

# Sparking action on smart energy at work

by Professor David Grayson CBE and Melody McLaren  
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The Doughty Centre for Corporate Responsibility is an action-research centre within Cranfield School of Management. We work closely with academia, business, and other partner organisations and networks to advise, teach, research, and publish books, articles, reports and practical How-to guides.

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# Executive Summary

## **Project background and purpose**

Smart Energy GB commissioned Cranfield School of Management's Doughty Centre for Corporate Responsibility to research literature and develop the business case for companies to help their employees live green and sustainable personal lives, including opting for installation of a smart meter at home as part of their 'customer journey' with their energy supplier.

Stages of this journey include:

1. Hearing about smart meters through media campaigns and other sources.
2. Making a decision about having one installed.
3. Scheduling an installation at home by the energy supplier.
4. Having the smart meter installed.
5. Using and benefiting from the smart meter.

## **How the customer smart meter journey connects with corporate sustainability**

The Cranfield team worked to understand how support for employees' smart meter journeys could fit into the context of operating a responsible, as well as profitable, business which engages its employees. The team proposed an initial working model of pro-environmental behaviour change for employees at home and at work to help structure their literature review and synthesis. The elements included:

- workplace environment – encompassing (1) a home-work interface supporting open sharing of home experiences at work; (2) organisational structure and climate which promotes responsible business behaviours, including pro-environmental actions governing energy use, recycling and waste management
- individual organisational experience – encompassing both extrinsic motivation (recognition and reward) and intrinsic motivation (feedback) on pro-environmental actions

both these elements are proposed to shape two sets of behaviours, in parallel:

- individual pro-environmental behaviours at home – including getting a smart meter installed at home, with employer support; and changing behaviour to reduce domestic energy use as well as reducing water use, improve waste management and recycling and cycling to work
- individual pro-environmental behaviours at work – including changing energy use behaviour as well as sharing learning from domestic behaviour change with work colleagues. This sharing could in turn be mediated by employees' social identity and sensemaking of pro-environmental behaviours

The impacts of these behaviours can then be assessed, for example, in the form of reduced costs and better management of energy, water and other resources at home and at work. Longer term outcomes can include improved environmental mindsets, behaviours and skills for individuals and improved energy and resource management, employee engagement, recruitment and retention and corporate reputation for employers.

## **Literature review suggests opportunities for employers**

Research into smart meter adoption outside Great Britain suggests that challenges in encouraging people to adopt smart meters have varied across nations. They have included a lack of awareness of smart meters and benefits (including environmental and system benefits of dynamic pricing tariffs), resistance to dynamic tariff pricing based on loss aversion, concerns about ease of switching suppliers; perceived usefulness of the smart meter, data privacy and lack of trust in energy suppliers.



By contrast, research on smart meter adoption in Great Britain suggests that awareness of smart meters is high and those consumers who have had one installed have changed their energy behaviours as a result. Survey research has found increasing smart meter awareness, knowledge of what smart meters are and what they do, as well as how they could get one. Of those who already had smart meters installed, 82% had taken at least one step to reduce their energy use, 70% felt more in control of their energy use and 73% would recommend them to others.

While eleven million smart meters had been installed by March 2017, a major barrier to reaching the target of 26 million households by 2020 is consumer apathy to energy generally. Survey research reveals that large numbers of domestic customers do not engage in retail energy markets by shopping around or switching supplier. But consumer barriers present potential opportunities for employers to build energy awareness among their employees at different stages of the customer journey, set out in the table below.

Suggested actions	Potential business benefits	Potential employee benefits
<b>Stages 1 and 2</b>		
Engage employees in dialogue about environmental issues as a first step to creating & implementing organisational environmental management plans which they can help to achieve	Stimulation of innovation  Improved organisational energy-saving => environmental performance & operational efficiency	Opportunities for personal development as an 'environmental intrapreneur'  Enhanced employee knowledge of environmental issues and organisational environmental plans
Activate organisational social networks and initiate changes to the physical environment that will promote energy-saving behaviours in the workplace	Enhanced employee engagement and commitment => reduced retention (& recruitment) costs  Organisational energy/cost savings	Increased knowledge of energy-saving behaviours which may transfer to home => cost savings  Development of an environmental social identity
<b>Stages 3 and 4</b>		
Recruit and support employees who could become energy/environmental champions for your organisation	Identification of potential organisational leaders	Personal development opportunities for employee champions => role satisfaction
<b>Stage 5</b>		
Create interactive websites and/or use social media to reinforce and sustain energy-saving behaviours at work, and at home	Organisational energy/cost savings	Personal energy/cost savings
Offer non-financial incentives for employees to engage in energy-saving behaviours	Organisational energy/cost savings  Creation of community-wide commitment to the environment	Personal rewards/recognition) obtained through non-financial incentive schemes  Development of environmental social identity
Help employees establish a positive environmental self-identity by engaging in energy-saving behaviours, at work and at home	Organisational energy/cost savings  Enhanced employee engagement and commitment => reduced retention (& recruitment) costs	Development of a coherent environmental social identity spanning home and workplace
Help employees establish a positive environmental self-identity by engaging in energy-saving behaviours, at work and at home	Organisational energy/cost savings  Enhanced employee engagement and commitment => reduced retention (& recruitment) costs	Development of a coherent environmental social identity spanning home and workplace

# Contents page

<b>Section one</b>	<b>1</b>
.....	.....
<b>Chapter one</b> Introduction	<b>2</b>
.....	.....
<b>Chapter two</b> Smart meters - the basics	<b>7</b>
.....	.....
<b>Chapter three</b> Current work and the state of the field	<b>8</b>
.....	.....
<b>Section two</b>	<b>20</b>
.....	.....
<b>Chapter four</b> Opportunities	<b>21</b>
.....	.....
<b>Chapter five</b> Challenges	<b>24</b>
.....	.....
<b>Bibliography</b>	<b>26</b>
.....	.....
<b>Appendices</b>	<b>33</b>
.....	.....

# Section 1

# Chapter one

## Introduction

As part of a national campaign, Smart Energy GB have been working with partners across Great Britain to promote adoption and use of domestic smart meters to better monitor and manage energy use. These have included local and national charities, housing associations and community organisations.

Smart Energy GB are now engaging a range of businesses and national employers with the campaign, as they have an important role to play in encouraging adoption and proactive use of smart meters. Often, getting a smart meter installed may involve taking time off work or working from home and many employers also provide an important channel of communication to their staff through newsletters and intranet sites. Beyond the installation, however, the employer can play a role in encouraging employees to become more aware of, and seek to manage proactively, their domestic energy use as part of a more sustainable lifestyle. It is hoped that by embedding a more sustainable, cost-effective lifestyle at home, employees might transfer their associated mindsets and behaviours to the workplace, helping to create a more sustainable business. Such a transformation, extrapolated to a large scale, would benefit employers as well as employees and society at large.

A number of employers have been recruited to work with Smart Energy GB including the NHS, who delivered a campaign as part of NHS sustainability day encouraging individual trusts to share information with staff; Adnams; British Gas and Premier Foods. The initiative has received support from campaigners such as Jonathon Porritt.

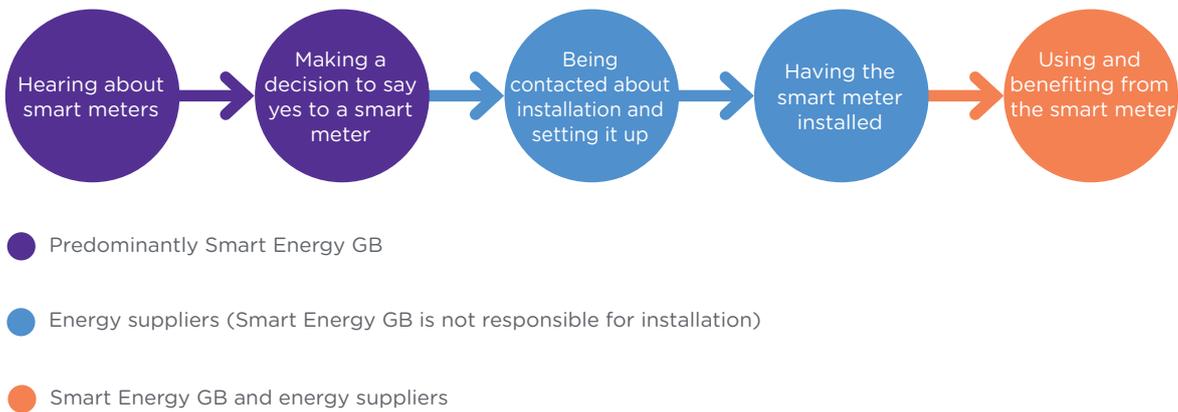
To take the campaign to the next level, Smart Energy GB commissioned Cranfield School of Management to conduct a literature review and, based on their analysis, develop the business case for companies to help their employees live green and sustainable personal lives, just as many have already done to encourage them to live healthier lives. A key point of focus was on employees who could opt to have their energy supplier install a smart meter at home as part of their 'customer journey'.

