Department for
Business, Energy
& Industrial Strategy

SMART METERING NON-DOMESTIC 'EARLY LEARNING'

Annex 4: Cluster 5 – Lower energy, customer facing chains

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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

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.

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[1]

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).[2]

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 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

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

recruit were covered in Stage 2 of the research. The two stages of research are illustrated in Figure 1.

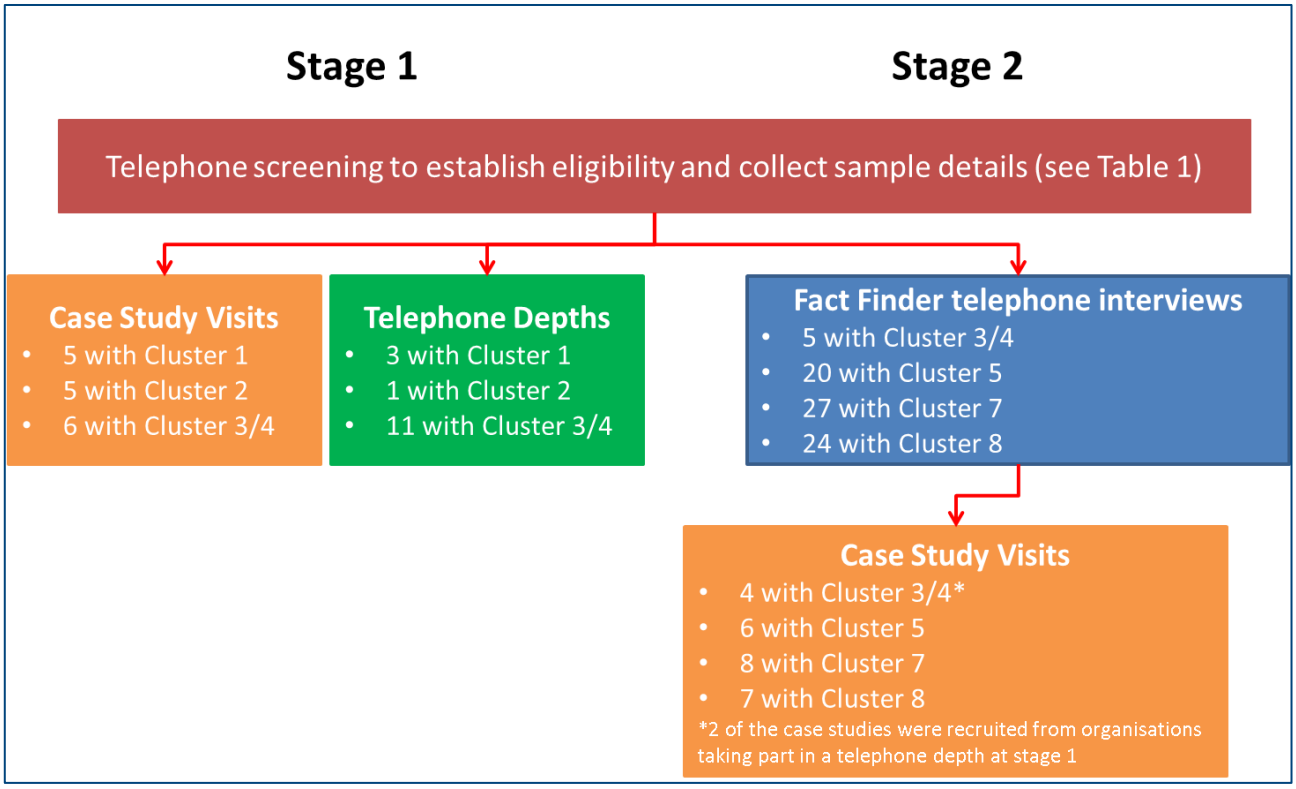

Figure 1: Flow chart of research method

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[3]. These interviews were conducted to provide additional information to support the case studies.

[3] 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[4], 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 5 Sample

This annex focuses on Cluster 5 - a sample of lower energy consuming, customer facing chains. This cluster covers organisations such as retailers and service providers (see Business type, p9 for further details).

[4] 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: 20, of which, six were case studies

Region			**Locus of control**		
East	-		Individual site	-	
E Mids	3		Head office	20	(6)
London	1	(1)			
N East	2		**Tenure**		
N West	2	(1)	Owner occupier	7	(1)
S East	2	(2)	Tenant	13	(5)
S West	2	(1)	**Energy bills**		
W Mids	2	(1)	Paid direct	20	(6)
York & Humber	3		Included in rent	1*	(1)
Scotland	2		**Energy types**		
Wales	1		Electricity	20	(6)
Size of organisation (total employee number)			Gas	7	
Sole trader	-		Other	2	(1)
Micro (<10)	1	(1)	**Type of meter**		
Small (<50)	-		Smart/advanced electricity	16	(5)
Medium (<250)	6	(3)	Smart/advanced gas	4	
Large (250+)	13	(2)	**Importance of reducing energy use**		
Number of sites			High	14	(3)
<100	12	(4)	Medium	6	(3)
>100	8	(2)	Low	-	

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

NB: Most of the information in Table 1 relates to a single case study site (the fact finder 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 depth interviews conducted as part of stage 1 also focused on a single site). The exceptions are 'size of organisation', 'number of sites',' and 'the importance of reducing energy use', which apply to the chain as a whole.

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 Cluster 5 sample is provided in Table 1 below. The individual cells of the table show both the overall number of organisations in the cluster 5 sample and, in brackets, the number of these taking part as a case study.

Twenty retail chains took part in a fact finder interview; six of these also took part in a case study visit. Eleven internal actors participated in the case study visits: six energy management decision makers, four implementers of such decisions and one user of energy. Interviews were also conducted with two energy consultants. One was working as both a broker and a consultant in relation to ESOS; the other specialised in energy efficient heating and lighting, and helped design LED lighting systems for the organisation in question.

Interpreting the Findings

The findings in this report provide insights into how different cluster 5 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 each cluster. Some organisations were purposively selected to learn from examples of best practice, and although a range of more ‘typical’ organisations were also included in the research, the sample was 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 lower energy, 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 twenty retail chains that took part in the fact finder interview. Where findings only relate to one or more of the six chains that went on to take part in a case study, this is indicated in the text.

Nature of Business

Business type

The sample included a mix of retailers (including clothing, discount stores, food, furniture, health and beauty, jewellery, motor vehicles and sportswear equipment) and service providers (including betting shops, a building society, fleet hire, funeral services, garden centres). One of the chains was a franchise.

Business size

All, bar one, were medium or large businesses (defined in terms of the number of employees), although most of the individual outlets employed a small number of staff. There was some variation within individual chains; for example, two of the larger chains had outlets of different sizes, from relatively small, high street stores to larger outlets located in shopping malls and retail parks. The number of retail outlets that made up each chain (excluding head office and other non-customer facing units, such as warehouses) varied from just two to some 2,500.

Business operating hours

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

Nature and Management of Buildings

Tenure

The sample was made up of a mix of tenants and owner occupiers. The tenants in the sample were mainly on full insuring and repairing leases[5] (at least for the internal parts) and most leases were for terms (where known) of 10 years or less. All the tenants, with two exceptions, were responsible for paying their own energy bills[6]. The first exception was a business that was mainly located within hospitals and, in most cases the energy was included in the rent. Heating was also often provided by the hospital. The case study site for this chain was one of a small number of outlets which had its own metered supply. The second case was a retail outlet which was part of an international chain and was based in a shopping centre. Heating and air conditioning was provided and billed by the shopping centre management as part of a service charge while electricity was paid directly to the supplier; however, the retail manager did not see the costs as the bills were sent to the European headquarters.

The initial fact finder interviews suggested that none of the outlets chosen as the focus of the interview had any common parts although in at least one case, it only emerged during a case study visit that there were common parts[7]. Many respondents from tenant organisations were unaware of the length of their lease but where it was known, it was often for 10 years or less. A participant from one of the largest chains commented that their stores often had leases of about 100 years.

Condition and management of buildings

A small number of sites were located in new or recently refurbished premises which were considered to be relatively energy efficient. In contrast, many organisations were operating from older premises that were not

There is almost no insulation, it's single glazed and has a suspended ceiling with a large void above it which we are not allowed to insulate. (C5; ladies fashion retailer; DM)

[5] A lease which imposes full repairing and insuring obligations on the tenant, relieving the landlord from all liability for the cost of insurance and repairs.
[6] This may not reflect the wider situation. Attempts were made to include in the research some landlords who were managing multi-occupancy sites and where the landlord was responsible for energy bills. In the event, this proved to be very difficult.
[7] Common Parts are parts of a property that may be used for access and egress as necessary by the landlord, the tenants, their staff and authorised visitors, for example, • the main entrances and receptions, • lifts and lift lobbies and staircases.

felt to be especially energy efficient.

In most cases, there was either no active facilities management or this was included as just part of the role of a member of staff. Only a few of the organisations had a full-time person or persons dedicated to this role. A similar number of the organisations (not necessarily the same ones) had some form of Building Management System (BMS)[8] in at least some of their outlets.

> *We state that we recognise the cost and impact on the environment by our use of energy, and underline our responsibility to reduce our use of energy. (C5; discount store; DM)*

Environmental policy and energy audit

Several organisations in the sample had an environmental policy in place and a similar number (but not necessarily the same organisations) had had an energy audit carried out. In at least one case, the environmental policy was linked to the organisation's environmental and quality management standards. Some of the organisations spoke about having energy audits carried out in relation to the Energy Savings Opportunity Scheme (ESOS).[9]

> *It covers ISO 9001 and 14001, social responsibility, sustainable development, a systematic approach to managing energy, reducing carbon, energy efficiency and clean sources of energy. (C5; sportswear and equipment retailer; DM)*

Energy Use

Types of energy and meters

Most of the organisations in the sample had at least one smart/advanced electricity meter[10]; a small number had traditional meters only. Most did not have gas although a small number had smart/advanced gas meters and a similar proportion had traditional meters. The garden centre was using LPG for heating and,

> I think almost we've been waiting as well because we've been hearing the rumours of BEIS putting in the mandatory legislation around having half hourly meters anyway. So we've kind of just been waiting for that to happen I think, if I'm totally honest. (C5; health and beauty retailer; DM)

[8] 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. Terms highlighted in turquoise text are defined in the glossary in the main report.

[9] The Energy Savings Opportunity Scheme (ESOS) is a mandatory requirement for all large businesses to undertake regular energy audits. Rather than having every outlet audited, organisations were often selecting a cross-section of outlets; these may not have included the case study sites but lessons from other sites were being transferred.

[10] 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).

along with one other organisation, had solar PV. Smart meters were not present in all outlets of the larger chains with some waiting for the national roll-out.

Energy intensity and main uses of energy

Only a small number of organisations in the sample considered their business to require high intensity energy use and all of these organisations were involved in the motor trade.

The main uses of energy are summarised in Table 2.

One of the main uses of energy within this cluster was lighting. Although often associated with low energy consumption, the number of lights in many of the outlets meant this was often the biggest energy consumer. Heating/cooling was mainly provided via a mix of electrical heaters/air conditioning units and gas fired central heating. Organisations that operated an 'open door' policy might also have had over-door heaters.

Typically, energy was also used in relation to IT and staff kitchen facilities. Other uses were specific to the type of business. For example, the car dealerships in the sample had workshops attached, food retailers had fridges and freezers, and the chain of betting shops had gambling machines.

