coffee shop; DM)

- **Lack of information, time and expertise** were all potential barriers. As previously noted, not all the decision makers were experts in energy management and as this was often not their main role, they did not have the time or inclination to acquire the necessary information or expertise. This was well illustrated by the main decision maker for one of the pub chains. He commented that many publicans (whether tenants or managers) did not really grasp the relationship between how much energy they were consuming and the size of their energy bill; he felt this was because energy is intangible. A similar point was made by their energy consultants who had a large number of publicans as customers. The decision maker also acknowledged that there was a lack of in-house expertise on the demand side especially when it came to more technical and/or complicated equipment and services. This was borne out by the manager of the pub that was the focus of the case study visit who said it would be useful to

> Speaking about my experience of dealing with the sites they say, 'it's just a small pub, how can I be using this much?' But they don't realise the refrigeration and things like that [use lots of energy]. (C1; pub with restaurant; EC)

have help from someone with the relevant knowledge and experience. Although the pub was on different tariffs for day time, evenings and weekends, and night times, the manager did not seem aware of this and when asked, he did not see any scope for changing things to take advantage of it. Although he had a number of ideas for ways in which he might be able to reduce consumption, such as turning drinks chiller cabinets off at night, he was unsure whether this might compromise the quality of the drinks and whether it would yield any real savings. He had no means of finding out.

> Yeah I'm not an expert. It's always nice to have someone who is very experienced in making energy savings. [ ] I mean, I would always welcome expert help. I like to hear things that are going to make me learn to operate better. (C1; pub with restaurant; I)

- This last point illustrates an additional barrier; those organisations not using their smart meter data **lacked reliable information about how energy was being used** and as a consequence were unable to **demonstrate that an energy efficiency improvement had resulted in lower consumption and bills**. For example, one of the coffee shop franchises had changed all their front of house lighting to LEDs but when asked, the decision maker acknowledged he had no idea if this had had any impact on consumption.

> We changed all the lights to LED lights over the last three years as well. [ ] I don't think the saving was as great as they told me. But I haven't got reliable information really to make that comparison. So I don't know. (C1; coffee shop; DM)

- This difficulty in being able to link energy consumption with individual items of equipment meant that those responsible for energy management, in organisations not using smart meter data, often felt a **lack of control over the use of equipment** and therefore that they had **limited scope to reduce consumption.**

Smart Meters

Those organisations that were accessing their data were using it to identify unexpected consumption levels and to measure the impact of changes in energy management practice. Where smart meter data was not being used this was either because of a lack of awareness that it existed or an inability to access the data.

Motivation for Installing

> We started installing half hourly meters in all of our shops in the over 100kWh market in 1994 when the market deregulated. We ramped up the installation of smart meters about 5 years ago, when we had them installed in all shops except the ones in shopping centres. (C1; bakery with shops/cafes; DM)

The bakery with the chain of shops and cafés had been arranging for half hourly meters to be installed at its sites for the past 20 years. With the exceptions of the small bakery chain, where the smart meter had been installed at the insistence of the energy provider, and the smaller coffee franchise, which did not have smart meters, all the smart meters had been installed at the instigation of the businesses themselves.

The main advantages associated with smart meters were also the main reasons why they had been installed, namely, remote reading, more accurate bills, improved bill validation, and to allow the businesses to monitor energy use across their various outlets.

> I knew it was a good idea, so I drove the idea of getting smart meters installed. (C1; coffee shop; DM)

Installation Experience

Some organisations in the sample had experienced difficulties with some of their outlets either because of the lack of a signal (for example, where meters were in the basement) or because meters were in inaccessible locations which meant the switch over was more problematic. The small bakery chain was still having their smart meter read manually despite the fact there were no problems with the signal. They did not know why this was.