### The smart meter 'customer journey'

In 2013, Smart Energy GB worked with a number of experts to define the smart meter 'customer journey' – starting with communications about smart meters through to installation and using them productively - including points of engagement with Smart Energy GB and energy suppliers.<sup>1</sup>

#### Figure 1.

The customer journey – the complementary roles of Smart Energy GB national consumer engagement and energy supplier engagement with their own customers



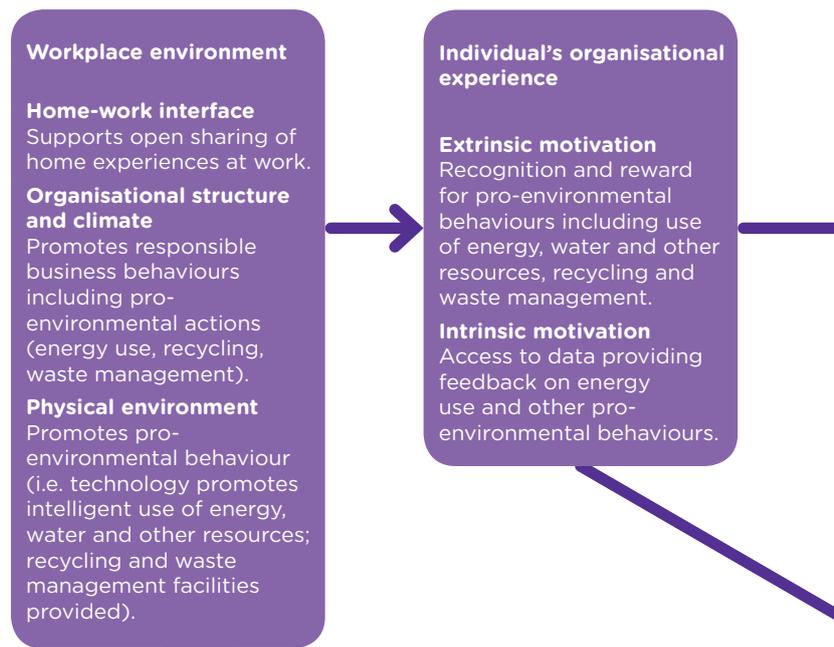
<sup>1</sup> A smart route to change: The application of behavioural science in supporting Great Britain's smart meter rollout and changing the way we use energy for the better. Smart Energy GB (July 2016).

In the course of this journey, the customer will hear about smart meters (through media campaigns and other sources), make a decision about having one installed and, if this is favourable, schedule an installation at home by the energy supplier. It is believed that employers of such customers can play a supportive role by allowing, and even encouraging, their employees to take a half day off from work or work from home to arrange smart meter installation. Cranfield School of Management (through the Doughty Centre for Corporate Responsibility) were asked initially to explore, through a literature review and their own knowledge of responsible business behaviour and its impacts, the potential business benefits of offering such support to employees.

**The wider context: employee, organisational and societal journeys to sustainability**

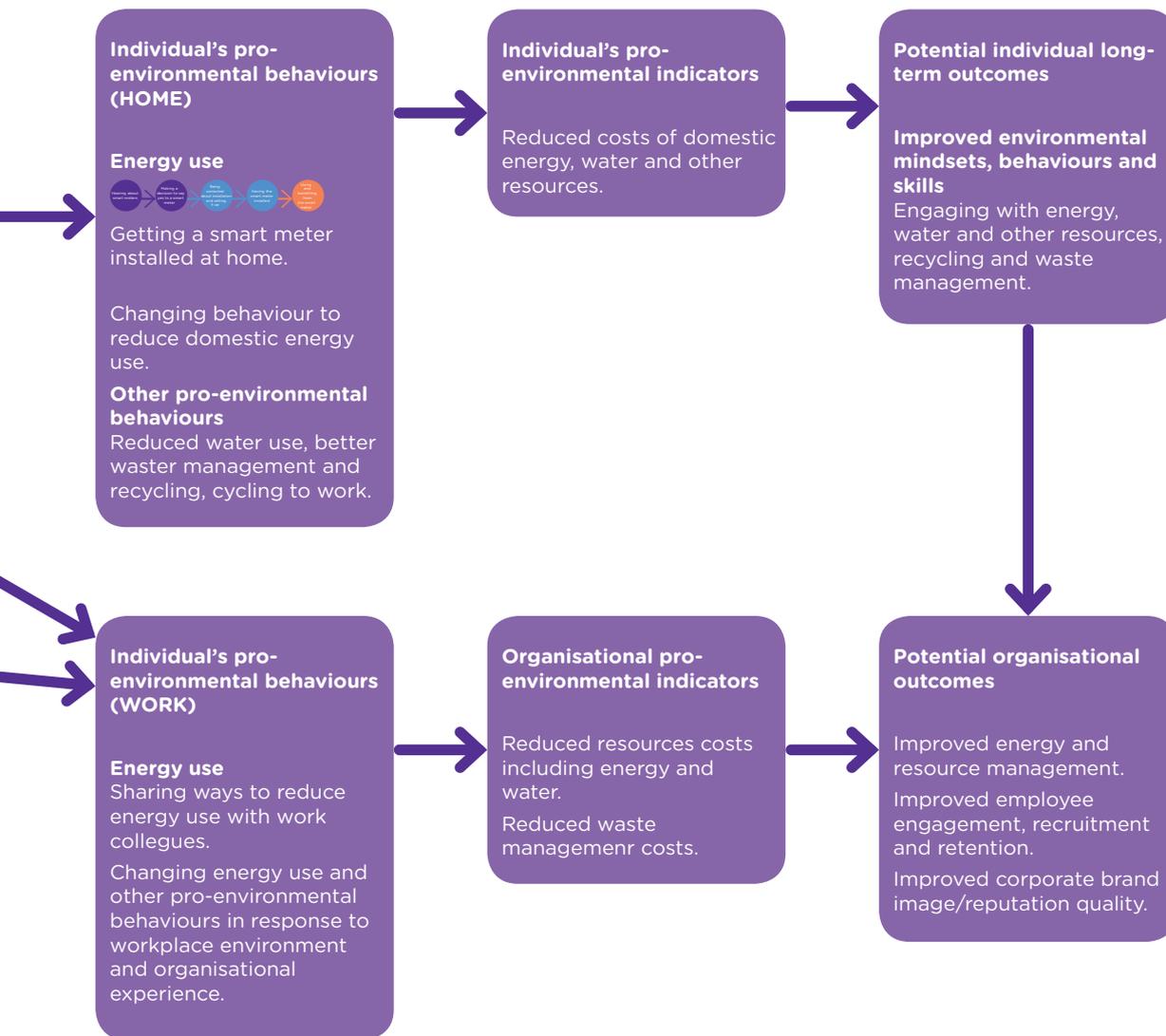
In responding to the Smart Energy GB brief, the Cranfield team suggested that, in order to fully ascertain the potential business benefits of supporting employees in adopting smart meters, it might be useful to consider their journeys in a wider context encompassing their employees' multiple roles as domestic energy customers as well as members of organisations that are, in turn, on their own journeys to improve their performance as responsible businesses generally and, more specifically, as employers of people and managers of energy.

Based on our team's previous experience of modelling the processes through which employers work to promote health and well-being among employees in the workplace to create business and employee benefits<sup>2</sup>, our Cranfield team proposed an initial working model of pro-environmental behaviour change for employees at home and at work to help structure our literature review and synthesis:



<sup>2</sup> See Business in the Community's 'Workwell Model' at <https://wellbeing.bitc.org.uk/resources/workwell-model>, "Wealth from Health" (<https://wellbeing.bitc.org.uk/all-resources/toolkits/wealth-health>) and associated toolkits (<https://wellbeing.bitc.org.uk/all-resources/toolkits>).

**Figure 2.**  
Working model of pro-environmental behaviour change



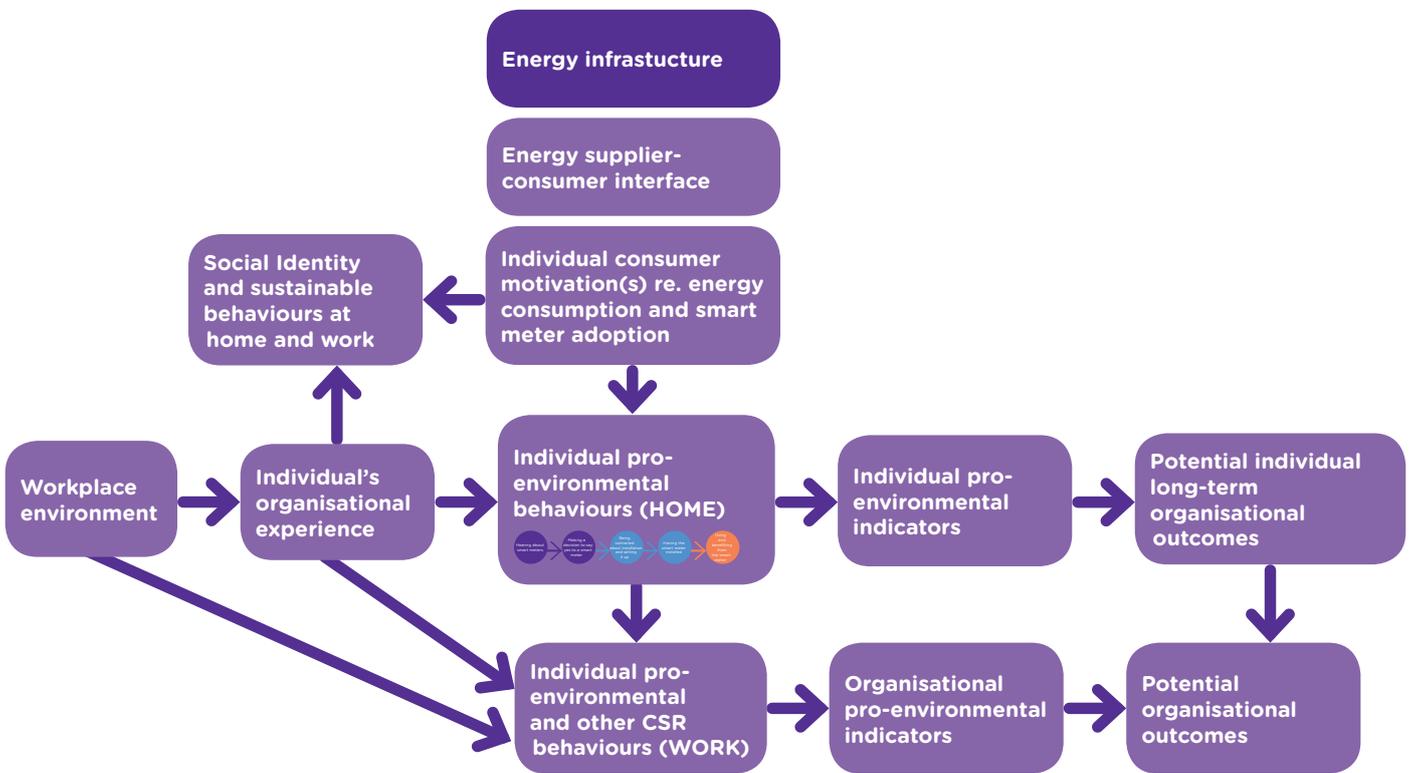
However, such change would necessarily occur in an even wider societal context of efforts to create a 'smart grid' infrastructure in which the smart meter 'as a key element for the smart grid is expected to provide economic, social, and environmental benefits for multiple stakeholders'.<sup>3</sup>