Table 2: Main uses of energy

Lighting	Mainly a mix of LEDs, fluorescent and halogen
Heating/cooling	HVAC (some); over-door heaters/air conditioning (some); gas boilers (some); heating provided by landlord (1 site)
IT	Computers, tills, security systems, phone systems, printers/copiers, servers
Staff kitchen/canteen	Kettle, microwave, fridge, toasters. hand driers, hot water heaters
Other	Workshop equipment (car dealers); fridges/freezers (food retailer); gambling machines (betting shops)
Renewables	Solar PV (2 organisations)

Variation in energy consumption

Occasionally, respondents spoke about peaks in energy consumption that coincided with staff breaks or, in the case of the garden centre that operated a café, at lunch times, or at times when they were most busy, such as on a Saturday or at Christmas. However, with these exceptions, most organisations felt that there was little variation in energy consumption during opening hours as well as over the course of the year, as heating and cooling costs often balanced out.

Energy as a proportion of total operating costs

Among the six sites that were visited as case studies, the cost of energy ranged from £5k p.a. for a chain of two jewellery shops, to £30m p.a. for the largest chain.

Many of the organisations in the overall sample felt that energy was a small or tiny proportion of their operating costs. One organisation that typically employed just one or two members of staff in each store, rated their energy as a 'high' proportion of their total operating costs. A couple of other organisations rated their energy as a' medium' proportion of operating costs; one of these was the large chain spending £30m pa on energy, the other was a discount retailer where operating margins and costs were particularly important.

Importance attached to reducing energy consumption and being energy efficient

All organisations in the sample rated the importance of reducing their energy consumption as either 'high' or 'medium'. Similarly, all organisations rated energy efficiency as a 'high' or 'medium' priority. However, in some cases at least, respondents may have been giving what they perceived to be the 'right' answer rather than admitting that reducing their consumption /being energy efficient was a low priority. During the case study visits, it was sometimes difficult to see how a 'high' or 'medium' priority was being translated into energy efficiency actions.

Perceived level of control over energy use

Very few of the organisations felt that they had complete control over their energy consumption, many said they had a reasonable level of control while a smaller proportion felt they had only limited control.

The main things that provided some sense of control included: having automated BMS, a 'last man out' switch, usage being authorised or controlled by head office, having a means of investigating any 'spikes' in usage.

> I can't stop the site staff from doing things. The way we operate, I wouldn't pick up on any unusual usage until two to three months after the fact. (C5; discount store; DM – Limited control)

> I can see if anything is left on and the lights and heating are on sensors. We just use what we need and people don't have things plugged in at their desks. (C5; clothing retailer; DM – Complete control)

In contrast, some of the things that could make control of energy more difficult included: a policy whereby each site was responsible for its own energy use, even where there was centralised control; having limited control over how staff used energy either for their own use (e.g. boiling the kettle) or changing settings on BMS or heaters; lacking the means to identify unusually high usage in a timely manner, perceptions that 'we have to use what we need to use', and perceptions that there was limited scope to make further savings.

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

Only a small number of the energy decision makers were working full-time and, typically, were called energy managers or had this as part of their job title. The main reasons for having a full time energy manager appeared to relate to the size of the organisation and its energy costs and, in one case, in response to the introduction of the Carbon Reduction Commitment (CRC) scheme[11].

The remaining decision makers were from accounts/ purchasing/ procurement/ administration or facilities management/ property/ operations, a couple were directors (managing or finance) and another was a 'category manager'. Most estimated they spent no more than five per cent of their time on energy management. The remaining respondent was an external energy consultant.

Most of those responsible for energy management worked with a range of other people to achieve this, their line managers and/or colleagues from other departments or the MD, CEO, FD or board of directors, depending on management structures and responsibilities.

Implementers

In the smaller chains in the sample, the managers/supervisors of individual outlets were often responsible for ensuring any energy management decisions were implemented within their own outlets. The extent to which they were free to change settings and decide when heating/cooling should be switched on varied.

Larger chains often had a regional management structure with energy management one of the things the regional managers were responsible for. Store managers also had a responsibility for energy use although this was not always a priority for them.

Users

All staff within the stores were users of energy. There was little evidence of any training or involving staff in energy management.

> No we don't [have any staff training regarding energy efficiency]. As I said, probably as a priority it's not that high really, so it's more just like you know, just telling them what to do and what not to do. (C5; furniture store; DM)

[11] The Carbon Reduction Commitment (CRC) Energy Efficiency Scheme is a mandatory reporting and pricing scheme to improve energy efficiency in large public and private organisations.

Energy management expertise

Organisations in the sample that employed dedicated energy managers had in-house expertise whereas those who did not were more reliant on external assistance, such as an energy consultant or a buying group.

> And you get to a point after so many years in the business of being able to look at a profile and you know what's gone on with that site. You can see what's happened and you can see how it's working. (C5; discount store; DM)

Degree of centralised control

All organisations in the sample sought to exercise a degree of control from the centre. There appeared to be two main strategies although, in practice, a mix of the two approaches seemed to be at work: those where most of the decision making was taken at head office, which typically included not only choice of supplier but also lighting/heating settings, etc; and those where some/all decisions were devolved to individual stores; for example, staff may have some flexibility over lighting/heating/ cooling settings.

The level of control also reflected the extent to which BMS had been implemented across the chain (for those with BMS).

Standardisation of energy management across sites

> We want one supplier for all of our sites. We can't do one bill for all sites but it's easier to manage if it's the same supplier and the same renewal dates. (C5; travel agent; DM)

Standardisation of energy management was important to most of the organisations in the sample, especially in relation to energy contracts. A single supplier was easier to manage and also allowed them to negotiate attractive rates. Although standardisation in relation to how energy was used and managed may have been seen as the ideal, actual practices needed to take into account different 'types' of store in terms of size, location, range of goods/services provided, and so on.

Energy targets

A number of the organisations reported setting an energy target for their outlets, most of which were using their smart meter data as part of their energy management. Most of these organisations had not linked rewards to their energy targets.

Decision Makers and Key Influencers: External Actors

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

Energy supplier

Just one organisation referred to close working with a supplier and this was in relation to helping with changes in legislation rather than energy management.

Energy consultants

In contrast, most of the organisations in the sample were working with an energy broker and/or consultant. In a small number of cases, the consultant was a third party energy collection and management bureau involved in the collection and analysis of smart meter data and, as part of this role, they were offering advice either in relation to procurement and/or energy efficiency (see also Users of Smart Meter Data, p32). Other organisations were using energy consultants primarily to source and negotiate energy contracts. Yet other ways in which consultants had been used included: to provide advice, expertise and design in relation to the installation of LED lighting; to help the organisation in terms of meeting ESOS requirements; to consolidate energy accounts; in the decision to install smart meters; to help identify energy saving schemes.

> They came up with LED lighting, where we've got open chillers, put glass doors on chillers, lift controls, an element in BMS in some sites and various movement sensors on lights. In most cases we've got them. So it generalised a little bit but that suggested some £4½ million worth of savings in what they saw. (C5; discount store; DM)

Trade and professional bodies

A number of the organisations in the sample were members of a trade association or professional body although, in most cases, these were not involved in the provision of energy efficiency advice. In three cases, the trade or professional body had played a role in terms of energy efficiency: the Association of Independent Stores, the Company of Master Jewellers and the Retail Energy Forum and the Energy Managers Association.

> [The Associated Independent Stores] help us find good deals from energy suppliers; they also sometimes send an email with energy saving tips. They also conducted an audit to determine the most suitable LEDs and sourced suppliers. (C5; furniture store; DM)

> [Retail Energy Forum and the Energy Managers Association] helped us when we were looking into LED lighting and have helped us deal with various tax changes. They also help in lobbying the government about policy. (C5; health and beauty retailer; DM)

Landlords

There was no evidence to suggest that landlords and managing agents were taking steps to enable tenants to be more energy efficient and the terms of a lease were sometimes perceived as a barrier to energy efficiency (see Barriers, p25).

Government

Given that many of the organisations in the sample were classed as 'large' businesses, they were affected by government policies, such as CRC and ESOS. One of the larger chains also spoke about the impact of the increase in the minimum wage. They worked to

a high volume, low margin business model and the energy decision maker felt that an increased wage bill might make it harder to convince senior management to invest in energy efficiency measures as energy will become an even smaller proportion of their operating costs.

Energy decision makers interviewed during the case study visits were asked about government messages in relation to energy efficiency and the impact of these on their organisation. They mainly identified renewables as a concrete example of such policy. A couple of respondents felt that recent government decisions, such as the reduction in the FIT and the introduction of ESOS, signalled a move away from renewables in favour of encouraging demand reduction; in one case, this had resulted in a refocusing of their strategy away from micro-generation.

Other influencers

A director of a small chain recalled taking part in a training day offered via the local authority 10 years previously. It included a presentation from the Carbon Trust (he still had his copy), a presentation from a supplier on LEDs and a free energy audit. This was the trigger for their decision to switch to LEDs – the audit estimated this could result in savings of over £7k p.a. Another organisation referred to equipment suppliers notifying them about new models and the energy efficiency of various products.

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 lower energy chains (cluster 5 organisations) 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 in the fact finder interviews using a list of prompted items derived in part from the context map developed as part of the research framework (see Non-Domestic Smart Metering Early Learning Research reports: Main Report) and partly from the first stage of research. These were explored, as appropriate, in the case study visits. The findings reflect what was reported during the fact finder interviews supplemented from the case study interviews but should be approached with caution as they may not give a full picture of what was being done or why.

Culture of Energy Efficiency

The case study organisations varied in the extent to which their corporate culture contributed to energy efficiency. For the larger chains in the sample, the organisational culture was one of centralised control with systems and procedures in place to try and ensure a uniform approach. One was a chain of discount stores with a business model focused on selling high volumes of low ticket items and all decisions were geared to this. Although energy management was a part of the cost reduction strategy, other factors took precedence. The two smallest chains in the sample adopted a different approach. One

> We follow the guidelines from Head Office and we do what they set out for us to do. We have a staff manual and a health and safety file as well, with all the things that we have to follow up on, the lighting and things like that, making sure it’s all up to date. (C5; ladies fashion retailer; I)

was a family run business in which the culture was quite paternalistic while the approach to energy management was *ad hoc*. The other was a microbusiness in which the owner was responsible for all aspects of management.

Where the role of full-time energy manager (not always given this title) existed, this seemed to be related to the size of the organisation and its energy costs and, consequently, the perceived need to exercise greater control.

Individual store managers also had a responsibility for energy use although this was not always a priority for them. For example, the two large chains that took part in case study visits both provided their store managers with a 'dashboard' which showed how much energy they were using but the energy managers acknowledged that the information was often not being accessed or acted upon, largely because there was no incentive to do so. This was confirmed by a manager from one of the stores.

The larger chains also spoke about holding regional meetings where store managers were briefed on various initiatives, including where appropriate, energy management. These meetings also provided a forum for exchanging ideas about best practice. The largest chain in the sample had involved half their stores in a major engagement programme; it was focused on the stores that between them accounted for 80 per cent of energy consumption.

Energy Efficiency Measures

Lighting was a major consumer of energy for the chains in the sample and consequently, was an area where efforts had often been made to improve energy efficiency. Many of the organisations in the sample had installed or were due to install **LEDs**. This was particularly the case among those organisations that were using their smart meter data (although there was nothing to suggest that such data was triggering the action) and was typically reported to have resulted in a significant reduction in energy bills (see Box 1). Although the data is anecdotal and based on small numbers, it suggests that LED lighting can result in considerable cost savings and a good return on investment, along with other benefits included the life expectancy of the fittings, lower maintenance costs and improved quality of lighting.

The decision whether or not to install a **Building Management System** was often made on the basis of whether or not sufficient savings could be achieved to justify the cost. Most of the small number of organisations with BMS in at least a proportion of their sites, typically those where they felt there was greatest potential to benefit from the investment,

indicated that BMS had been installed as an energy efficiency measure12. They were the largest chains in the sample in terms of the number of outlets. One of them operated on low margins and had trialled BMS in a small number of outlets (including the case study site) but had decided it was not worthwhile rolling it out further. They were unwilling to pay for an external bureau to manage and monitor the BMS and the energy manager was concerned that any energy efficiency savings would be achieved in the first year, and thereafter, the BMS would become another overhead. Another of the organisations was trialling BMS in an outlet before deciding whether to roll it out across all their sites.