> The biggest issue we have with that for our restaurants is that it has to be paid on a calendar month basis and not a financial period. [ ] There's nothing worse for a manager to look at the smart meter data and it says they are saving, but it is not reflected in their Profit & Loss statement (P&L). (C1; restaurant; DM)

One of the pub chains and one of the chains of restaurants said their management cycle did not correspond with the billing periods used by energy providers which created difficulties. For example, the pub chain cycle was based on four periods of 4-4-5 weeks whereas energy suppliers read meters on a

monthly basis. They had negotiated with their preferred suppliers to provide data to fit their reporting cycle. The pub chain also reported problems of meter compatibility where a pub had an existing smart meter and was being transferred from one energy supplier to another[15].

Non-users of Smart Meter Data

Three of the seven organisations in the sample that had smart meters were not using the data other than for billing purposes. Two of these were smaller chains; another small chain did not have a smart meter.

In the case of the small bakery where the smart meter had been installed at the instigation of the supplier, they reported that they were not using the data because their energy provider had not offered any explanation about how the meter worked and had not provided them with any means of accessing the data.

> They promised us last year that they were going to do an online portal for us and it all sounded very good and that we'd be able to dive in and drill down on an hourly basis and see our usage, but they weren't able to fulfil their promise. [ ] They introduced this new system and they simply weren't capable of putting our stores and accounts, our different accounts, onto the system. So we had six or seven accounts, but actually the billing, it went beyond that and they weren't able to produce bills for some of our stores for seven or eight months whilst they were moving to this new system. (C1; coffee shop; DM)

The coffee shop franchise had been told by their energy supplier that by installing smart meters in all their outlets they could consolidate all the accounts and thereby attract a more competitive rate. It would also make the management of billing easier and allow them to compare sites and identify excessive consumption via an online portal. However, the supplier had not been able to deliver on their promise.

One of the pub chains (an example of a larger chain) was only using smart meters to ensure more accurate billing; in the future – once they had converted more sites to managed houses, the expectation was that smart meter data would assist with future reporting in relation to CRC and ESOS (they currently do not meet the criteria) and with monitoring consumption across all managed sites. They had appointed two preferred energy suppliers who were in the process of setting up an online portal which would allow head office to view energy consumption across all managed houses and run various reports.

> The Carbon Reduction Commitment - and they're also going to be helping us with ESOS – Energy Savings Opportunity Scheme. They compile all the figures for me. All I have to do is sit there for a minute and upload them onto the website. (C1; restaurant; DM)

[15] Once the new Smart Meter Equipment Specification 2 (SMETS2) installations have been rolled out, this difficulty should not arise.

Users of Smart Meter Data

Four of the seven organisations in the sample that were using their smart meter data were all larger chains (as noted above, the only large chain in the sample that was not currently using its smart meter data, expected to start doing so in the future). Although data from smart meters might facilitate compliance, there was no evidence to suggest that smart meters had been installed as a direct consequence of government initiatives such as CRC or ESOS.

The organisations using the data were making extensive use of it to help them manage their energy consumption more effectively. This is illustrated in Box 1.

Box 1: Smart meter data provision and use

Example 1: Restaurant chain

Smart meter data was used at all levels of the organisation on a daily basis; data was provided by a third party using a specification designed by the main decision maker and could be displayed graphically. The data enabled them to monitor patterns of use, as well as to measure the impact of different initiatives. For example, by experimenting with turning off different items of equipment at different times, they reported that savings of around 20 per cent had been achieved.

It also allowed them to identify restaurants that were consuming above average amounts of energy so that they could investigate why this was. For example, the manager of the highest consuming restaurant thought this was because the flats above the restaurant were feeding off of their supply but when the energy manager visited, she discovered everything was switched on. A new manager was appointed who was able to achieve a saving estimated to be about £8,000 on the energy bill within six months.

They used what they described as a form of device disaggregation using a database that showed what each item cost to operate based on manufacturers' data.

Example 2: Restaurant chain

Their smart meter information had allowed them to cut out unnecessary use, including overnight consumption.