<sup>3</sup> Alahakoon, D., & Yu, X. (2016). Smart Electricity Meter Data Intelligence for Future Energy Systems: A Survey. IEEE Transactions On Industrial Informatics, 12(1), 425-436.

Sharon Jackson, who has researched how managers make sense of, and enact, sustainability practices in the workplace<sup>4</sup> and has also developed immersive sustainability training programmes for managers<sup>5</sup>, has suggested that both social identity and sensemaking theory could be useful in building conceptual links between employees' pro-environmental behaviours at home and at work<sup>6</sup> and suggesting testable measures for reinforcing these links in practice for the benefit of both employers and employees. We have therefore added this idea to the process model above as follows:

We have used this working model to guide our literature review and initial synthesis of the business case.

**Figure 2.**  
Working model of pro-environmental behaviour change



<sup>4</sup> See, for example, Sharon Jackson, Mind the Gap: Making Sense of Sustainability from a Business Manager's Perspective, Doughty Centre for Corporate Responsibility at the Cranfield School of Management (2010) and Sharon Jackson, How Managers Make Sense of CSR: The Impact of Eastern Philosophy in Japanese Owned Transnational Corporations. In Editors: Prastacos, Gregory P, Wang, Fuming, Soderquist, Klas Eric (Eds.), Leadership through the Classics: Learning Management and Leadership from Ancient East and West Philosophy, pp.487-503, October 2017.

<sup>5</sup> See European Sustainability Academy programmes at <http://eurosustainability.org/courses>.

<sup>6</sup> Personal communication, 2017.

# Chapter two

## Smart meters: the basics

The UK Department for Business, Energy & Industrial Strategy describes smart meters as ‘the next generation of gas and electricity meters [which] offer a range of intelligent functions. For example, they can tell you how much energy you are using through an in home display. They communicate directly with your energy supplier meaning there will be no need for your supplier to visit your home to read your meter in future’. They ‘put consumers in control of their energy use, allowing them to adopt energy efficiency measures that can help save money on their energy bills and offset price increases.’<sup>7</sup>

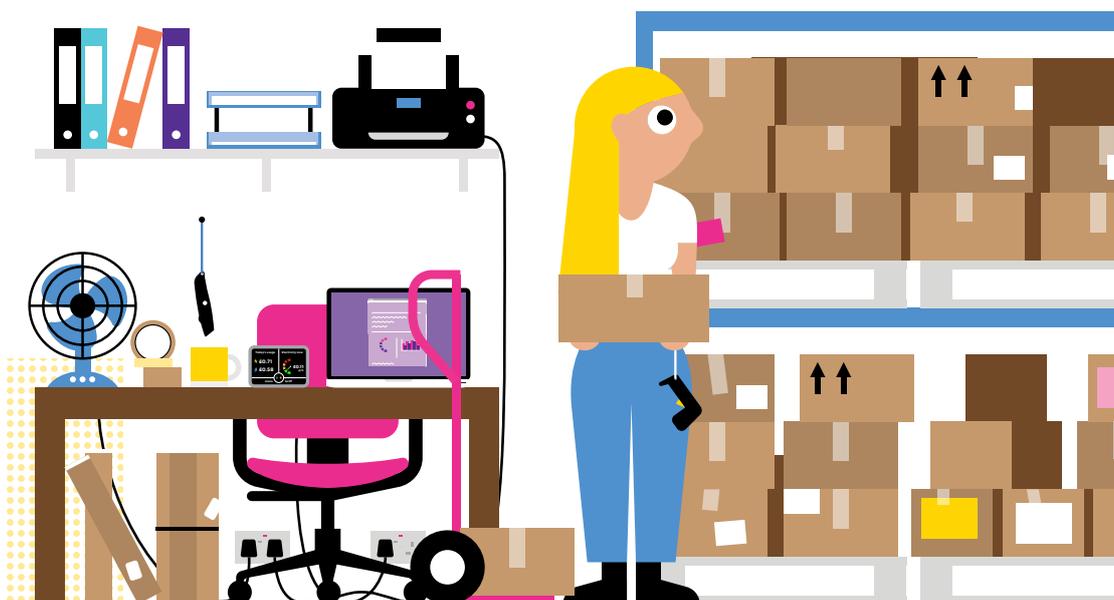
### Engaging employers with the campaign

As part of this consumer campaign, Smart Energy GB has been working to engage employers in partnerships that will enhance their employees’ awareness, adoption and utilisation of smart meters to reduce energy waste. We can use our working process model to highlight where employers have been supporting their employees to adopt smart meters:

The UK Government’s vision to roll out smart meters, set out in 2016, is:

**‘for every home to have smart gas and electricity meters by 2020. This illustrates our need to change our behaviour towards energy in Great Britain to secure an affordable and reliable energy supply and move towards a low carbon economy in the future.’<sup>8</sup>**

**‘Smart Energy GB ‘was created as an independent not-for-profit company...to deliver the national consumer engagement campaign for the British public to support the installation of smart meters in consumers’ homes and microbusinesses across the three nations of Great Britain by all energy suppliers; and to support those consumers in the successful use of their smart meters when installed so as to reduce energy waste.’<sup>9</sup>**



7 “Smart meters: a guide”. Department for Business, Energy & Industrial Strategy, <https://www.gov.uk/guidance/smart-meters-how-they-work>

8 Smart Energy GB Consumer Engagement Plan and budget 2017, <https://www.smartenergygb.org/en/-/media/SmartEnergy/essential-documents/essential-documents/english/Consumer-Engagement-Plan-and-budget-2017.ashx>

9 Ibid., p. 4.

# Chapter three

## Current work and the state of the field

In this literature review, we have sought to identify the variables and contingencies that might determine the accrual of business benefits for firms that support their employees in adopting smart meters at home.

### Scoping the business case

Cranfield has previously produced, with Business in the Community, a review of the different types of business benefits that companies can accrue from responsible business behaviour generally.<sup>10</sup> These include:

1. Brand value and reputation.
2. Employees and future workforce.
3. Operational effectiveness.
4. Risk reduction and management.
5. Direct financial impact.
6. Organisational growth.
7. Business opportunity.
8. Responsible leadership.
9. Macro-level sustainable development.

We anticipate that the principal documented benefits of supporting employees' domestic smart meter adoption and use will fall into the categories of 'employees and future workforce' and 'macro-level sustainable development', although benefits of other types may accrue as well.

Carroll and Shabana (2010) have noted that 'the benefits of CSR are dependent on mediating variables and situational contingencies'.<sup>11</sup> In addition, the nature of the benefits themselves can vary across contexts, encompassing '(1) reducing cost and risk; (2) strengthening legitimacy and reputation; (3) building competitive advantage; and (4) creating win-win situations through synergistic value creation'.<sup>12</sup> The literature review we have conducted has taken such caveats into account.

### Results of the Literature Review

We searched for, and found, literature in the following areas which corresponded to the following points in our process model:

#### SOCIETY

**Systemic issues** such as national energy strategy, infrastructure, policy and implementation;

#### BUSINESS

The workplace environment (including organisational structure and climate, home-work interface, physical environment)

- workplace-based interventions to improve general CSR/sustainability performance
- promoting organisational citizenship behaviours for the environment/ sustainability (OCBEs) within organisations

**The individual's organisational experience** (including both extrinsic and intrinsic motivation for pro-environmental behaviours).

**Individual pro-environmental behaviours at work** such as reducing energy (and other forms of) waste, recycling, cycling to work.