Box 1: LED installation case study examples
A chain of jewellery shops reported a 46% reduction in their annual energy bills across their two shops from £9,960 to £5,400. The cost of the investment was recouped in less than three years and the expected lifespan of the LEDs was at least five years.
A furniture store reported a 50% reduction in annual energy bills from £28,800 to £14,400 with the investment being recouped within three years.
A discount chain had invested £1m in LEDs in the last few months; they were typically replacing 50 watt bulbs with 20 watt LEDs and they were working to a ROI of up to two years.
A retailer that rented premises in hospitals where energy was often factored into the rent based on an assumed rather than actual consumption basis, reported that they had been able to negotiate a reduced rent for two new sites on the grounds that they were going to install LEDs, and this is a strategy they were looking to adopt in other sites when leases were due for renewal. They were looking at a two year payback.
The largest chain in the sample said that they typically saw a 23% reduction in consumption following the conversion of a store to LEDs.
LEDs were reported to offer additional benefits including lower maintenance costs and better quality lighting.
The environmental consultant thought that the payback period for LEDs had come down from around seven to two years or less.

A number of other measures had been put in place but by only small numbers. These included:

- a ‘last man out’ switch
- motion sensors/timers on lights in certain back-of-house locations where staff only went occasionally
- new, more efficient air conditioning systems and energy efficient fridges and chillers. For example, one organisation had installed chillers that were 40 per cent more efficient and also had lower maintenance costs

[12] Of the other organisations with BMS, one was based in a shopping mall and indicated that the BMS was provided by the landlord; the other organisation reported that there was a manual BMS in place but did not identify this as an energy efficiency action that they had undertaken.

- solar PV: two organisations had done this although in one case, the motivation was the return on the investment from a Feed In Tariff rather than as an energy efficiency measure.

Key Motivations

The term **key motivations** is used to refer to the key internal motivating factors behind an organisation's energy efficiency efforts. **Other drivers** is used to refer to any other influence on energy management activity. **Barriers** refers to anything that could make it difficult for an organisation to become (more) energy efficient. **External factors**[13] could also have an impact on approaches to energy management. The relationship between these various factors in cluster 5 are summarised in the pathway summary maps (Figure 3, p39, and Figure 4, p40). The same key motivations were found among those organisations within the sample that were using their smart meter data and those that were not (although there were differences in terms of some of the other drivers and barriers; see below).

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.

> Energy is a spiralling cost. We do anything to reduce our energy costs because we don't have the luxury of being able to switch suppliers at the majority of our stores. (C5; ladies fashion retailer; DM)

The most important driver mentioned by all organisations in the sample was to **reduce costs**. While the drive to reduce costs and increase profitability may seem somewhat at odds with the frequent acknowledgement that energy represented a small proportion of total operating costs, any savings may be significant if applied across all outlets in a chain. In one average sized, high street retail outlet, for example, the manager estimated that there were 200-300 fluorescent tubes in

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

use and, as noted above, switching to LEDs often resulted in significant savings being reported (see Box 1).

Government policies such as CRC and ESOS, were having an impact on the larger organisations and providing an incentive to review and reduce their energy consumption. In one case, the role of energy manager had been created in response to the introduction of CRC.

> So whilst [ESOS] didn't change the direction, it definitely changed priorities, because ultimately we had to get that done. Otherwise you know, we didn't want brand risk through not doing it and being publicised for not being compliant and also possibly a fine as well. (C5; health and beauty retailer; 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. Some of the larger organisations with well-known brands had made public commitments (for example on their website) to reduce their energy consumption and CO_2 emissions. Failure to do so, it was felt, could have negative consequences for their brand.

In the case of smaller organisations, 'doing our bit for climate change' often came down to the personal values of the owners and/or senior management and, in this sense, they were acting as much as 'responsible citizens' albeit through the vehicle of their business.

Having said this, there were some instances where an organisation claimed that these were important reasons behind their actions but it was sometimes difficult to see a clear link between such statements of intent and how energy was being managed. For example, although a number of organisations had an environmental policy, not everyone responsible for energy management knew what it said about energy use. Indeed, the research team felt that across all clusters, there was an element of respondents providing what they may have considered to be the 'correct' answer, especially in relation to the priority they attached to reducing energy consumption. The quote is from a respondent who, earlier in the interview had said that reducing consumption and being energy efficient was a 'high' priority.

> I don't think we're particularly a high user of electricity, so I suppose in that respect it sits fairly low in our priorities. You know, a lot of the time we just consider it as a cost you incur and there's not an awful lot you can do about it, whether that's right or wrong, that's something you just think about and you tend to concentrate on other variables and ones which are more of a percentage of your overall turnover than say electricity usage is. (C5; discount store; DM)

Other strategic reasons, such as to gain a competitive edge, and the influence of **supply chain requirements** were deemed to be relevant by only a small number of organisations in the sample. For example, the business model of one of the discount chains meant that any uplift in margins brought about by reducing energy costs was to be welcomed. The energy consultant made the point that in his experience, international brands that were interested in establishing and maintaining their reputation for social and environmental responsibility were beginning to insist that their regional operations and all parts of the supply chain adopted certain policies including those related to energy.

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 in the impact of other drivers depending on whether organisations were using their smart meter data which are summarised below (highlighted in red in the pathway maps on p39 and 40).

- **Energy price increases/contract renewal:** the external factor of energy prices, along with contract renewal**,** had been a trigger in the past, and for many, was still a key trigger; for example, many of the organisations in the sample were working with energy brokers to source and negotiate energy contracts. However, recent stabilisation/falls had sometimes dampened the perceived need for energy efficiency. For example, the energy manager of one of the discount stores spoke about how the current fall in energy prices made it more difficult for him to persuade senior management to invest in energy efficiency because they worked to an ROI of two years and when energy prices were falling, it took longer to achieve a return.
- The **purchase of new or replacement of existing items of equipment** and **moving or refurbishing premises** were both frequently mentioned as events or occasions that could trigger a review of energy use, just as they were across all clusters.
- **Cross-site comparisons** were a characteristic of chains (clusters 1 and 5); although there were a few multi-site organisations in clusters 7 (higher consuming, employee only sites) and 8 (offices), the samples were too small to form a judgement about cross-site comparisons within those clusters. Those organisations in cluster 5 that were using their smart meter data were able to monitor their sites using the data; where smart meter data were not being used, cross-site comparisons were being made using energy 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 those organisations that were using their smart meter data were being prompted to think about their energy consumption by a wider range of other drivers.

- **Smart meter data:** not surprisingly, information from the smart meters had enabled them to do things which they previously were unable to do (see Users of Smart Meter Data, p32)
- **Motivated, knowledgeable, empowered decision maker:** the organisations that were using their smart meter data were more likely to employ a full-time

energy manager and/or to involve a small team of head office staff in the process of energy management.

- **Head office targets**: although some of the non-users of smart meter data had set themselves energy targets, this was more characteristic of the smart meter data users. Targets ranged from the owner of a chain of two jewellers setting himself a personal target (non-user), to a larger chain setting each shop a new weekly target based on their last four weeks usage (user). In some cases, there was not a specific energy target but an overall operating budget set for each outlet.

> Here we're trying to keep the bill below £100 a month, in the other shop we're trying to keep the bill under £350 a month. (C5; jeweller; DM)

- One of the motor dealers in the sample (a user of smart meter data) had a range of different manufacturer franchises, one of which set an energy target. Although the other franchise owners did not, the organisation was applying the best practice procedures provided by the first franchise owner across all its outlets.
- Only a small number of these organisations had rewards linked to their energy targets. In a couple of cases, this was in the form of a site manager/staff bonus. In the case of the car dealership franchise, the total sales percentage was increased by 0.25% if a dealership met the franchise owner's energy target.
- The view of the energy consultant involved in one of the case studies was that setting targets could be very effective and he expected this to happen with the case study organisation he was working with once the findings of the audits conducted for ESOS had been acted upon. Although the organisation was not currently using its smart meter data, the consultant expected that they would do so going forward. He envisaged that regional managers responsible for the 'bottom line' in their area would be motivated to make reductions in energy use.
- **To take advantage of funding streams, subsidies or award schemes:** although mentioned by some decision makers during the fact finder interviews, there was less evidence of this during the case study visits. In terms of award schemes, one of the case study organisations was accredited to the Carbon Trust Standard[14] and displayed the logo on its website.
- **Competitor/stakeholder pressure**: this was also mentioned by some decision makers during the fact finder interviews but did not feature very much in the case studies. In terms of competitor activity, the energy manager from the largest chain spoke about attending meetings of the Retail Energy Forum as well as the Energy Managers Association. A number of their competitors also attended and there was some sharing of best practice ideas by members at these meetings.

[14] Carbon Trust awarded certification of an organisation's achievements in taking action on its environmental impact and tackling climate change by managing and reducing greenhouse gas (CO2e) emissions

Drivers that characterised non-users of smart meter data

There was one further driver that was frequently mentioned by organisations in the sample, in particular, among those not using their smart meter data:

- **Suggestions from external outside organisations**: In some cases, this was in relation to energy consultants but there were also examples of trade and buying groups influencing behaviour. The two smallest chains in the sample spoke about help and advice they had received from the buying groups to which they belonged. For example, the Company of Master Jewellers (CJM) arranged a session on lighting which was attended by the owner of a small chain of jewellery shops which led to him installing LEDs. CJM also helped source the lights.

While energy audits often identified opportunities to reduce consumption, typically by switching to LED lighting, not all organisations had acted on the recommendations.

Although users of smart meter data were also working with external organisations, the difference seemed to lie in the extent to which they were depending on them for energy management information and advice. This might reflect the levels of in-house expertise.

Third party recommendations was not usually identified as a trigger across other clusters. For cluster 5, it may, in part, be in response to meeting ESOS requirements but it might also suggest that trade bodies in the retail sector are more active.

Barriers

The main barriers to energy efficiency are summarised below and in the pathway maps (see Figure 3, p39, and Figure 4, p40). With a few exceptions, the barriers applied to most, if not all organisations in the sample and across all clusters, irrespective of whether they were using their smart meter data.

Common barriers

The first three barriers described below were found in most, if not all, clusters:

- **Staff compliance:** all organisations in the sample relied on staff to use energy efficiently and, at the same time, they acknowledged that this was an on-going challenge. Many of the organisations did not have a formal policy relating to staff use of energy, instead there was an expectation that staff would use it wisely with verbal encouragement being used to encourage this. Even where there was some centralised control, it was not always possible to control the use of appliances such as kettles or stop staff changing settings on BMS or heaters. The energy manager of the largest chain in the sample spoke about how this was especially challenging in larger stores where staff were less likely to take ownership of the issue.

- **Condition of the building:** as noted earlier, many of the organisations were operating from older, less energy efficient sites which meant that actions to deal with this could be seen as prohibitively expensive (see Condition and management of buildings, p10).
- **Buildings are leased, not owned:** operating from leased/rented premises was a barrier in a number of ways. Firstly, it militated against investment in longer term/more expensive energy efficiency measures. Many of the organisations had leases of 10 years or less and this could be a barrier for any investment where a return was only achieved after several years.