They employed consultants to interpret the data and make it easier for staff to engage with, using a traffic light system and smiley/sad faces and converting the savings into a more tangible measure, such as the equivalent number of trees they have saved. Each restaurant received a weekly report:

> *"Each of our restaurants every week receive a report with how much gas and electricity they have saved as a percentage, underneath they have the previous 5 weeks performance. Under that, there are two graphs, one shows each day's performance compared to last year and the other shows the overnight performance. It also shows them the percentages of their performance for the period and for the year. Finally it gives them a figure of how many trees they have saved or killed." (C1; restaurant; DM)*

Example 3: Pub chain

Smart meter data were accessed and reviewed on a daily basis in a format they designed themselves and which could be accessed across a number of platforms.

> *"We are provided with a report in csv format which details the previous day's usage of all our sites in half hourly increments. That feeds into our reporting. We can also get maximum demand figures and other detail, but generally the half hourly data is enough for us. [ ] The report is provided in a format that was designed by us. [ ] It's all HTML5 so we can access the data on most devices. [ ] The data is presented in a bespoke format that we designed ourselves, so it is exactly as we want it." (C1; pub with restaurant DM)*

The information allowed them to identify excessive energy consumption as well as measuring the impact of any energy saving initiatives.

Example 4: Bakery with chain of shops and cafés

Data was accessed daily at head office but not shared with staff in individual outlets. It was displayed using commercially available software and was interpreted by an in-house analyst. It had enabled them to reduce unnecessary consumption especially outside opening hours.

> *"We identified certain shops that had unusually high night time consumption using our smart meter data. They were leaving things turned on at night so we were able to reduce costs by talking to the site staff and getting them to turn things off at night. [ ] It is a huge help in identifying and controlling unnecessary usage." (C1; bakery with shops/cafés; DM)*

None of the case study organisations that were actively using their smart meter data could provide precise details of the savings they had been able to achieve but they all said they had resulted in reductions in energy consumption. One of the restaurant chains provided some indication of the sorts of savings they had achieved. They reported:

- a 6 per cent reduction in energy use over the last 12 month period across all their restaurants
- by turning off half the front of the grill on Mondays to Thursdays, the restaurant had reduced the gas consumption of the grill by a factor of nearly 5 per cent
- by changing the controls on the extractors so they only operated while the grill was in use, one of their restaurants had reduced the consumption of the extractor by 50 per cent
- by reviewing the timings when different items of equipment were turned on, another restaurant reduced its energy consumption by about 20 per cent
- by conducting an energy audit at a high consuming restaurant (identified from their smart meter data), the restaurant saved some £8,000 on its energy bill in just six months.

Reactions to Products and Services

Methods of accessing data

Respondents from organisations that were not using their smart meter data were told about the sort of information that was available, along with various methods of accessing it (see Figure , p46).

There were mixed views on the value of accessing the data visually via an app or visual display and the level at which the data might be shared:

- the larger coffee shop franchise would only want the information available at head office and for area managers and not within individual outlets as it would distract staff from their main tasks. A similar view was expressed by the bakery with the chain of shops and cafés and the main decision maker for one of the pub chains. However, the manager from the case study pub was enthusiastic as he felt he could use it to motivate his staff
- the daughter of the owner of the small bakery, who worked for the business, thought it would be interesting to have a visual display but was unsure how this would, in itself, help them to reduce their consumption
- the decision maker and the implementer from the smaller coffee shop franchise, which currently did not have smart meters, were both interested in being able to access the data in all modes but felt it would be important to be able to have a print-out. While the decision maker thought that they would be able to use the information to better manage their consumption, the store manager did not think he would be able to use the information in his store.

Added value services

At the end of the case study visits, reactions were explored to four product or service ideas intended to help organisations make better use of the information from their smart meters. Due to constraints of time, it was only possible to briefly cover each and they were not covered in the telephone depth interviews. They are shown in Box 4, p47.

There was little interest in the idea of a **power of attorney service** whereby an organisation could be automatically switched to a cheaper tariff when it becomes available. The main reasons for this included; some of the organisations were already working with a broker; a lack of trust and negative experiences of switching in the past; it would need to result in considerable savings because of the perceived difficulty of switching supplier, and come from a trusted source.