#### Impacts and outcomes:

- measuring outcomes and impacts
  - including business benefits - of responsible business behaviour

#### HOME

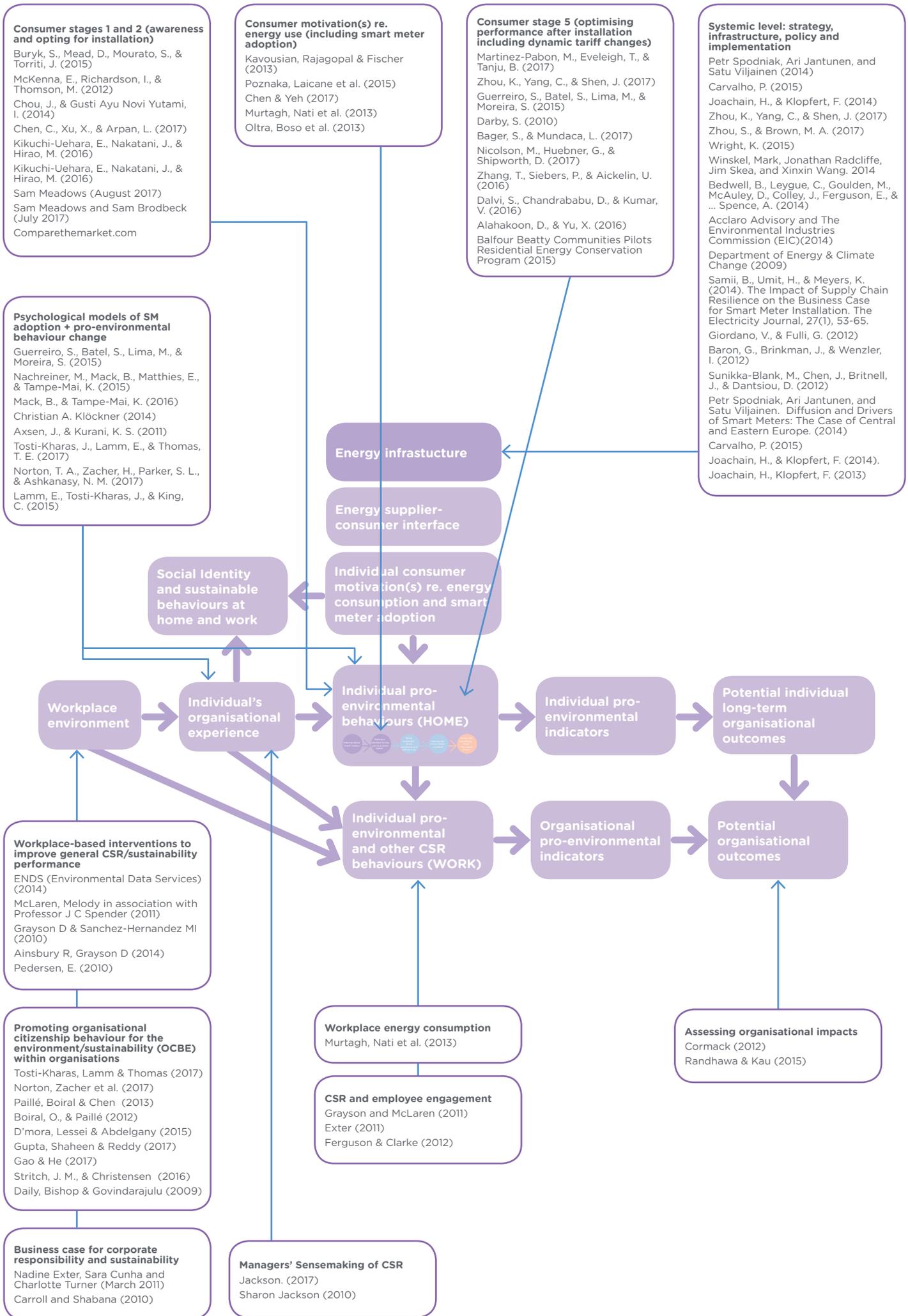
**Individual pro-environmental behaviours at home** - including hearing about, getting, and using, a smart meter to reduce domestic energy waste but also other pro-environmental behaviours including reducing water use, improving waste management and recycling, cycling to work.

Shown below is our "literature map" - our process model annotated with the references included in this review.

<sup>10</sup> Nadine Exter, Sara Cunha and Charlotte Turner, The business case for being a responsible business, Doughty Centre for Corporate Responsibility at the Cranfield School of Management, March 2011.

<sup>11</sup> Carroll, A. B., & Shabana, K. M. (2010). The Business Case for Corporate Social Responsibility: A Review of Concepts, Research and Practice. International Journal Of Management Reviews, 12(1), 85-105.

<sup>12</sup> Ibid., p. 101.



Below we highlight key findings of our review, particularly those which offer potential opportunities for employers to engage with employees to save energy (at home and at work), for the benefit of both employees and the organisation.

### Opportunities for employee engagement through stages of the customer journey

While the business case for employers encouraging employees to have smart meters installed in their homes may initially appear to be narrowly defined, a more in-depth examination of the chain of behaviours involved across the stages of the 'customer journey' - particularly 'using and benefiting from the smart meter', which may encompass a spectrum of behaviours - suggests different windows of opportunity for employers to interact with employees for their mutual benefit.

### Building trust to promote smart meter adoption and use

The overarching theme which emerges from research into different stages and aspects of the customer journey is that trust in smart meter technology and energy suppliers is key to its adoption.

### The Smart Meter Customer Journey

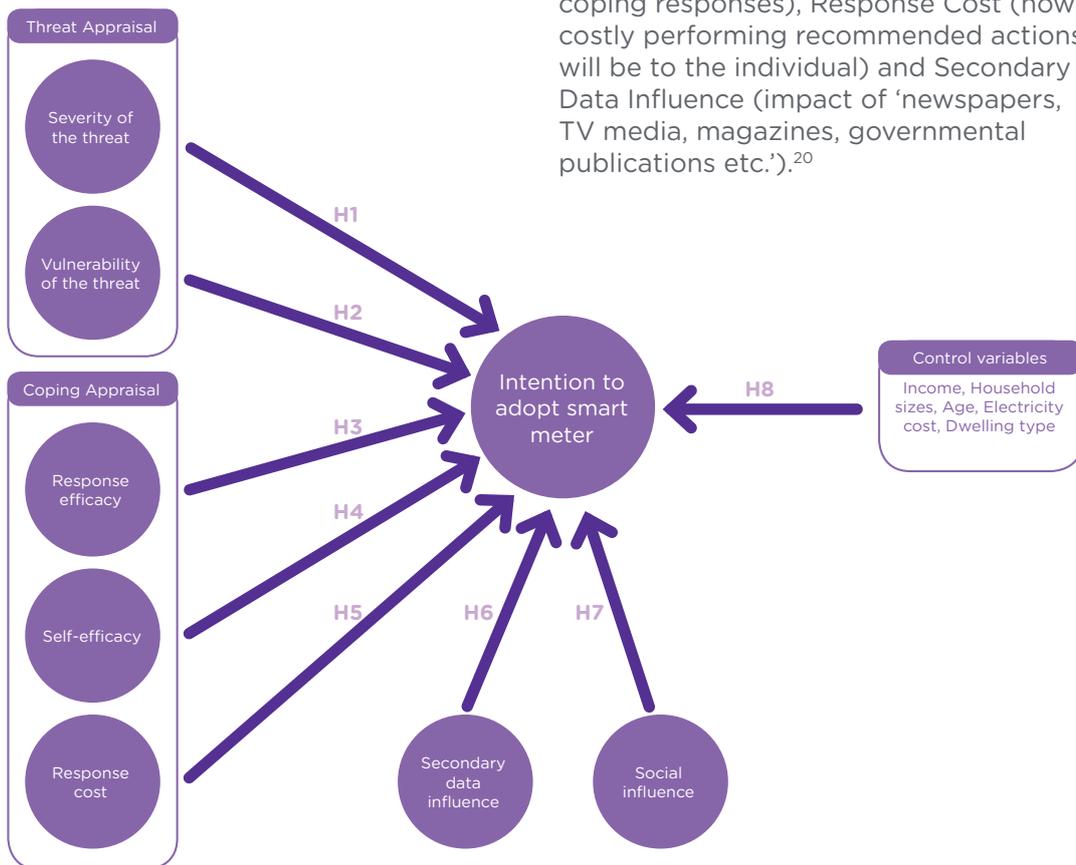
Stages 1 and 2: Communication and decision making about smart meter adoption



## Smart meter adoption outside Great Britain

Research suggests that challenges in encouraging people to adopt smart meters have varied across nations. They have included a lack of awareness of smart meters and benefits (including environmental and system benefits of dynamic pricing tariffs)<sup>13</sup>, resistance to dynamic tariff pricing based on loss aversion<sup>14</sup>, concerns about ease of switching suppliers<sup>15</sup>; perceived usefulness of the smart meter<sup>16</sup>, data privacy<sup>17</sup> and lack of trust in energy suppliers.<sup>19</sup>

Chen and Yeh (2017) revealed the complexities of various influences on smart meter adoption in Taiwan, where electricity price increases are expected in the post-Fukushima era as the country moves to increase the proportion of renewable energy to cope with energy demand. The most significant influences on intention to adopt smart meters were: Perceived Severity of electricity pricing (personal impact of rising electricity costs); Personal Perceived Response Efficacy (likelihood of recommended actions reducing threats of higher pricing); Self-Efficacy (likelihood of being able to make recommended coping responses), Response Cost (how costly performing recommended actions will be to the individual) and Secondary Data Influence (impact of 'newspapers, TV media, magazines, governmental publications etc.').<sup>20</sup>