> I'd love to have solar panels because this building is in the sun, in the summer we could probably run this building for free. But you need the landlord's permission and I'm sure he'd not be willing to. [ ] If this was a building we owned this would be a serious option for us to look at, we'd be quite interested in that. I know that it might take us 10 years to get our money back on it but I think it'd be worth the investment. (C5; jeweller; DM)

> It obviously makes it quite difficult if we don't own the shop, or if it's part of a bigger shopping centre, because then there are all sort of things that are not in our control. (C5; health and beauty retailer; I)

Another consequence of being a lessee was that tenants often had to return the building in the same condition as when they first occupied it, which could mean having to remove energy efficient equipment they had installed such as air conditioning. The largest chain in the sample aimed to get round these barriers by negotiating longer leases, typically of the order of 100 years. Nevertheless, they also recognised that, as a tenant, there were a number of things outside their control.

Landlords might also impose charges and legal fees may be incurred where a tenant requests permission to introduce energy efficiency measures. One organisation wished to install air conditioning in one of their stores; however, the landlord wanted to charge a fee to allow them to install the condensing units on an external wall. The business owner was unwilling to meet the charge and, instead, the units had been installed in an upstairs room which was used as a staff canteen. The units blow out hot/cold air which meant they were not switched on until the afternoon once staff had had their lunch break.

The chain with most of its outlets based inside hospital premises faced a number of specific challenges. In some units, their energy costs were included within their rent and reflected the amount of energy they were expected to use; they paid a fixed amount irrespective of how much they actually used. In these cases, there was no real incentive to reduce consumption. They also had no control over the choice of supplier/tariff. In some other locations, there was a metered supply although the meter was 'owned' by the hospital. The hospital billed the landlord/managing agent who then billed the tenant. In these cases, there was an incentive to reduce consumption as they were charged on the basis of their actual consumption, although once again, they had no control over choice of supplier/tariff. In a few cases, they 'owned' the meter and energy costs were based on actual consumption and they had control over choice of supplier/tariff. In some situations, such as shops located in shopping malls, some aspects of energy were controlled by the landlord. The owner of a small chain had tried to persuade the managing agents of the shopping mall in which one of his shops was located to install LED lighting in the common parts but he had not been successful.

> The service charge is about £10k a year for the electricity for the shopping centre. And the main reason for that is that they've got these massive great big halogen light bulbs that are about this big, in the walkway underneath there. And I'm trying to pressurise them to get them changed into an LED thing. (C5; jeweller; DM)

One respondent commented that a fairly common problem is where a landlord had divided a larger building into smaller units without splitting/sub-metering the services. In the situation where one of the tenants is responsible for paying the energy bills, it may not be clear that the meter readings included energy used by other occupants of the building.

A further issue was that arrangements relating to leases were often the responsibility of a different part of the organisation and those responsible for energy management may have little, if any input.

> It will be the estates team that deal with leases rather than us. [ ] The estates team will probably work with them when doing all the negotiation side and signing the lease to make sure that's there and it meets all the mandatory requirements. (C5; health and beauty retailer; DM)

Barriers that characterised cluster 5 organisations

Three further barriers were identified that applied, in particular, to organisations in cluster 5:

- **Planning restrictions:** this barrier came through particularly strongly. Outlets were often located on the high street where local planning restrictions sometimes applied or

they might be in listed premises. For example, there may be restrictions on installing double glazing or solar panels.

- **Open door policy:** a number of the chains operated an approach whereby the front doors were permanently open when the store was open to the public with consequential heat loss. Where heaters were installed above the doors to create a cushion of warm air as customers entered, this added considerably to the store's energy consumption. As one energy manager observed, where the over-door heaters were not linked to the air conditioning system (as was the situation in most of their stores), during the summer months, the heaters and the air conditioning system might be working in opposition.

> The company's open door policy (to make customers feel welcome) makes it difficult [ ] to manage energy use at the store. It requires that we put over-door heaters above the door which contribute a lot to energy usage. (C5; discount store; DM)

- **Lack of resource:** not only was this a potential barrier for the smaller organisations in the sample, the larger ones also commented that it could be difficult for them to find the time to deal with all the energy efficiency issues that might arise. For example, the largest chain in the sample spoke about relying on exception reporting to identify the 10 worse performing stores. The energy management data provided to the case study store suggested that the air conditioning was operating overnight but, as it was not one of the worse performing sites, this was not something that had been flagged up for further investigation. A potential downside of centralised control, especially for larger chains, was that the decision makers may have limited knowledge of individual sites.

> There are four of us in the team so we can't look at all the stores we've got. We'd love to, it would be fantastic, but it's not possible. (C5; health and beauty retailer; DM)

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

Three further barriers appear to apply, in particular, to the organisations in the sample that were not using their smart meter data (but care is needed in interpreting these differences given the small sample size):

- **Energy costs, payback period and ROI:** non-users of smart meter data were more likely to identify the payback period and the return on investment (ROI) as a barrier. This, in turn, was a function of energy costs being perceived to be too small to make it worthwhile (see Energy as a proportion of total operating costs, p13). When attitudes to ROI were explored during the course of the case study visits, this revealed that different organisations were working to widely differing time periods. The discount store chain with very low profit margins worked to an ROI of two years and given the fall in the cost of LEDs, this meant they were now switching to this form of lighting in their stores. Another chain worked to between three and five years, while the largest chain in the sample worked to a seven year ROI. One of the energy consultants commented that in his experience with retail chains, the payback period they worked to was

typically around two years which meant that greatest savings would mainly come from installation of LEDs and the education of staff to use energy efficiently.

- **Perceived lack of control over energy use/limited scope to reduce consumption:** the organisations that were not using smart meter data for energy management purposes (other than for billing) felt that over and beyond the steps they had already taken, such as switching to LED lights, there was little else that they could do to become more energy efficient. Perhaps not surprisingly given the range of barriers to greater energy efficiency, many of the organisations in the sample did not feel they were fully in control of their energy use (see Perceived level of control over energy use, p13).

> Because most of the energy we use is essential to the running of the business. We have efficient lighting, heating and cooling so there isn't much else we can save. (C5; furniture store; DM)

- **Lack of awareness of smart meter data/ability to access it/know how to use it:** These organisations also lacked the means to identify unusually high usage in a timely manner.

On balance, those organisations not using their smart meter data were more likely to identify a wider range of barriers; this, along with the insights gained from the case study visits, suggested that they were less in control of energy use compared to those organisations in the sample that were using their smart meter data. This is explored in greater detail in the next chapter.

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. The main reason for not using smart meter data was due to lack of awareness that the data existed or how it could be used for energy management.

Motivation for Installing

Most of the organisations taking part in the research had smart meters installed at one or more of their outlets (smart meters had not necessarily been installed in all outlets across a chain). Many of these had been requested by the organisation itself (via head office) although in a number of other cases, the smart meter had been installed at the instigation of the energy supplier. All, bar one, of the users of the smart meter data had asked for smart meters to be installed.

> It was put in as part of an early action metric for CRC. At the time it was a case of, if you did that early action metric you could earn some more points for CRC. That justified it. It was a big investment, it was about £40,000 at the time. (C5; discount store; DM)

> It's become an awful lot easier to do so and I think because, dare I say it, that's because people have had to do measurement for CRC. There is an awful lot of measurement that has gone on for that and there has been for about five years. Now there's even more companies being brought in, so the CRC when it first started, it said it was the top 5,000 businesses and it was probably about 3,500 to 4,000 in reality. If you then take the ESOS, that includes 12,000 businesses; you're getting the next tranche through and I think it's the realisation of, 'oh, right, we've got to actually measure this stuff'. (C5; sportswear and equipment retailer; EC)

One of the chains reported that they began installing smart meters in response to CRC; another organisation that did not currently have smart meters was planning on installing them, at least in part, in response to ESOS. The energy consultant agreed that such schemes had given impetus to the use of data from smart meters especially where the requirement to report did not just apply to the UK but across Europe and further afield.

Although the numbers are small, those organisations using their smart meter data to manage their energy often had an environmental policy in place and had undertaken an energy audit.

Installation Experience

Among the case study sample, there were no reported instances of problems with smart meters either at the time of installation or subsequently. One respondent reported that, having had their smart meter installed by one provider, when they switched to a different supplier, the smart meter was also changed as the new supplier could not read it[15].

Non-users of Smart Meter Data

Some of the organisations in the sample with smart meters were not using the data to manage their energy other than to ensure they received accurate bills, which was the main perceived benefit. In at least one case, the supplier had installed a smart meter in response to the organisation raising concerns about estimated bills.

A further possible benefit of having a smart meter mentioned by one case study respondent was receiving more competitive quotes.

There was no recall of information being provided before/during/after the installation process by the case study organisations that were not using their smart meter data. Indeed, some respondents had been unaware that the smart meter data could be accessed or

> I didn't realise it was for us particularly, I thought it was just for the energy companies. That's the way it was always profiled to me and it basically just gave them the readings so they could give accurate information when it came to billing. (C5; furniture store; DM)

> When you phone round for quotes, you get cheaper quotes if you have a smart meter than if you don't. (C5; jeweller; DM)

> If they had explained the benefits of it and what it could be used for. You know whether they could say, 'you are looking at it and you notice a sharp spiking at this time, then perhaps you want to look at what's happening around that time and see whether it could be avoided', and that sort of stuff. (C5; furniture store; DM)

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

how it could be used to inform energy management decisions. When this was explained, in at least one case, the respondent assumed they would need to access the meter to obtain the data.

> And then, for reasons that I've not been able to find out [ ] they took that facility away. I phoned several times and asked, 'well why can't I have it?' And they say, 'well, we have the data but at this moment in time we're not able to give that to our customers', which seemed absolutely crazy because [ ] why have a smart meter if I can't access that data? (C5; jeweller; DM)

Users of Smart Meter Data

A similar proportion of the sites with a smart meter were using the data to manage their energy; another had been using it until the service was withdrawn by the energy provider.

> We have access to an online portal from our energy provider, which is very temperamental and doesn't always work. We are also sent a paper report with our monthly bills. (C5; clothing retailer; DM)

Among the case study sample the smart meter data was being provided either by the energy provider or by an energy data management service provider. In most cases, the data was accessed via a web portal with the option of running/ downloading various reports. In one case, it was supplied in the form of an Excel data file. The reported quality of the web portals varied.

The two larger chains were accessing the data on a daily basis; others were accessing it on a weekly/monthly basis.

> On a Sunday we were using a lot of energy and we couldn't work out why but I think it was because we had a fridge that wasn't very economical and I think the other thing was we have an electric water heater upstairs and the policy is now that we turn it off on the Saturday night so it's not running. You could actually see the little peak every hour or so that it was kicking in and heating up. It was probably about 15% of what we used [on a working] day but as we weren't here that seemed a lot to be wasting. [ ] When we first opened we used to only leave some of the lights on in the shop and we decided, once we'd got the smart meter actually, we decided not to leave them on because that was wasting quite a bit of money. (C5; jeweller; DM)

Data provision and how it was put to use were explored in some detail in the two case study visits where the organisation was using its smart meter data. The key findings are summarised in Box 2.

The energy consultant who took part in one of the case study visits described how his company took the smart meter data and converted it into charts and graphs for different periods of energy usage, providing clients with these to interpret themselves and/or giving guidance. One of the outputs that he thought companies found most useful was a comparison of their sites with a 'normal' profile. A typical finding would be that equipment was operating earlier in the day than needed and went on longer; for example, escalators might be switched on well before the shop was open to customers.

With one exception, all of the case study organisations that were using their data reported that smart meter data had enabled them to do things which they previously were unable to do, including:

- identify stores that were using most energy and take action to lower use
- identify unusual patterns and/or trends in consumption
- identify equipment that had been left on unnecessarily including usage when the business was closed
- identify and, if necessary, repair/replace faulty equipment
- measure the impact of changes in energy use/management
- look at how energy consumption was related to weather patterns
- day plus one data allowed actions to be taken and for the impact to be gauged very promptly
- monitoring and tracking energy savings against an annual target across the estate
- provision of data that can be used to support an argument or a case.