Some of the organisations in the sample were already comparing individual outlets both with each other and with themselves over different periods although not necessarily taking into account variations in temperature; as such, **automated buildings performance evaluation** (a means of comparing a building's energy performance against itself to help identify the

> We can see all the restaurants within our northern region and we could go bigger if we wanted to. So what we kind of look at is where we are in terms of other restaurants which are similar to us in terms of size, and stuff like that, so that we can gauge whether there's any work that we can

extent to which energy is being used efficiently) did not appear to offer them anything new. Those who were not doing this questioned how meaningful it was to compare different buildings. The concept of **pattern recognition** (using smart meter information to identify unusual patterns of consumption) generated a similar response.

One of the restaurant chains said they had achieved the same thing as **device disaggregation** (which indicates the electricity consumption of individual devices) through their equipment database (see Box 1, Example 1).The idea of a low cost smart plug had some appeal. However, concerns were expressed about the number of plugs an outlet might need if it wanted to monitor all or most of its equipment, as well as the robustness of the plugs. One option considered was to use them to help troubleshoot in an outlet that was shown to be using above average amounts of energy.

Willingness to pay for added value services

In relation to all four ideas, the views of the decision maker from the larger coffee shop franchise summed up attitudes to these types of products and services. He would willingly pay for a service as long as he could be convinced that the provider could actually deliver on what they were promising and that the savings achieved were greater than the cost. One of his concerns was that all of these types of service might generate lots of information which would become a distraction rather than an aid to improved energy management.

Conclusions

Summary of Key Findings

Summary pathway maps[16]

Two pathway maps were developed for cluster 1, the first based on those organisations that were using their smart meter data to manage their energy (see Figure 2), and the other for organisations not using their smart meter data (see Figure 3).

The maps display 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. Factors highlighted in **red** in the pathway maps highlight things that may discriminate between users and non-users of smart meter data. These maps need interpreting with care as they are based on small numbers of organisations.

[16] A pathway map is intended to help summarise the various factors, triggers and barriers that result in an organisation or a group of organisations managing energy in a particular way.