- 13 Chou, J., & Gusti Ayu Novi Yutami, I. (2014). Smart meter adoption and deployment strategy for residential buildings in Indonesia. *Applied Energy*, 128336-349.
- 14 Nicolson, M., Huebner, G., & Shipworth, D. (2017). Are consumers willing to switch to smart time of use electricity tariffs? The importance of loss-aversion and electric vehicle ownership. *Energy Research & Social Science*, 23(1), 82-96.
- 15 Buryk, S., Mead, D., Mourato, S., & Torriti, J. (2015). Investigating preferences for dynamic electricity tariffs: The effect of environmental and system benefit disclosure. *Energy Policy*, 80(1), 190-195.
- 16 Chen, C., Xu, X., & Arpan, L. (2017). Between the technology acceptance model and sustainable energy technology acceptance model: Investigating smart meter acceptance in the United States. *Energy Research & Social Science*, 25(1), 93-104.
- 17 *Ibid.*, p. 95
- 18 McKenna, E., Richardson, I., & Thomson, M. (2012). Smart meter data: Balancing consumer privacy concerns with legitimate applications. *Energy Policy*, 41(1), 807-814.
- 19 Chen, C., Xu, X., & Arpan, L. (2017). Between the technology acceptance model and sustainable energy technology acceptance model: Investigating smart meter acceptance in the United States. *Energy Research & Social Science*, 25(1), 93-104.
- 20 Chen & Yeh, op. cit.

## Smart meter adoption in Great Britain

Research on smart meter adoption in Great Britain suggests that awareness of smart meters is high and those consumers who have had one installed have changed their energy behaviours as a result. Survey research by Populus on behalf of Smart Energy GB<sup>21</sup> has found that, as of March 2018, 98% of consumers aged over 21 were aware of smart meters. Of those who already had smart meters installed, 82% had taken at least one step to reduce their energy use, 69% felt more in control of their energy use and 73% would recommend them to others.

As of March 2018 more than 11 million smart meters had been installed.<sup>22</sup> The challenge going forward is, how best to persuade the remaining householders who do not yet have a smart meter, to agree to install, and use, a smart meter to reach the target of 26 million households by 2020?

A major challenge to overcome is consumer apathy to energy. Survey research by the Competition and Markets Authority reveals that large numbers of domestic customers do not engage in retail energy markets by shopping around or switching supplier. Out of 7,000 domestic customers surveyed, 34% said they had never considered switching supplier and 56% said they had never switched supplier, did not know if it was possible or did not know if they had done so.<sup>23</sup>

Interview and survey research on smart meter adoption by the Department of Energy and Climate Change (DECC)<sup>24</sup> has identified consumer issues which present potential opportunities for employers to build energy awareness among their employees at different stages of the customer journey. Relevant stage-specific excerpts are shown below.

## Pre-installation

### Stage 1

‘During the in-depth interviews it was apparent that discussions within social networks may provide an opportunity for informal learning around the smart meter and IHD. Respondents who had discussed smart meters in this way reported these conversations to have been positive. Customer expectations of smart meters and IHDs were also found to play a clear role in their willingness to engage.’

### Stage 2

‘Some in-depth interview respondents felt they would have benefited from further information about the benefits of a smart meter, and particularly the IHD, between the appointment booking and the installation visit. Such preparation may help householders go on to make better use of the IHD after the installer has left.’<sup>25</sup>

## What might employers do?

Employers who are interested in implementing energy management plans in their own organisations as part of business strategy could initiate discussions with employees – in the context of team meetings, energy awareness events or other fora – about their own perspectives on energy saving (whether at home or at work), the potential benefits (for employees and/or the business) and how these might be achieved. This could bring employee concerns about energy saving costs – at home or at work – to the surface and begin a useful dialogue about energy management which engages the workforce in achieving the organisation’s environmental goals. Smart Energy GB could provide toolkits to support interested employers who might wish to run such sessions in the workplace. Employers could be signposted to additional materials, such as videos, which could provide information about smart meter benefits and in-home displays to employees ahead of the installation visit.

21 Smart Energy GB, Smart energy outlook, August 2017.

22 Department of Business, Energy and Industrial Strategy (BEIS) (2018). Smart Meters, Quarterly Report to end March 2018 Great Britain, 2-18.

23 Competition and Markets Authority (June 2016), Modernising the energy market.

24 Department of Energy & Climate Change (March 2015), Smart Metering Early Learning Project: synthesis report.

25 Ibid., p. 10

### Institutional enablers and disablers

Although this paper seeks to explore the roles that employers can play in promoting smart meter adoption and use, it is worth noting that national government policy is a key institutional determinant of success in overcoming barriers to adoption. A comparative study of variations in national policy across several European Union countries (Sweden, Finland, Denmark, Germany and the Netherlands) have led to different levels of success in overcoming barriers to smart meter adoption. Nicolson et al. (2017) have found that ‘countries with a combination of policy measures that address multiple barriers to smart meters tend to be leaders, while laggards often overlook or fail to adopt policies to overcome key barriers’.<sup>26</sup>

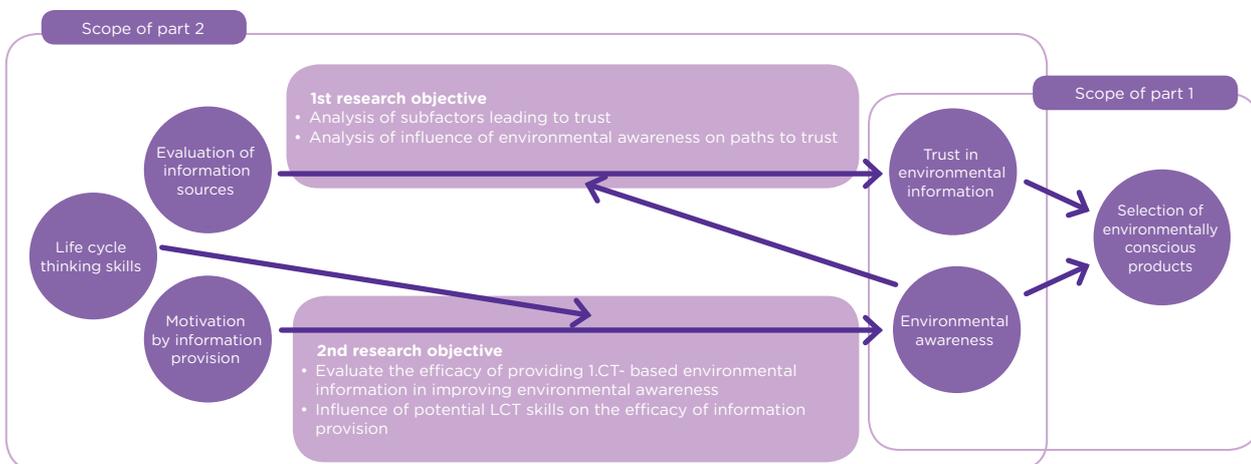
### What might employers do?

In the context of workplace discussions about energy savings mentioned above, employees might be encouraged to discuss what they perceive as barriers to smart meter adoption (if they do not have a smart meter at home) and/or share their own experiences of smart meters (if they have one already installed) and what steps could be taken (with employer support, if relevant) to enable more energy saving.

### Environmental information

Kikuchi et al. (2016a, b) found that provision of relevant information to consumers who already have high environmental awareness – including provision of life cycle thinking (LCT) information - can play a role in promoting pro-environmental behaviour, particularly selection of environmentally conscious products, as per their model shown below.<sup>27</sup>

Acknowledging climate change as a motivation to save energy showed correlation with lower electricity consumption (Kavousian et al., 2013).<sup>28</sup>



26 Zhou, S., & Brown, M. A. (2017). Smart meter deployment in Europe: A comparative case study on the impacts of national policy schemes. *Journal Of Cleaner Production*, 144(1), 22-32.

27 Kikuchi-Uehara, E., Nakatani, J., & Hirao, M. (2016). Analysis of factors influencing consumers' proenvironmental behavior based on life cycle thinking. Part I: effect of environmental awareness and trust in environmental information on product choice. *Journal Of Cleaner Production*, 11710-18; Kikuchi-Uehara, E., Nakatani, J., & Hirao, M. (2016). Analysis of factors influencing consumers' proenvironmental behavior based on life cycle thinking. Part II: trust model of environmental information. *Journal Of Cleaner Production*, 125216-226

28 Kavousian, A., Rajagopal, R., & Fischer, M. (2013). Determinants of residential electricity consumption: Using smart meter data to examine the effect of climate, building characteristics, appliance stock, and occupants' behavior. *Energy*, 55184-194

### What might employers do?

Employers wishing to implement organisational environmental management plans can create opportunities to increase general awareness of environmental issues (including the need to reduce energy wastage but also, more broadly, the impacts of climate change) and promote OCBs in the workplace. See the next section about the dynamics of promoting pro-environmental attitudes and behaviours at work.