> One of the guys who worked at [monitoring bureau] found this store that was over consuming massively and it was basically something to do with their HVAC system. It wasn't faulty but it wasn't running as efficiently as it could be. So basically they went in and did some optimisation work with that. [ ] Off the top of my head I think it was about £5000 investment and it paid back in under a year. (C5; health and beauty retailer; DM)

> When we go through the legislation stuff, we try and feed back into our consultations, with the lobbying, [ ] without that data we wouldn't be able to back any of our arguments up. (C5; health and beauty retailer; DM)

Box 2: Smart meter data provision and use

Example 1
The chain was working with two service providers:

- one was responsible for energy procurement, energy trades, bill validation, changes in tenancy and providing reports for individual stores, including setting weekly targets; they consolidate the data by region, area and individual store
- the other was responsible for managing the individual meters and their website provides data about consumption based on MPANs

Regional, area and store managers received weekly reports via email which included a new weekly target set at just below the average consumption for the previous four weeks. However, energy consumption was not a KPI and the energy manager acknowledged that the reports were not a priority. The energy manager focused on **exception reporting** and those sites which had much higher than expected consumption.

He had visited the case study site a week before the interview to investigate higher than expected consumption and discovered that the temperature setting of the two over-door 12 kW heaters, which should be set at 21^{o,} had been set to 37^{o}. Although the settings are supposed to be 'locked down', he assumed a member of staff had discovered how to unlock the controls and had changed the settings because (s)he was cold. He reset the temperature and within 24 hours he recorded a 30 per cent 'step down' in consumption.

Example 2
This chain worked with a larger number of external organisations that provided a range of services including procurement, energy provision, meter reading and maintenance, BMS, bill validation and dashboards and reports.

Their BMS bureaux had an energy reduction target written into their contracts as a KPI and one of their roles was to identify and, where possible, rectify excessive consumption. Another supplier was responsible for analysis and reporting which included monthly budget reports and weekly usage reports for every store. In addition, the 10 worse performing stores were identified. These were referred to the BMS bureaux to see if the cause can be identified and, where appropriate, adjustments were made remotely. Where this did not reveal the cause or the solution, an engineer visited the store to establish the cause.

Monthly divisional and regional reports were produced showing £/m2/trading hour.

Each store manager had access to weekly data via an online web portal. With the exception of the 10 worse performers, the onus was on the individual managers to keep energy use under control. The weekly report for the case study site identified excessive consumption when the store was closed, probably due to the air conditioning staying on (see Figure 1). The store was not identified as one of the 10 worse performers and the manager had not taken any action.

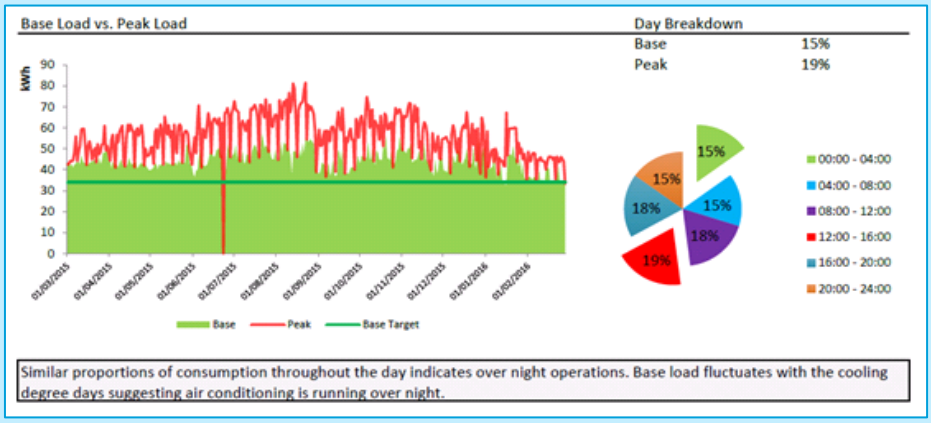

Figure 2: Example of weekly reporting at store level

Non-user Reactions to Products and Services

Towards the end of the case study visits, respondents were shown a range of material to illustrate how smart meter data could be used to help make energy management decisions. Not everyone was exposed to all of the materials; this depended in part, on whether they were using their smart meter data as well as the amount of time available.

Methods of accessing data

Respondents were shown information about how smart meter data could be accessed, including different formats, such as via smart phone apps, laptops, tablets, etc. (see Figure 5, p47). Respondents' preferences varied but the ability to access data via a web portal was often the preferred approach. However, in some cases, the requirement to log onto a website for something which was considered to be a low priority, was a barrier, and the preference was for important or useful information to be drawn to one's attention, for example, by means of email.

> I think personally the ones where you have to log in and get the information, you would probably tend not to do, given everything else that goes on within a business. [ ] What I'd quite like to have is an email each week and I could just click on it and see what the usage was during the day or that week and where it's spiked and that sort of stuff. (C5; furniture store; DM)

An 'in store' visual display was of interest to the smallest organisation as a method of engaging staff with energy consumption but larger chains felt it had little value, especially where energy management was highly centralised.

> When we first had it, [I was accessing it] probably three times a week, probably for three to four months. [ ] But it is a game of diminishing returns in the sense of once you've identified things that were costing you money and sorted it out, then there's not much more to do. (C5; jeweller; DM)

Critical window

There was an expectation among some non-users that smart meter data was something one might look at when the service was first available, that this might result in some changes in how energy was being used, after which, one might only look at the information periodically. This had been the experience of one of the users.

Expressing savings as a monetary value

An energy consultant, who was working with one of the case study organisations, indicated that in his experience any savings that result from energy efficiency measures need to be communicated in monetary terms and not, for example, kWh or CO_2 equivalents. A similar point was made by the energy manager of a large chain.

Added value services

Respondents were also shown some examples of **pattern recognition** software that can be used to identify opportunities for saving energy (see, for example, Figures 5-7, pp48-49). This was often seen as not relevant or 'stating the obvious' (e.g. checking to see that timers were changed at the beginning and end of BST). This was particularly true of smaller chains where they felt they would be able to tell if the heating was coming on in the middle of the night or if staff were turning on the air conditioning unnecessarily. In contrast, the energy manager from the largest chain commented that 'pattern recognition' was something they expected their third party data collectors/monitors to be doing as part of the service (rather than an additional form of analysis they might carry out themselves).

The energy consultant that was working with a number of international retail chains expressed a similar view that simple bar charts showing, for example, their consumption over time, were as much as many clients wanted instead of more complicated outputs which take into account other factors such as external temperature.

In contrast, **device disaggregation** was seen as more tangible and relevant as the information drills down and highlights where action is needed (see Figure 8, p49). It was likened to sub-metering by both energy managers in the two larger chains which both had trialled but decided was not cost effective. Device disaggregation was seen as possibly representing a cost effective alternative and there was considerable interest in finding out more about this.

> It's taking it from that next level isn't it, from the level of, 'oh here's the bill', and then 'here's the half hourly data', but 'we'll also tell you what actual appliances are working'. That is joyous to us as an energy manager. (C5; discount store; DM)

The suggestion of setting staff **energy saving targets** and providing regular feedback about how well these were being met (see Figures 9-10, p50) was felt to be unnecessary or too labour intensive by most respondents. Only one of those taking part as a case study had put a staff engagement programme in place and their approach to reporting the outcomes was similar to that used in the stimulus material.

The energy consultant was also aware of chains that set targets and shared information on individual stores' performance. To motivate each outlet, he felt it was important that senior staff or energy consultants retained by the organisation visited and engaged with staff on the ground; the ideal, he felt, was for the store manager to engage with data at a simple level. However, he made the point that it is unrealistic to expect continuous improvements.

Methods of engagement

Reactions were explored briefly to the idea of having access to **energy saving mentors** (someone with experience of running a similar business where they have achieved affordable energy savings); the mentor would offer information and advice about how to use smart meter data to make savings), **local networking** (local businesses coming together to share their experiences and discuss how best to save energy), and **energy saving case studies** (based on other similar businesses showing how they have reduced their energy consumption) (See Figure 11, p51). Each of these ideas had limited interest for some respondents and there were examples of similar methods of engagement being effective, for example:

- both smaller chains in the sample had switched to LED lighting following a presentation of their benefits and had help sourcing LEDs by their buyer groups. One was a member of the local Chamber of Commerce and was happy to share his experiences with other local businesses if invited to do so; the other was an active member of the local traders' association and felt this would be a good vehicle for sharing information about energy efficiency
- the energy manager from the largest chain was an active member of professional networking groups related to energy and benefitted from the sharing of best practices.

Willingness to pay for added value services

There was a reluctance to pay for added value services unless the savings were guaranteed to exceed the cost, as well as the effort needed to make the required changes. One suggestion was for a payment by results approach.

Conclusions

Summary of Key Findings

Summary Pathway Maps

Two pathway maps were developed for cluster 5 to illustrate how different factors influenced energy management, one based on those organisations that were using their smart meter data to manage their energy (see Figure 3), 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. Factors highlighted in **red** indicate things that may discriminate between users and non-users of smart meter data from cluster 5. These maps need interpreting with care as they are based on small numbers of organisations.