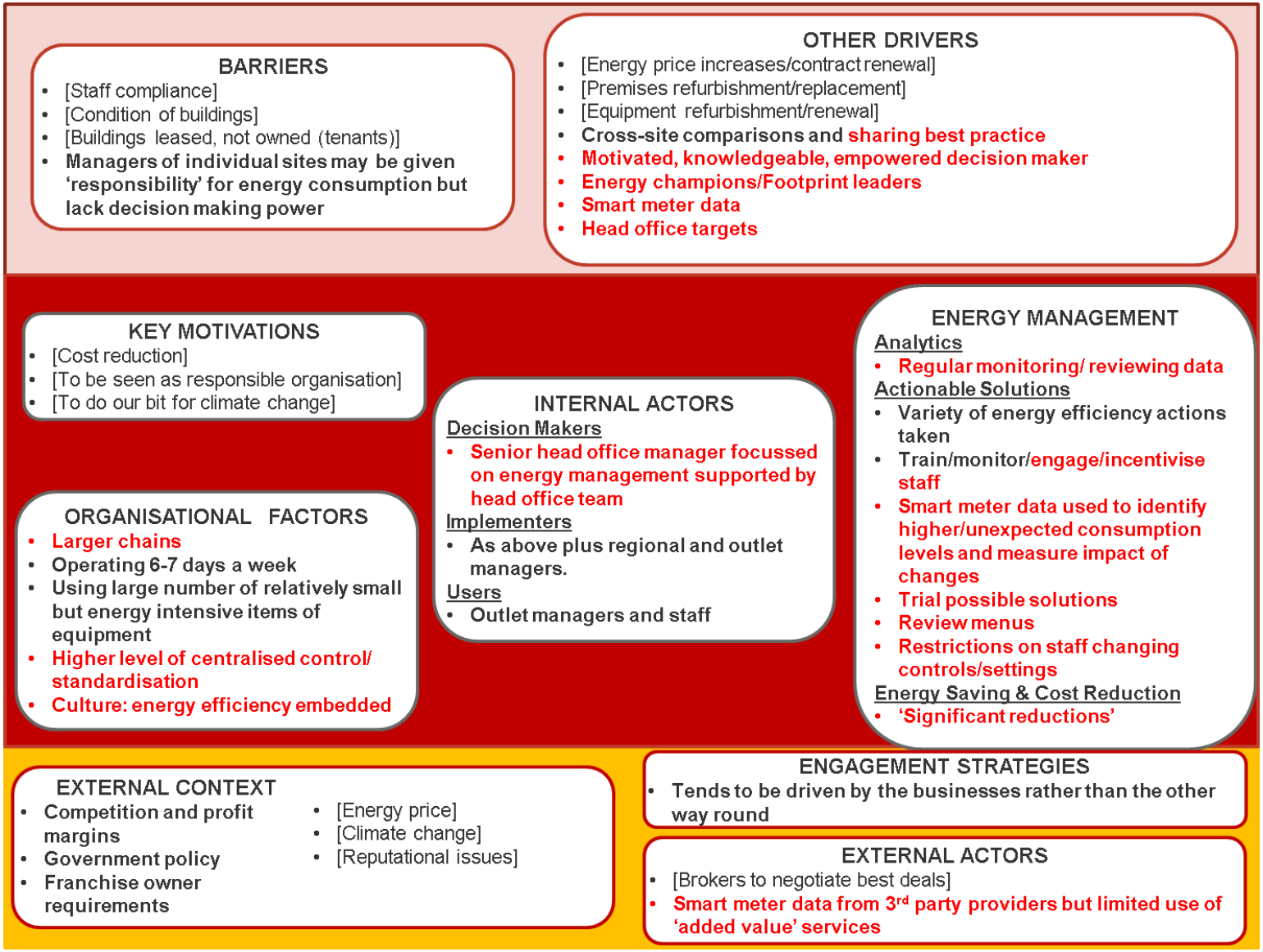

BARRIERS
[Staff compliance]
[Condition of buildings]
[Buildings leased, not owned (tenants)]
Managers of individual sites may be given 'responsibility' for energy consumption but lack decision making power
OTHER DRIVERS
[Energy price increases/contract renewal]
[Premises refurbishment/replacement]
[Equipment refurbishment/renewal]
Cross-site comparisons and sharing best practice
Motivated, knowledgeable, empowered decision maker
Energy champions/Footprint leaders
Smart meter data
Head office targets
KEY MOTIVATIONS
[Cost reduction]
[To be seen as responsible organisation]
[To do our bit for climate change]
INTERNAL ACTORS
Decision Makers
Senior head office manager focussed on energy management supported by head office team
Implementers
As above plus regional and outlet managers.
Users
Outlet managers and staff
ENERGY MANAGEMENT
Analytics
Regular monitoring/ reviewing data
Actionable Solutions
Variety of energy efficiency actions taken
Train/monitor/engage/incentivise staff
Smart meter data used to identify higher/unexpected consumption levels and measure impact of changes
Trial possible solutions
Review menus
Restrictions on staff changing controls/settings
Energy Saving & Cost Reduction
'Significant reductions'
ORGANISATIONAL FACTORS
Larger chains
Operating 6-7 days a week
Using large number of relatively small but energy intensive items of equipment
Higher level of centralised control/ standardisation
Culture: energy efficiency embedded
EXTERNAL CONTEXT
Competition and profit margins
Government policy
Franchise owner requirements
[Energy price]
[Climate change]
[Reputational issues]
ENGAGEMENT STRATEGIES
Tends to be driven by the businesses rather than the other way round
EXTERNAL ACTORS
[Brokers to negotiate best deals]
Smart meter data from 3rd party providers but limited use of 'added value' services