#### Stages 3 and 4

##### Booking and carrying out smart meter installation by the energy supplier

As part of the installation process, households are given energy efficiency advice from the smart meter installer. The installation is an important opportunity for household to engage with the new technology and think about their energy use. Research by DECC found that:

**‘The installation visit also presents an opportunity to provide energy-related advice. Whilst many customers surveyed did not express an interest in receiving this type of information, the in-depth interviews revealed that while customers may not have expected to receive advice they would not have been resistant to receiving it either. The delivery of energy-related advice may be aided by managing customer expectations in advance about the information they are likely to receive.’<sup>29</sup>**

### What might employers do?

The employer can support their employees’ domestic smart meter installations in two ways:

1. By giving them time off – usually a half day - to be at home for a visit by the supplier’s installer, who can provide useful energy-related advice during the installation. This is easier to arrange in a workplace where flexible working practices are already in place as part of business strategy, which in itself can generate business benefits such as improved business performance on service delivery and customer satisfaction, efficiency savings and reduced recruitment and retention costs as well as environmental benefits and improvements in employee morale, productivity and loyalty.<sup>30</sup>
2. By linking the installation to wider discussions on energy and financial wellbeing in the workplace. This could benefit employees by lowering their energy costs at home, in turn creating goodwill and enhancing commitment toward the employer.

#### Stage 5

##### Changing energy use behaviour

Once a smart meter is installed at home, consumers have an opportunity to reduce their energy waste. But what factors might help to promote reduction of energy waste and other forms of ‘proenvironmental behaviour’? And how might employers support such behaviour in the workplace, as well as at home, for the benefit of their organisations?

29 <sup>[1]</sup>Department of Energy & Climate Change, op. cit., p. 10.

30 Thomson, P. (2008). The business benefits of flexible working. *Strategic HR Review*, 7(2), 17-22

### Socio-psychological drivers

Poznaka et al. (2015) found that changes in electricity consumption are influenced, not only by technical aspects related to smart meter function, but also by users' psychological aspects, such as subconscious motives and social group influences. In Latvia, where this research was conducted, attitudes toward energy saving changed over time. Initial attention to the devices which consumed the most electricity evolved into energy saving which was "unconscious", with respondents reporting they had not undertaken significant energy saving measures, despite having reduced their energy use.<sup>31</sup>

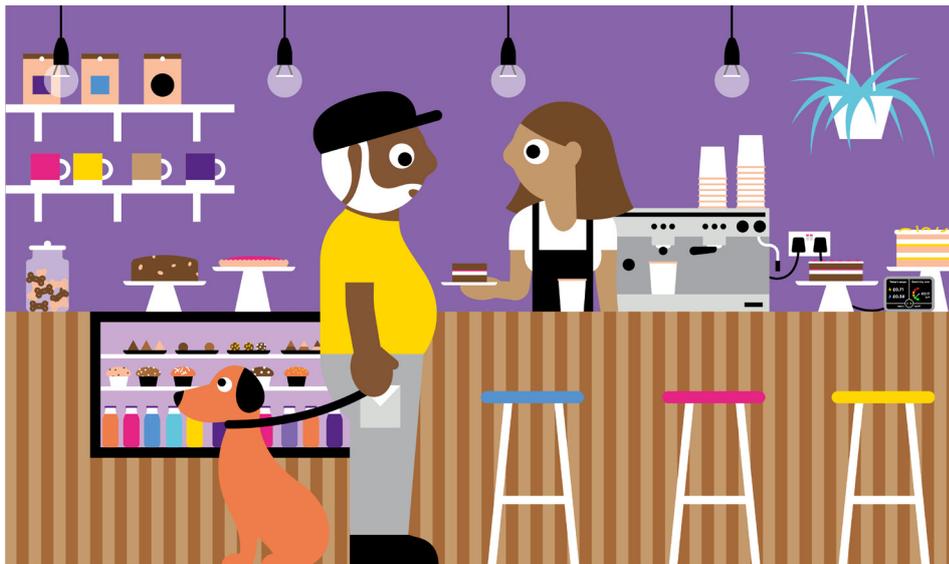
In Portugal, Guerreiro et al. (2015), identified socio-psychological factors underpinning smart meter use including subjective norms, perceived utility, health-related risk perception, procedural justice, and time of usage as well as perceived distributive injustice and loss of control and privacy-related risk perception.

### What might employers do?

Given that employees are embedded in workplace communities, social networks and the physical workplace environment provide an ideal context for initiating and sustaining new energy-saving behaviours. See the next section for more specifics on how this could best be achieved.

### Institutional enablers and disablers

Beyond the actions of individuals, institutions can also play a role in reducing energy waste at a collective level by, for example, deploying algorithms that analyse smart meter data as a basis for decision-making. For example, Zhou et al. (2017) have developed a process model to identify consumer electricity consumption patterns through large-scale mining and analysis of smart meter data.<sup>32</sup>



31 Poznaka, L., Laicane, I., Blumberga, D., Blumberga, A., & Rosa, M. (2015). Analysis of Electricity User Behavior: Case Study Based on Results from Extended Household Survey. *Energy Procedia*, 72(1), 79-86.

32 Zhou, K., Yang, C., & Shen, J. (2017). Discovering residential electricity consumption patterns through smart-meter data mining: A case study from China. *Utilities Policy*, 44(1), 73-84

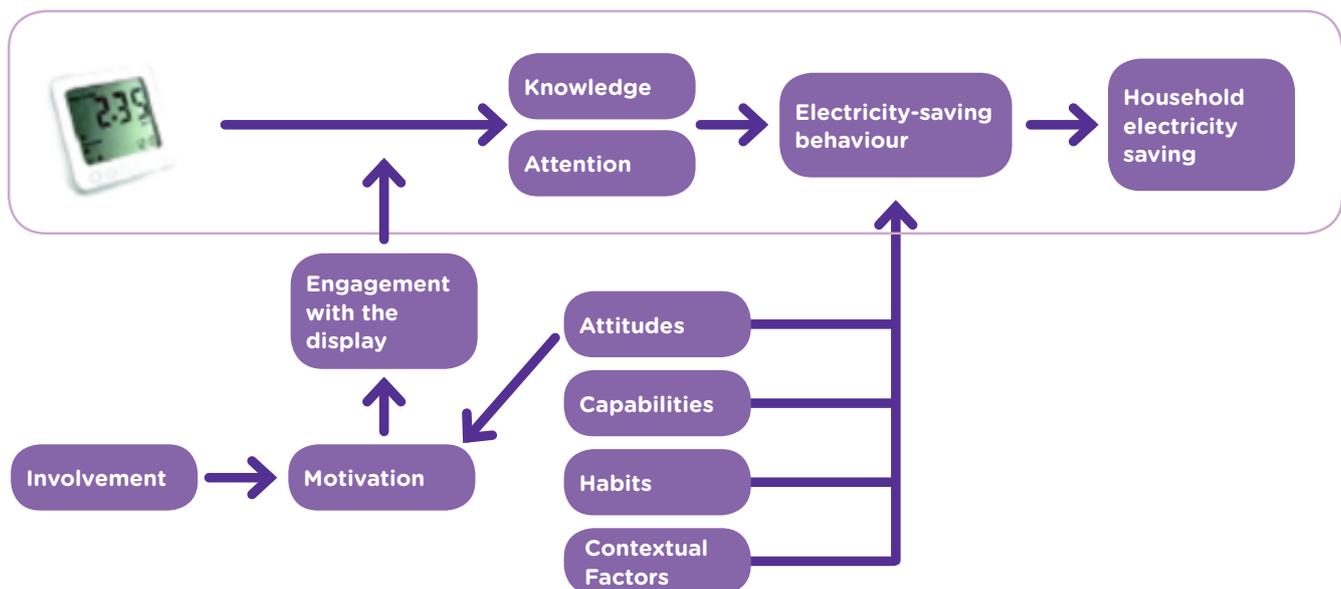
### What might employers do?

Employers may wish to identify employees who are potential “energy champions” who could play leadership roles in engaging colleagues with achieving energy-saving goals as part of broader corporate responsibility/environmental management plans. See the next section and Exter (2011)<sup>33</sup> for more details.

### Determinants of energy use reduction

Interestingly, not all energy use reduction following smart meter installation can be attributed to purely logical, conscious reasoning. In a pilot study conducted in Denmark which drew on principles of behavioural economics, energy use reduction was increased relative to controls when consumers were provided with additional “loss-framed” information about their standby energy use, with their smart meter displaying a daily message, “Money lost from electricity consumption” followed by the monetary value. The smart meter displayed the ‘amount spent per day as a running total; this figure was updated every few seconds and reset every day, meaning that it looked like money was flowing out of users’ pockets’.<sup>34</sup>

Oltra et al. (2013) investigated both the influence of in-home smart meter displays, previous motivation to save energy and social interaction (among study participants in focus groups to discuss experiences of smart meter use) on electricity use reduction. Results suggested that prior motivation to save energy influenced their level of engagement with the display, the attention paid to it and knowledge gained from it, which in turn influenced electricity saving behaviour and actual electricity saving (see below). However, participants noted that limitations of smart meters created difficulties in acquiring further knowledge on consumption and achieving further savings, leading to a decrease in interest over time.



33 Exter, Nadine. Engaging employees in corporate responsibility, Doughty Centre for Corporate Responsibility at the Cranfield School of Management, June 2011.

34 Bager, Simon and Mundaca, Luis. Making ‘Smart Meters’ smarter? Insights from a behavioural economics pilot field experiment in Copenhagen, Denmark. Energy Research & Social Science: Vol. 28, pp. 68-76.