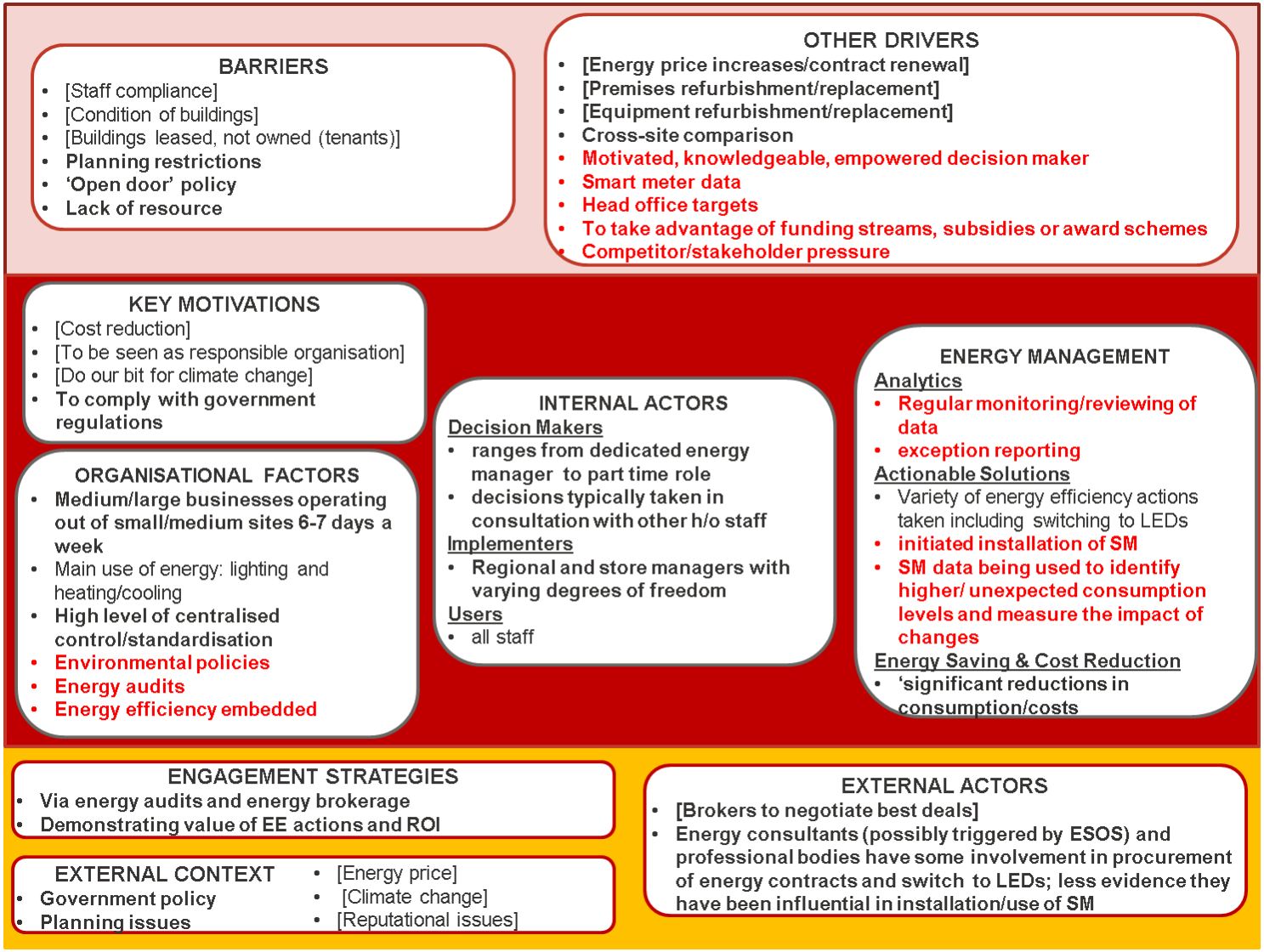

Figure 3: Users of smart meter data pathway map

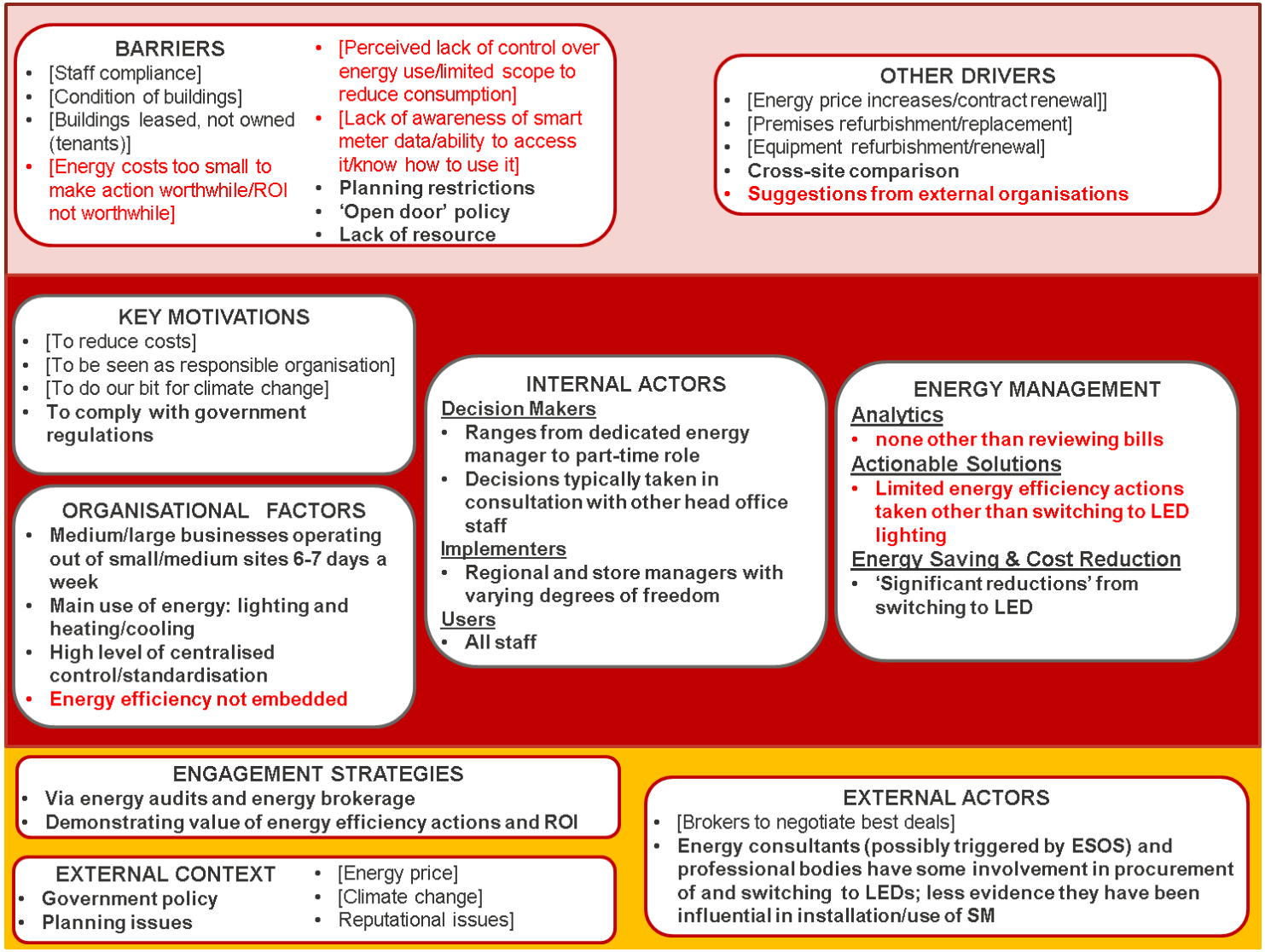

Figure 4: Non-users of smart meter data pathway map

Cluster specific findings on energy use, management and associated influences

The larger chains in this sample of lower energy consuming, customer facing chains shared a number of characteristics with the larger chains in cluster 1 (higher 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.

Lighting was one of the main uses of energy and several organisations reported achieving significant reductions in energy use by switching to LEDs; indeed, this was the most common (and in some cases, the only) energy efficiency action that had been taken (see Box 1: LED installation case study examples, p20, for some examples). Some of the energy managers in the sample, including those from larger chains, reported that they lacked the resources to identify and follow up all instances of higher than expected energy consumption. Instead, they relied on exception reporting to identify where best to focus their efforts. This appears to be different to what was happening among the cluster 1 chains and it may reflect the differences in energy intensity. Cluster 1 chains were higher energy consuming and therefore the potential impact of an outlet using more energy than was necessary was likely to be greater.

Several of the organisations reported operating an ‘open door’ policy on the grounds that this encouraged more people into their stores. It was acknowledged that this could result in energy efficiencies, especially where over-door heaters were used to create a cushion of warm air when someone enters the store (and even more so in the summer where air conditioning is also in operation).

There was a notable higher level of engagement with energy consultants among some of the organisations in this cluster. This was possibly as a result of ESOS which was due to come into effect shortly after the research was carried out. There was also some

engagement with professional bodies, although, as with other clusters, the number of organisations that had received information and/or advice through this means was small.

A number of the organisations reported that energy efficiency actions were sometimes restricted due to planning issues (e.g. not being able to replace older windows with double glazed units). Although planning restrictions were not identified as a barrier by the cluster 1 organisations in the research, this may reflect differences in the research approach between stage 1 and 2. Given that organisations in both clusters were largely operating from similar, high street premises, planning restrictions are likely to apply to both clusters.

Differences between users and non-users of smart meter data

As with all other clusters, the main reason why organisations with smart meters were not accessing and using the data was a lack of awareness that this was possible.

Where smart meters had been installed by the energy provider, the reason they gave for doing so was the benefit of having accurate bills. There was no evidence of energy providers or meter installers attempting to engage customers with the other benefits of smart meters.

With one exception (a micro business that identified a number of uses of energy when the stores were closed and took steps to remedy this), organisations that were using their smart meter data to help them manage their energy had not been prompted to do so by having the meter installed. They recognised the importance and value of energy efficiency and smart meters were one of the tools that enabled them to realise this. The smart meter data had, in nearly all cases, enabled the organisation to manage its 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 (see, for example, Box 2: Smart meter data provision and use, p34). Key differences between the users and non-users of smart meter data within the sample are summarised in Box 3 below.

Box 3: Key differences between users and non-users of smart meter data in Cluster 5

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

Users	Non-users
Tended to have an environmental policy **Tended to have had energy audits carried out** Energy efficiency was embedded in the corporate culture Often employed a motivated, knowledgeable and empowered decision maker Tended to review energy efficiency in response to a wider range of other drivers, triggers and enablers Fewer barriers to energy efficiency Smart meters installed at organisation's request 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	**Tended to rely on external organisations for energy efficiency recommendations (in part, in response to ESOS)** **Other than converting lights to LEDs they often had introduced fewer energy efficiency measures** Energy efficiency was not embedded in the corporate culture to the same degree Decision makers were often not involved in energy management on a full-time basis Perceived additional barriers to energy efficiency including expected ROI and felt there were fewer opportunities to make savings Relied on energy bills to review energy consumption including cross-site comparisons

Although the qualitative nature of the data means it is not possible to establish a 'cause and effect' relationship between these various behaviours and whether or not smart meter data were being used, in the judgement of the researchers, the most likely interpretation is not that the installation of smart meters came first and that the differences followed from this. Instead, those organisations that had themselves installed smart meters did so because they were already striving to be energy efficient, and had a corporate culture that promoted this; smart meters were one means to this end. In contrast, non-users of smart meter data were yet to be convinced of the value and benefits of investing in energy efficiency measures beyond those that offered cost savings with a good return on their investment, such as converting to LED lighting. They also lacked the same degree of in-house experience and expertise in energy efficiencies and were more reliant on external providers.

Research Implications

The Importance of Size

Most of the organisations in the cluster 5 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 1. In a similar way, smaller organisations in the research sample, including those in clusters 1 and 5, shared many characteristics in common[16] 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.
- However, even in the largest organisation in the sample they were unable to give attention to all their outlets. One strategy being adopted was to rely on exception reporting whereby outlets with much higher than expected consumption were being targeted.
- Some of larger organisations were using BMS as part of their energy management strategy. However, it was noticeable that this was often only in outlets where worthwhile savings from reduced energy consumption could be achieved and not across all their sites.
- 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.

- Organisations need to be aware that they can access and use their smart meter data; some are likely to need further support if they are to realise the potential of the data.
- There was no single preferred method of accessing smart meter data; access via a web portal was often the preferred approach. For some, the need to log on to a web portal could be a barrier to on-going engagement.

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

- For some non-users of smart meter data there was evidence of a critical window around the time a smart meter is installed, both in relation to people being motivated to engage with the data, but also an expectation that any energy efficiency actions would be implemented and, thereafter, there would be little need to continue monitoring the data. Although the research was not set up to address this specific issue, the impression formed by the research team was that the sooner interventions designed to encourage organisations to engage with their smart meter data were in place, the more likely they were to be effective.
- There was evidence that some form of exception reporting (for example, alerting decision makers about unusual/unexpected consumption via email or SMS) may be a more effective method of engagement for some organisations, instead of monitoring data on an on-going basis.
- To maximise effectiveness, it would be helpful for exception reporting to not just focus on the 'problem' (e.g. excessive energy is being consumed) but also on the 'solution' (ways of addressing the excess consumption); 'device disaggregation' appears to offer considerable promise in that it drills down to the level of individual types of appliances.
- Feedback about energy savings is likely to be more effective if expressed in monetary terms rather than kWh or CO_2 equivalents.
- Organisations are unlikely to want to pay for 'added value' services unless the savings these give rise to are greater than the cost of the service.