Figure 2: Users of smart meter data pathway map

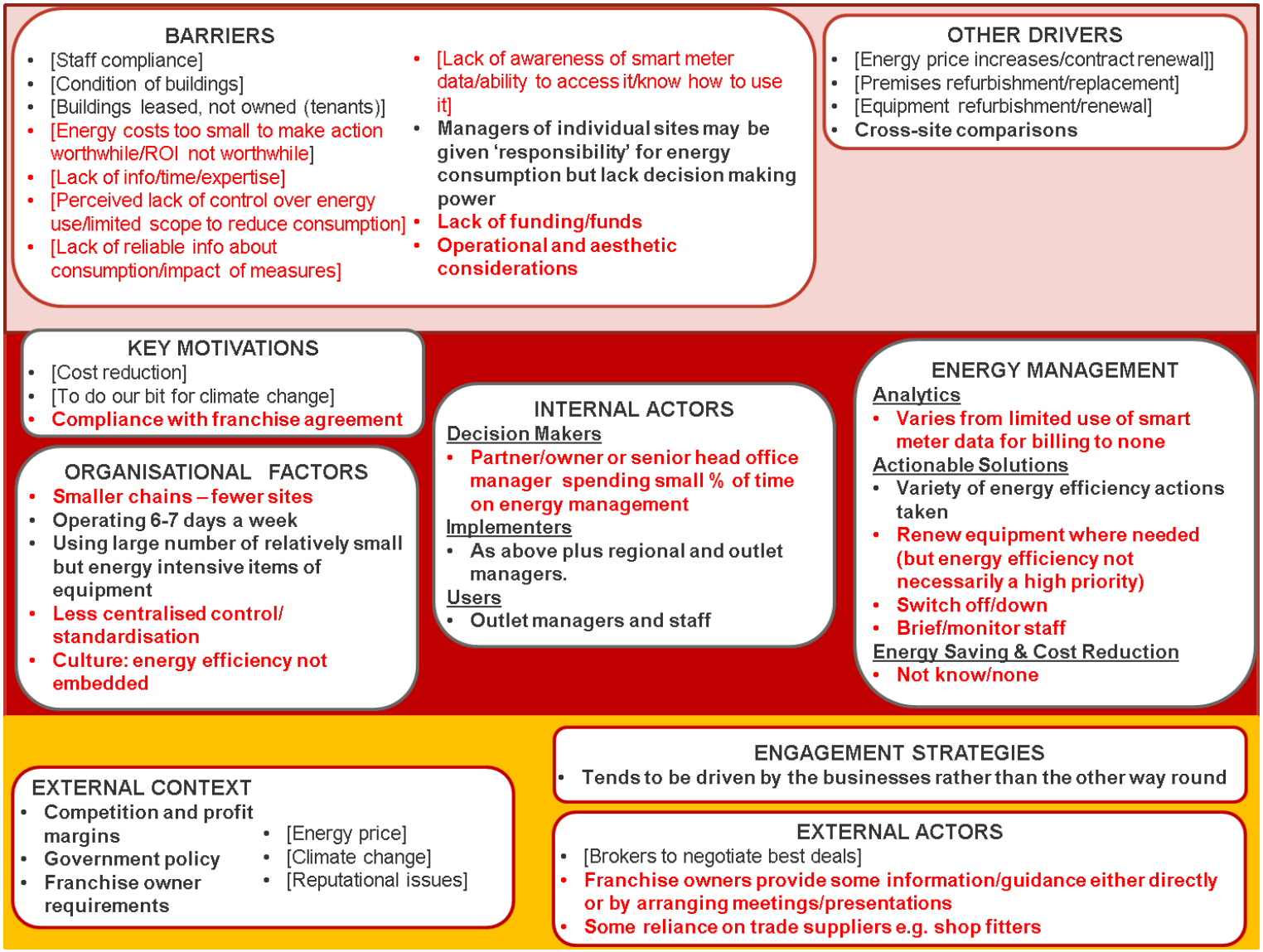


Figure 3: Non-users of smart meter data pathway map

Cluster specific findings on energy use, management and associated influences

The larger chains in this sample of higher energy consuming, customer facing chains shared a number of characteristics with the larger chains in cluster 5 (lower energy consuming, customer facing chains).