Similar drop-off of interest in energy savings in response to personal feedback on energy use has also been noted in a study of university office workers (Murtagh et al., 2013).<sup>35</sup> This suggests that challenges of sustaining behaviour-based reductions in energy waste may be similar in both domestic and workplace environments.

A key challenge is therefore to support people in continuing to build on their understanding of their own energy use so they can continue to make savings.

### What might employers do?

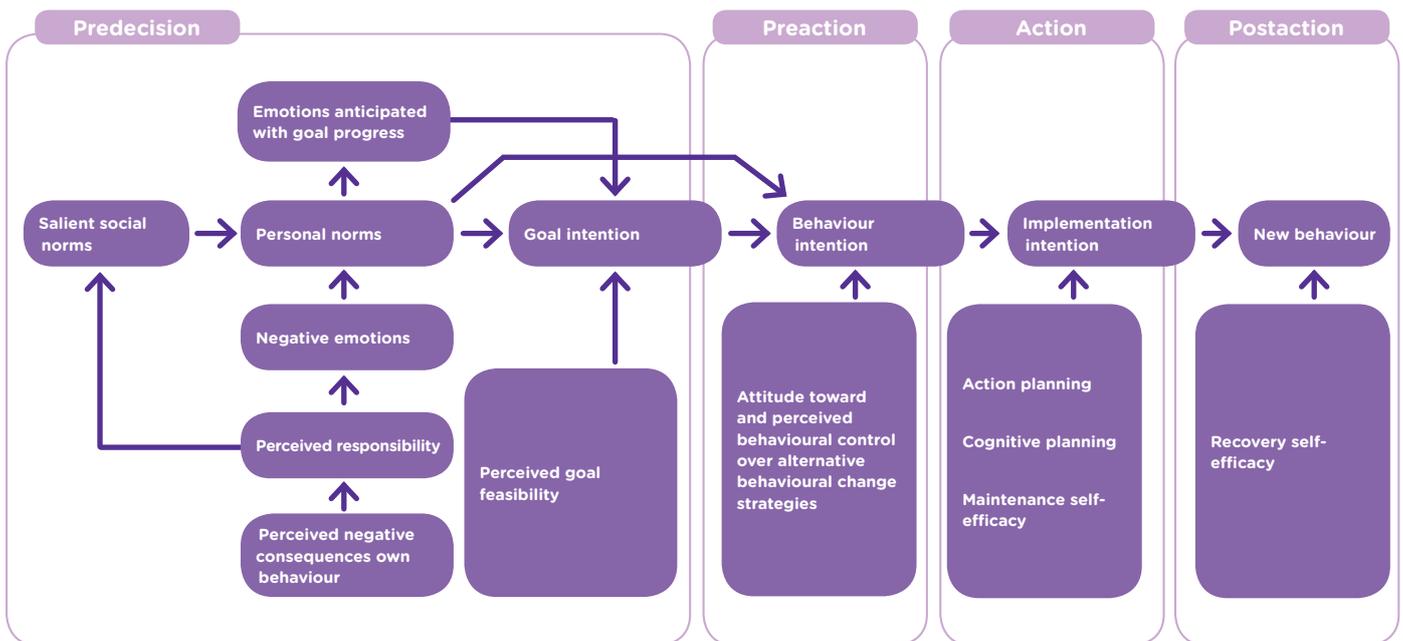
Given that sustaining interest in energy-saving (and other environmental management) plans is a challenge in the workplace as well as in domestic environments, employers might wish to consider adapting some of the interventions described below, as these could provide a link between the two.

## Interventions to sustain energy saving

### Web portals

In Germany, Mack and Tampe-Mai (2016)<sup>36</sup> have addressed the issue of sustaining energy-saving behaviour over time using a smart meter web portal integrated with a range of diverse intervention techniques based on a stage model of self-regulated behavioural change (SSBC) developed by Bamberg (2013). This model maps specific stages – predecision, preaction, action and postaction – to psychological motives as shown below.<sup>37</sup>

The entry page of the Mack and Tampe-Mai web portal features (a) the monthly consumption display and (b) the historical feedback chart, and links to (c) the consumption analysis module, (d) the what is Watt page, (e) the energy and climate information page, (f) the compare with others page, (g) the goal setting module, (h) the electricity saving domains module, (i) the message module, and (j) the blackboard or “our tips” module, as shown on the next page.



35 Murtagh, N., Nati, M., Headley, W. R., Gatersleben, B., Gluhak, A., Imran, M. A., & Uzzell, D. (2013). Individual energy use and feedback in an office setting: A field trial. *Energy Policy*, 62, 717-728.

36 Mack, B., & Tampe-Mai, K. (2016). An action theory-based electricity saving web portal for households with an interface to smart meters. *Utilities Policy*, 42(1), 51-63.

37 Bamberg, S. (2013). Changing environmentally harmful behaviors: A stage model of self-regulated behavioral change. *Journal Of Environmental Psychology*, 34(2), 151-159.

### What might employers do?

Use of a web portal to support energy-saving behaviour is interesting for this paper because it is the sort of intervention that employers could feasibly consider to support energy-saving behaviour at work, particularly as an extension of such behaviour at home where smart meters are installed.

### Complementary currencies

Joachain and Klopfert (2013) have suggested a different type of intervention to sustain interest in energy saving: complementary currencies.<sup>38</sup> In reviewing the success (and failure) of EU smart meter trials, they highlight 1) lack of pre-trial motivation of households participating in smart meter trials to reduce energy waste and 2) the fading of energy consumption reduction over time as challenges to be overcome. They note that complementary currencies (non-financial incentives) which can be used to support (or limit harm to) the environment ‘have specific features in terms of symbolic value, social dimension, limitation of the rebound effect and “green challenge” that could initiate and sustain household motivation over time’.

The authors also suggest that adding a “green challenge” for families could add a gaming dimension to smart meter introduction.

### What might employers do?

The social dimension of complementary currencies might be of particular interest for employers inasmuch as

**‘participation can create a sense of community. This could lead to the development of social networks where experiences and tips are exchanged enabling the emergence of new social norms and/or social practices which would, in turn, bend some social practices towards a more sustainable direction’.**

One route that employers might wish to explore is creating a sense of community around energy saving in the workplace. Non-financial incentives for employees who adopt domestic smart meters and/or engage in ‘organisational citizenship behaviours for the environment’ (OCBEs) could help to create such a community. A “green challenge” for employees who participate in such a scheme could also add a gaming dimension to build a sense of community.

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<sup>38</sup> Joachain, H., Klopfert, F., 2013. Smart meters as an opportunity to motivate households for energy savings? Designing innovative policy instruments based on the coupling of smart meters and non-financial incentives (Working Papers CEB No. 13-008). ULB— Université Libre de Bruxelles. JRC European Commission, 2013.

### **Building environmental self-identity**

Using questionnaire items, van der Werff et al. (2013) have explored the relationships between individuals' 'biospheric values' ('Respecting the earth', 'Unity with nature', 'Protecting the environment', 'Preventing pollution'), 'environmental (energy-saving) self-identity' ('Saving energy is an important part of who I am', 'I am the type of person who saves energy', 'I see myself as a person who saves energy') and diverse energy-saving behaviours (Meat consumption ('[which] reflects indirect energy use. A substantial amount of energy is needed to produce and distribute meat'), Showering time, Fuel efficient driving style, Intention to reduce energy use) and preferences and intentions related to use of green energy (how important is it that green energy is generated, to what extent they are willing to pay more for green energy, to what extent they are willing to cut down their energy use to reduce peak demand if their energy is green, how likely it is that they will switch to green energy in the next year). Results showed that environmental self-identity mediated the relationship between biospheric values and the dependent variables (energy saving behaviours and green energy preferences and intentions).<sup>39</sup>

### **What might employers do?**

The important role of environmental self-identity in mediating behaviour and intentions suggests that employers might consider supporting development of environmental self-identity in the workplace, for the benefit of individuals wishing to develop a "green" self-identity in all aspects of their lives as well as for the business (through energy use reduction and associated cost savings).

### **Summary**

This section has highlighted elements of the smart meter customer journey – including motives, enablers and disablers of smart meter adoption and effective use to reduce energy waste - which have emerged through our literature review. We have suggested actions that employers may wish to take to engage employees at different stages in that journey to build awareness of energy saving in the context of implementing a wider environmental strategy for the business.

In the next section, we highlight both the opportunities and the challenges which could arise from such engagement, based on Cranfield's broader knowledge of engaging employees with corporate responsibility and sustainability initiatives.

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<sup>39</sup> van der Werff, Ellen; Steg, Linda ; Keizer, Kees. The value of environmental self-identity: The relationship between biospheric values, environmental self-identity and environmental preferences, intentions and behaviour. *Journal of Environmental Psychology*, Volume 34, June 2013, Pages 55-63.