Appendices

Research Questions

Box 4: Research Questions

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

Stimulus Materials

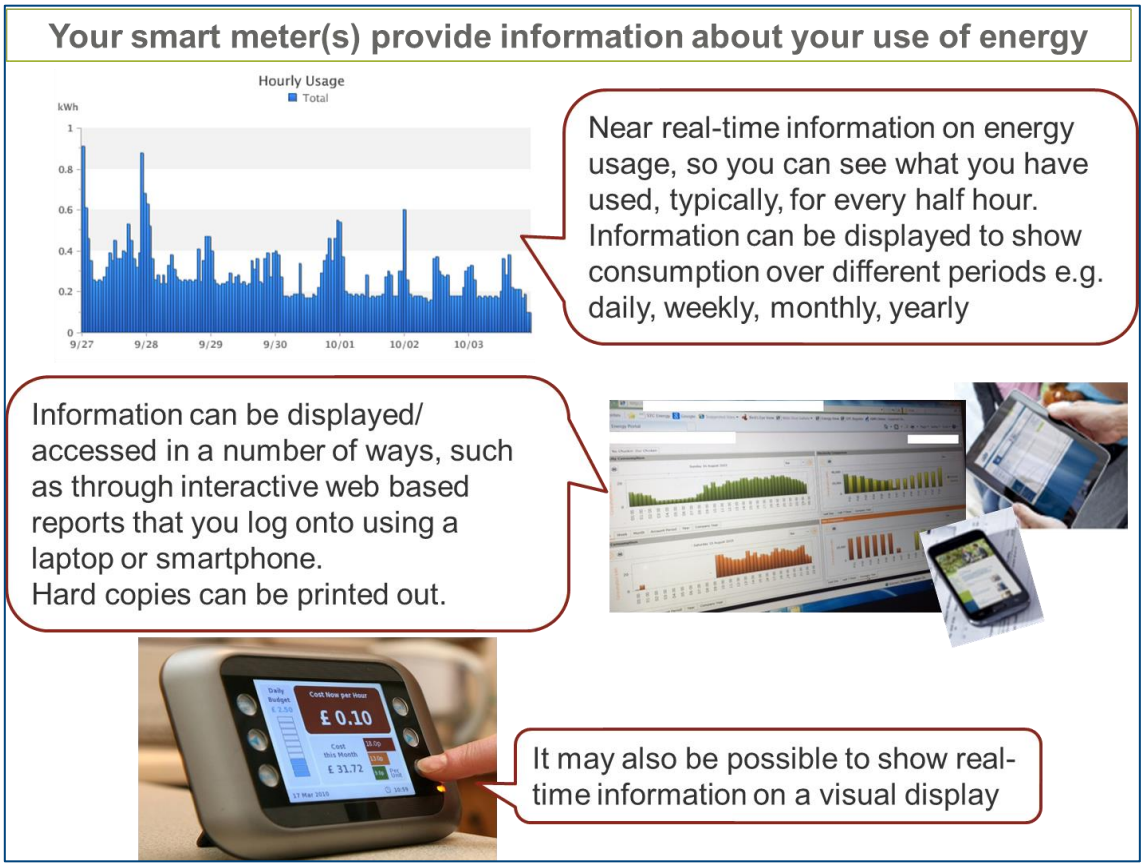

Figure 5: Methods of accessing data

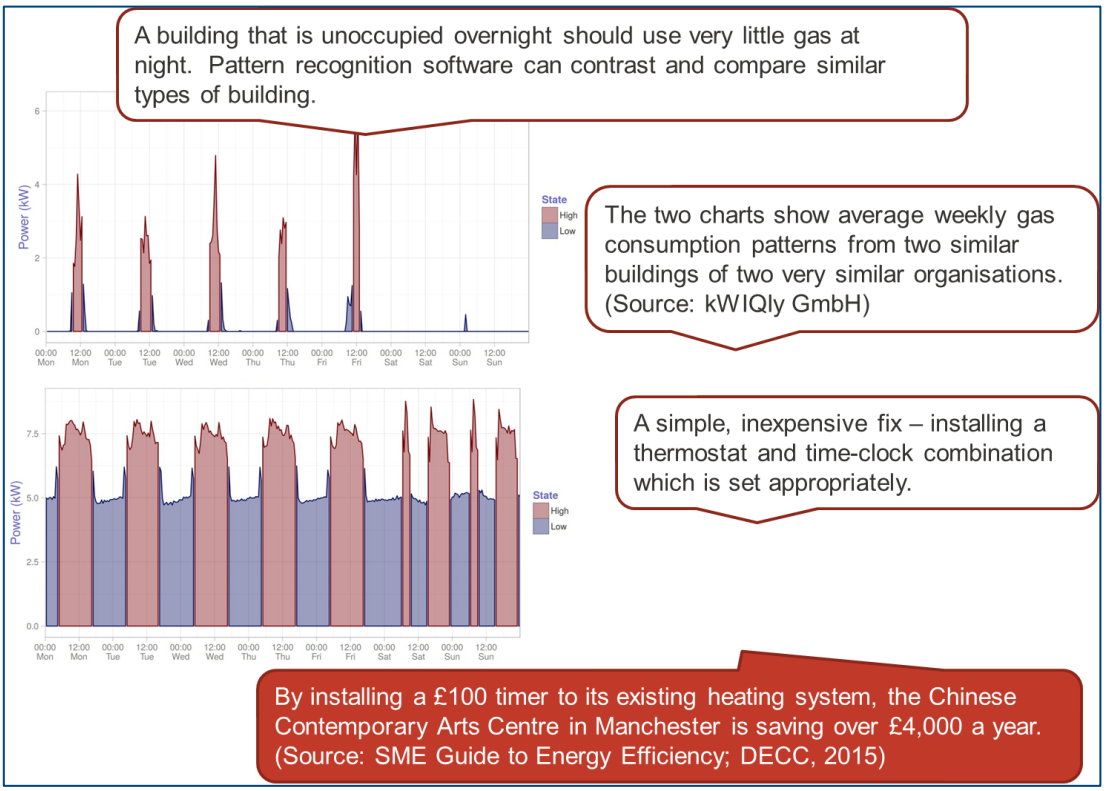

Figure 6: Example of pattern recognition (heating vs. external temperature)

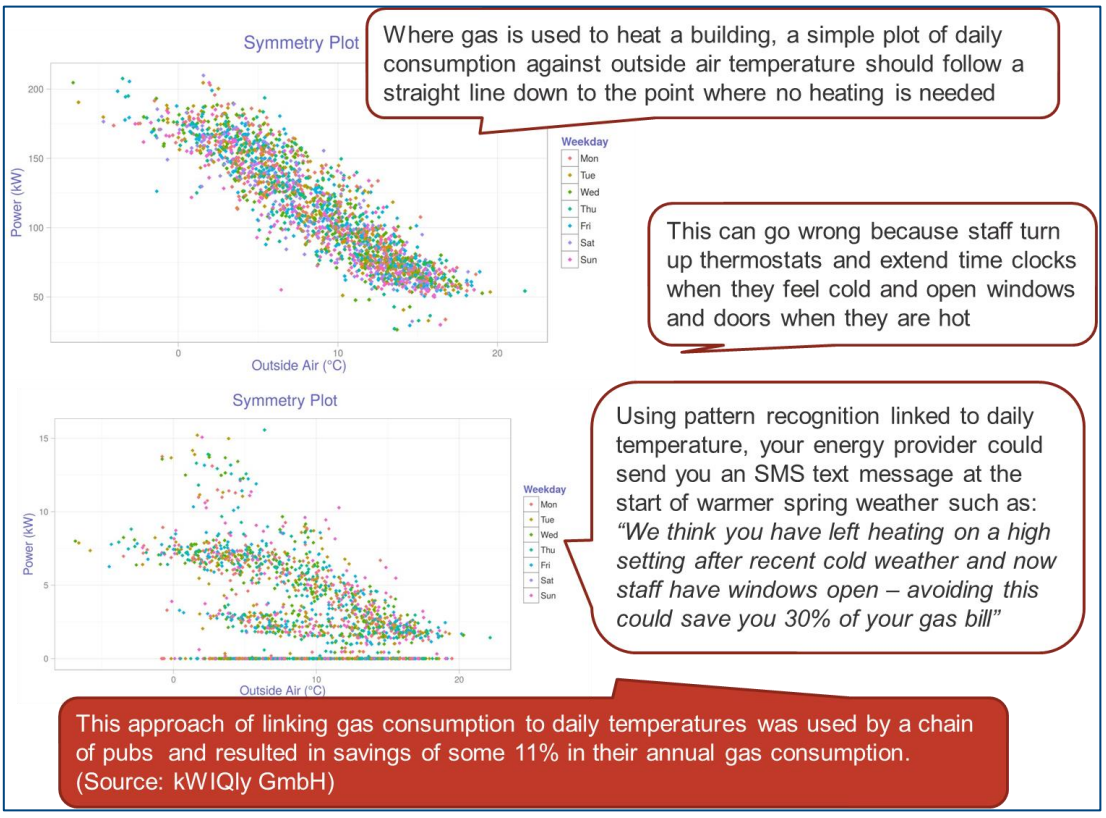

Figure 7: Example of pattern recognition (heating)

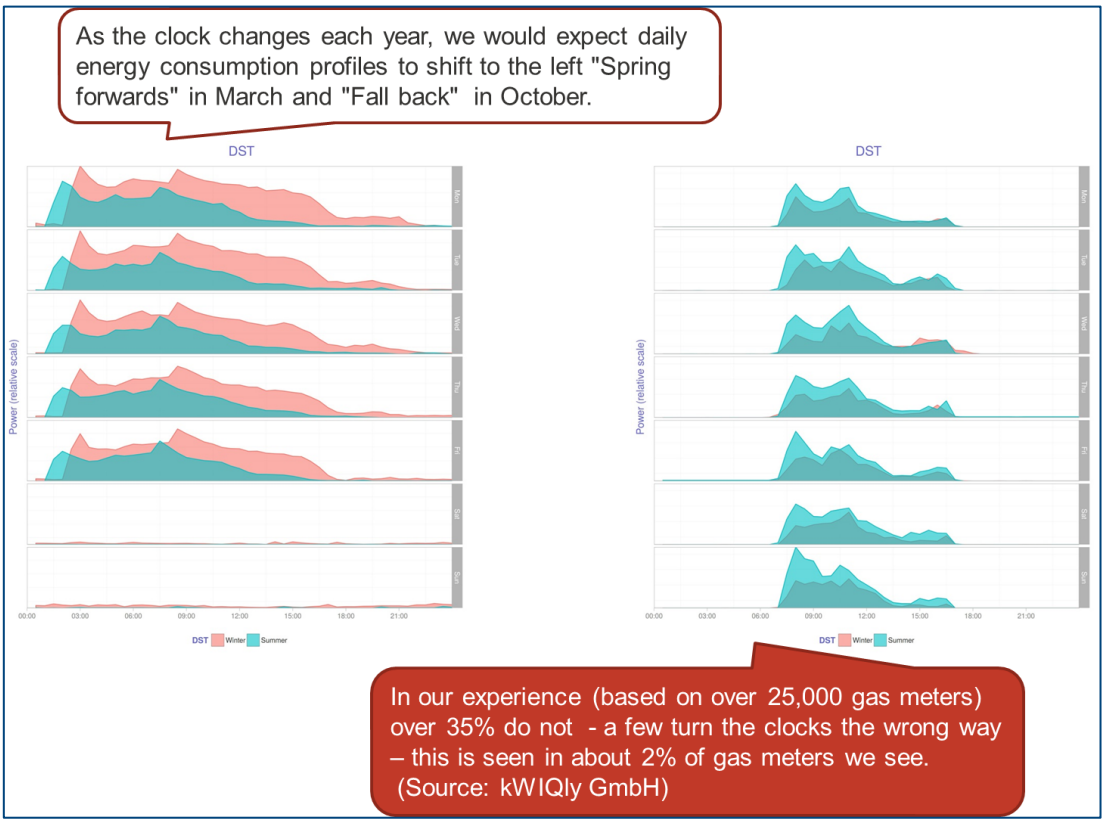

Figure 8: Example of pattern recognition (British Summer Time)