Energy efficiency tended to be embedded into the corporate culture of the larger chains and energy management was typically characterised by a high degree of centralised control and standardisation. They were more likely to employ dedicated energy managers, although decisions were often taken in consultation with other head office staff. Some also had a regional management tier who had a role in implementing energy management decisions. They were able to make cross-site comparisons, either by using their smart meter data or from an analysis of energy bills, to identify, and take steps to address, higher than expected levels of energy consumption. Energy efficiency appeared to be strongly influenced by government policy initiatives such as CRC and ESOS.

In contrast, the smaller chains in the cluster often had more in common with other smaller businesses from across all the clusters.

There were a number of factors relating to energy management that seemed to apply, in particular, to this cluster.

The businesses in the sample used a large number of relatively small but energy intensive items of equipment.

For businesses that are franchises, franchise owner requirements had an impact on energy management.

External pressures, such as shareholder requirements, can have an impact on energy management for listed businesses.

Although managers of individual sites might be given ‘responsibility’ for energy consumption, they may lack the authority to take action beyond trying to encourage staff to use energy efficiently.

Differences between users and non-users of smart meter data

As with all other clusters, one reason why organisations with smart meters were not accessing and using the data was a lack of awareness that this was possible. In one case, the energy provider had been unable to provide the organisation with access to a functioning web portal. In another case, their energy providers were developing an online portal; this was not currently being used but this might change in the future.

Those organisations that were using their smart meter data to help them manage their energy had not been prompted to do so by having a smart meter installed. Instead, they recognised the importance and value of energy efficiency and had requested smart meters to be installed as one of the tools that enabled them to become more energy efficient. The smart meter data had enabled the organisations to manage their energy use in a way that they had previously been unable to do; in particular, to identify unexpected and/or unnecessary consumption, to take steps to address this, and to evaluate the impact of any actions taken. Some of the organisations were using their smart meter data to help drive staff incentivisation schemes.

Key differences between the users and non-users of smart meter data within the sample are summarised in Box 2.

Box 2: Key differences between users and non-users of smart meter data in Cluster 1

Factors in bold applied, in particular, to cluster 1 organisations ; other factors (not in bold) also applied to Cluster 5 organisations – lower energy consuming, customer facing chains – with whom Cluster 1 organisations had much in common.

Users	Non-users
More likely to be larger chains	**More likely to be smaller chains**
Higher level of centralised control/ standardisation	**Lower level of centralised control/ standardisation**
Sharing of best practice	**Little evidence of sharing best practice**
Typically had implemented a wider range of energy saving measures	**Often had introduced fewer energy efficiency measures**
Energy efficiency was embedded in the corporate culture	Energy efficiency was not embedded in the corporate culture to the same degree
Often employed a motivated, knowledgeable and empowered decision maker	Decision makers were often not involved in energy management on a full-time basis
More likely to review energy efficiency in response to a wider range of triggers	Tended to respond to fewer triggers
Fewer barriers to energy efficiency	Perceived additional barriers to energy efficiency including expected ROI and felt there were fewer opportunities to make savings
Smart meters installed at organisation's request*	Relied on energy bills to review energy consumption including cross-site comparisons
Individual stores often had energy consumption targets set by head office	
Using smart meter data to identify opportunities to save energy and to measure the impact of changes	

Research Implications

The Importance of Size

Most of the organisations in the cluster 1 sample were classed as 'large' and this had an **impact on their approach to energy management. What follows also applied to the larger chains from cluster 5. In a similar way, smaller organisations in the research sample, including those in clusters 1 and 5, shared many characteristics in**

common[17] and, as such, size of organisation appears to cut across the cluster based approach to segmenting the market place.

The research findings imply that:

- As the number of outlets within a chain increased, so did the opportunity to amplify relatively small savings from reductions in energy consumption thereby making energy efficiency measures more cost effective.
- The larger organisations tended to be better resourced which enabled them to manage energy centrally and to standardise both energy provision and use which, in turn, resulted in further savings.
- Some of the larger organisations employed a dedicated energy manager thereby ensuring there was a greater degree of in-house expertise; where a dedicated energy manager was not employed, organisations were more reliant on external expertise.
- Dedicated, knowledgeable energy managers not only brought an understanding of energy management, they were also better placed to benefit from events such as conferences and trade shows which could spark ideas and provide opportunities for sharing best practice.
- Larger chains are also more likely to be listed companies and this seemed to have an impact on energy management within the sample. The four organisations that were using their smart meter data were all listed companies. The two coffee shop franchises and the small bakery almost certainly were not. Listed status can mean additional pressures come into play, for example, one of the restaurant chains spoke about it being easier to attract certain types of investor if they can demonstrate they are an energy efficient organisation.
- The large organisations were the focus of various government policy initiatives; there was evidence that energy management was being influenced by both CRC and ESOS, as well as by a focus on energy reduction as opposed to renewables.

Engaging non-users: Research implications

As noted, a number of 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.

There was no single preferred method of accessing smart meter data although access via a web portal was often the preferred approach; there were also mixed views on the value of sharing the data with staff in individual outlets.

[17] See the main report and the annexes for clusters 3/4, 7 and 8 for more details of the things that characterised smaller organisations.

While it might be easier for larger chains to embrace energy efficiency, smaller chains might be encouraged to do more, for example;

- by focusing on smaller, easier 'gains' such as changing lighting systems (both coffee shop franchises had done this, one on the basis of being told the likely level of savings and one because of direction from the franchise owner); see the comment below about technological issues
- demonstrating the value of services such as 'automated buildings performance evaluation' and 'pattern recognition'. This was something the larger chains claimed to be already doing whereas smaller chains may feel they had little basis for making comparisons or lacked the ability to do this. These services were not rejected as such, but decision makers wanted to see 'hard evidence' that they could deliver savings that were greater than the cost of the service
- encouraging organisations to take a longer term view on the Return on Investment (ROI) and signposting them to any sources of financial assistance. While one of the larger chains that was using smart meter data was working with payback periods of up to five years, smaller companies would find this a challenge and anything that enabled them to spread the cost of the investment might encourage them to adopt improvements that otherwise they might rule out.

Technology issues were sometimes a factor, whether this was in relation to problems communicating with the smart meter (if there is no signal, there is no data) or in relation to aesthetics (such as LEDs being rejected because of the quality of the light). Suppliers and manufacturers have a role to play here but it is worth noting that the more proactive organisations in the sample had managed to find a way of overcoming the perceived limitations of LEDs. Finding ways of sharing these experiences, as well as best practice in general, could help other organisations address these issues.

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. This is particularly the case with older buildings in need of upgrade. The introduction of ESOS is also likely to be a trigger going forward for large organisations.

The priorities of the two coffee shop franchises were influenced by the franchise owners. The extent to which the franchise owner includes energy efficiency as a Key Performance Indicator in any franchise agreement and either stipulates or encourages franchisees to install smart meters can help determine the priority given to managing energy.

Appendices

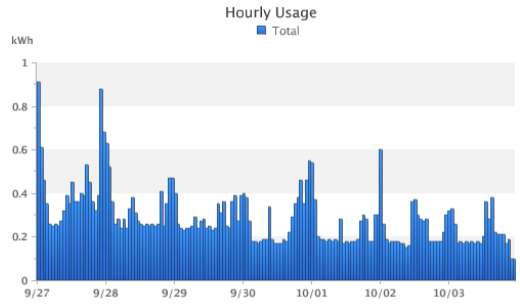
Research Questions

Box 3: 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)?

Stage 1 Stimulus Material

Information from smart meters

- On a PC/laptop via the web
- Smart phone app
- Consumer Access Device – a visual display that links with the smart meter(s)
- More detailed bills



Creative Research 9

Figure 4: Information from smart meters

Box 4: Products and Services Intended to Help Businesses make Better Use of the Information from Smart Meters
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

Department for Business, Energy & Industrial Strategy
1 Victoria Street, London, SW1H 0ET
www.gov.uk/beis