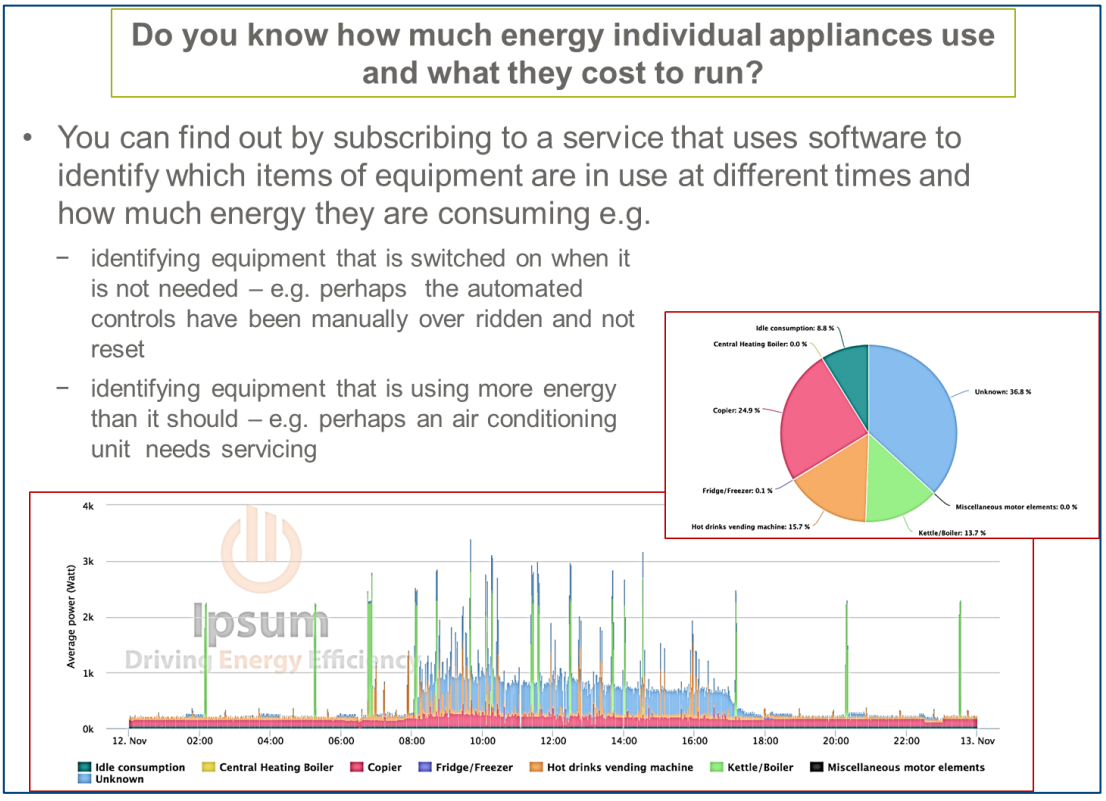

Figure 9: Example of device disaggregation

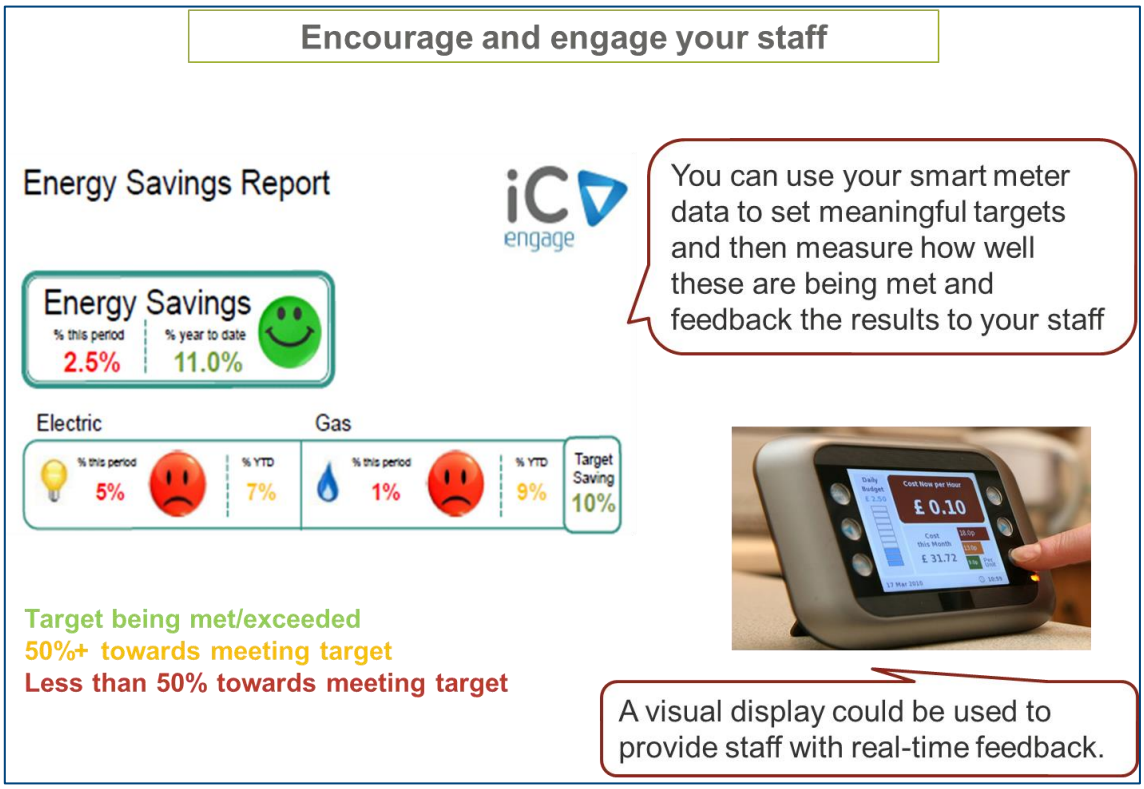

Figure 10: Staff engagement (individual site)

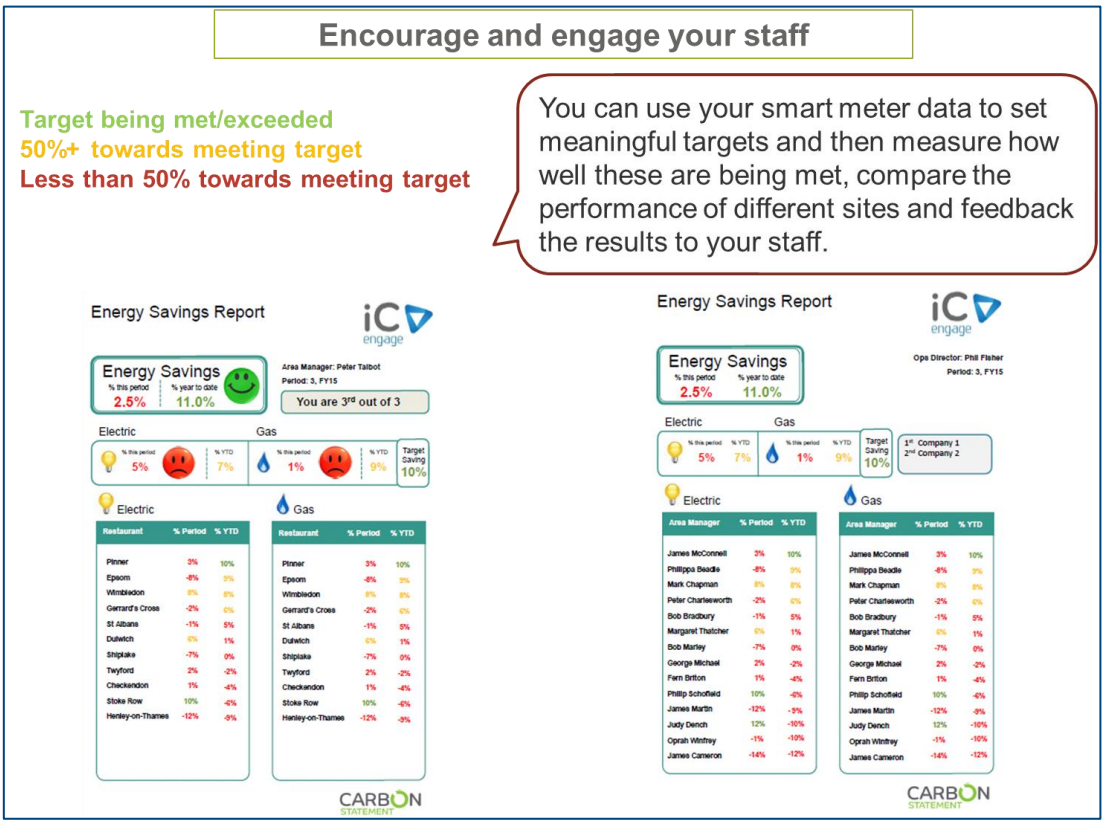

Figure 11: Staff engagement (multi-sites)

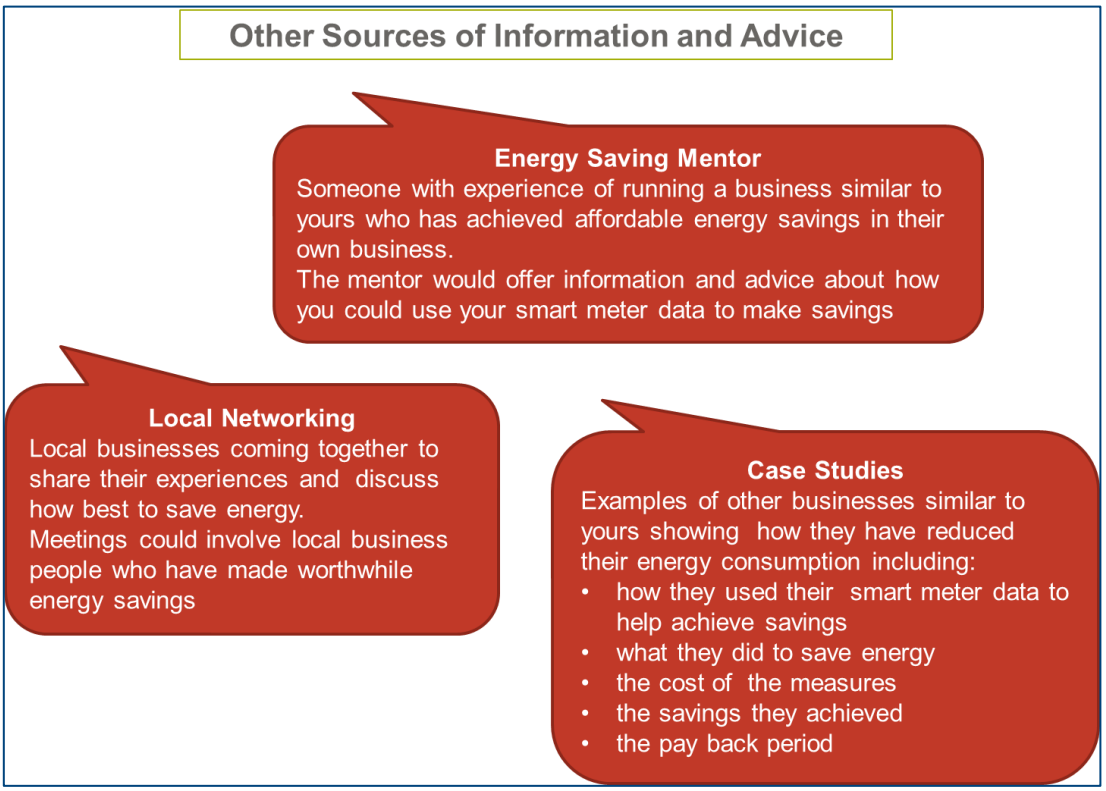

Figure 12: Other sources of information and advice

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

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