# Section 2

# Chapter four

## Opportunities

In the previous section, we highlighted potential opportunities for employers to engage positively with employees who are considering adopting, or using, a smart meter. The following actions have been suggested, based on what we have learned from the literature relevant to the smart meter ‘customer journey’, which could accrue benefits for both employers and employees:

Suggested actions	Potential business benefits	Potential employee benefits
<b>Stages 1 and 2</b>		
Engage employees in dialogue about environmental issues as a first step to creating & implementing organisational environmental management plans which they can help to achieve	Stimulation of innovation  Improved organisational energy-saving => environmental performance & operational efficiency	Opportunities for personal development as an ‘environmental intrapreneur’  Enhanced employee knowledge of environmental issues and organisational environmental plans
Activate organisational social networks and initiate changes to the physical environment that will promote energy-saving behaviours in the workplace	Enhanced employee engagement and commitment => reduced retention (& recruitment) costs  Organisational energy/cost savings	Increased knowledge of energy-saving behaviours which may transfer to home => cost savings  Development of an environmental social identity
<b>Stages 3 and 4</b>		
Recruit and support employees who could become energy/environmental champions for your organisation	Identification of potential organisational leaders	Personal development opportunities for employee champions => role satisfaction
<b>Stage 5</b>		
Create interactive websites and/or use social media to reinforce and sustain energy-saving behaviours at work, and at home	Organisational energy/cost savings	Personal energy/cost savings
Offer non-financial incentives for employees to engage in energy-saving behaviours	Organisational energy/cost savings  Creation of community-wide commitment to the environment	Personal rewards/recognition) obtained through non-financial incentive schemes  Development of environmental social identity
Help employees establish a positive environmental self-identity by engaging in energy-saving behaviours, at work and at home	Organisational energy/cost savings  Enhanced employee engagement and commitment => reduced retention (& recruitment) costs	Development of a coherent environmental social identity spanning home and workplace
Help employees establish a positive environmental self-identity by engaging in energy-saving behaviours, at work and at home	Organisational energy/cost savings  Enhanced employee engagement and commitment => reduced retention (& recruitment) costs	Development of a coherent environmental social identity spanning home and workplace

The potential business benefits, while attractive, are contingent upon a range of contextual factors. Some of these apply to corporate responsibility and sustainability programmes generally and include:

- corporate responsibility maturity. Corporate responsibility Stage of Maturity depends on mindset, which is based on elements such as its time-horizon, focus, outlook, attitudes to transparency and relationships (accountability), collaboration, and business model (Ainsbury and Grayson, 2014)<sup>40</sup>. This in turn influences business purpose, strategy, organisation, policies and practices; and ultimately performance. A mature organisation will integrate the smart meter awareness-raising opportunity into their responsibility/sustainability programmes
- employee engagement with corporate responsibility. Traditional forms of engagement encourage a top-down, almost one-way transactional engagement, of employees within corporate strategic rhetoric. Processes such as the medium-term planning process, objectives, budgets and KPI's are then expected to do the rest. The alternative, and complementary, approach to engagement is to involve all employees at the beginning, encouraging them to provide solutions and commitments around what should and can be achieved. Although this may mean the strategy production is delayed, this would be a small sacrifice compared to a more engaged and involved employee base, and a higher probability for a more expedient and successful implementation of the necessary changes of behaviour (Ferguson and Clarke, 2012).<sup>41</sup> Evidence

suggests that responsible companies work both “top down” and “bottom up” to engage their employees with the development of their sustainability strategies and practices (Grayson and McLaren, 2011).<sup>42</sup> Employee engagement is important as both a driver and an outcome of corporate social performance and creation of sustainable business value

- measurement of impacts. Identifying and prioritising the management of impacts is an essential pre-condition for companies to improve their sustainability performance. Key steps in identifying and managing impacts include self-assessment, interpretation, and contextualisation of company activities. Companies should then focus on those areas where they can make a tangible difference, including stakeholder awareness; trend, risk and opportunity evaluation, and materiality assessment. This approach can be used to document the achievements of smart meter awareness-raising and energy waste reduction activities (Cormack, 2012)

Additional contingencies relate to the specific intra-organisational dynamics which shape discretionary pro-environmental behaviours at work (organisational citizenship behaviours for the environment - OCBEs) which were identified in our literature review. These include the following:

- employees' perceptions of their organisations' rationales were more important than their own rationales in determining OCBEs (Tosti-Kharas et al., 2017)<sup>43</sup>

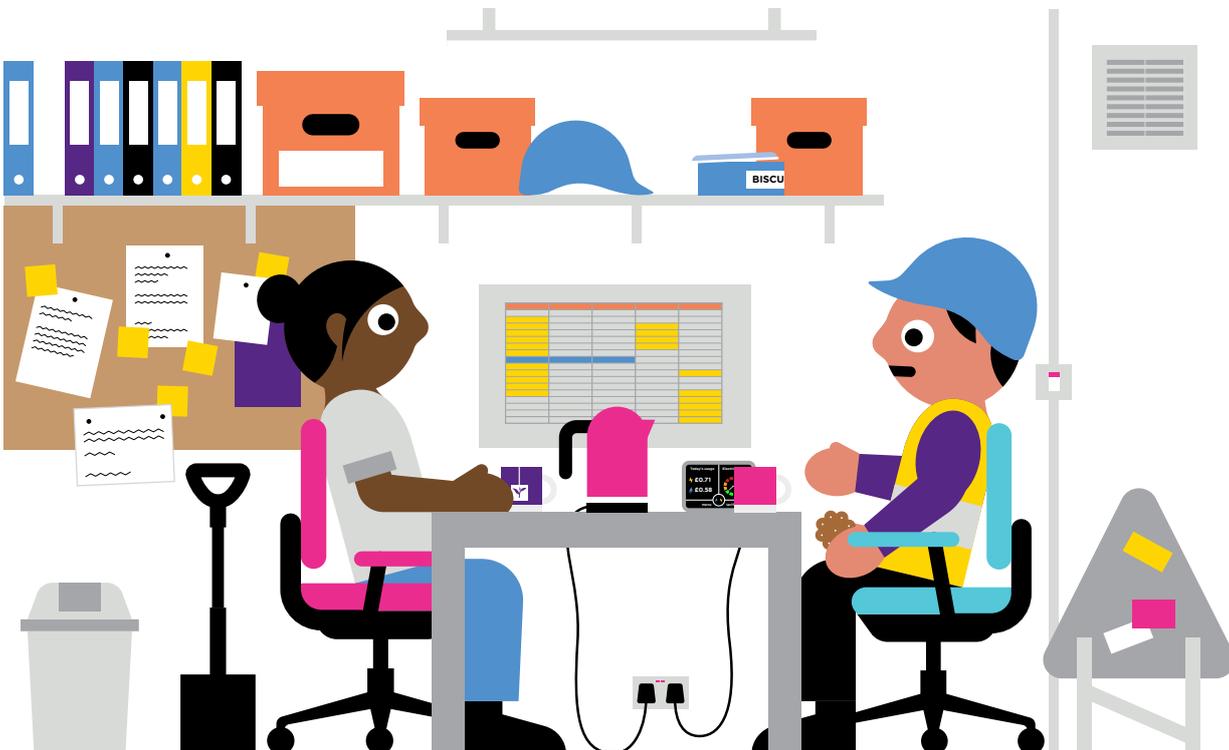
40 Ainsbury R, Grayson D. (2014) Business Critical: Understanding a Company's Current and Desired Stages of Corporate Responsibility Maturity. Doughty Centre Occasional Paper.

41 Ferguson, David & Clarke, Martin. "Enabling the Change: Corporate Sustainability and Employee Engagement". In David Grayson and Nadine Exter (eds.), *Cranfield on Corporate Sustainability* (Greenleaf Publishing, 2012).

42 David Grayson and Melody McLaren. *Engage employees and transform social and economic performance*, Ethical Corporation, May 2011, Pages 38-41.

43 Tosti-Kharas, J., Lamm, E., & Thomas, T. E. (2017). Organisation OR Environment? Disentangling Employees' Rationales Behind Organisational Citizenship Behavior for the Environment. *Organisation & Environment*, 30(3), 187-210

- employees must perceive a ‘positive green psychological climate’ in their organisation in order to bridge the gap between pro-environmental intentions and behaviour (Norton et al., 2017)<sup>44</sup>; with the resulting OCBEs having a positive effect on organisational performance (Shahin et al., 2014)<sup>45</sup>
- perceived organisational support toward the environment (POS-E) is positively related to OCBEs, job satisfaction, organisational identification, and psychological empowerment, and negatively related to turnover intentions (Lamm et al., 2015)<sup>46</sup>
- an employee is more likely to make extra environmental efforts if he/she perceives that the organisation supports his/her supervisor by granting him/her the decision-making latitude and necessary resources to engage in pro-environmental behaviour (Paillé et al., 2013)<sup>47</sup>
- OCBEs such as suggesting improvements to energy efficiency processes, sorting and recycling waste or setting up a green committee can have a significant impact on environmental performance but are challenging to measure (Boiral & Paillé, 2012)<sup>48</sup>



44 Norton, T. A., Zacher, H., Parker, S. L., & Ashkanasy, N. M. (2017). Bridging the gap between green behavioral intentions and employee green behavior: The role of green psychological climate. *Journal Of Organisational Behavior*, 38(7), 996-1015.

45 Shahin, A., Naftchali, J. S., & Pool, J. K. (2014). Developing a model for the influence of perceived organisational climate on organisational citizenship behaviour and organisational performance based on balanced score card. *International Journal Of Productivity & Performance Management*, 63(3), 290-307.

46 Lamm, E., Tosti-Kharas, J., & King, C. (2015). Empowering Employee Sustainability: Perceived Organisational Support Toward the Environment. *Journal Of Business Ethics*, 128(1), 207-220.

47 Paillé, P., Boiral, O., & Chen, Y. (2013). Linking environmental management practices and organisational citizenship behaviour for the environment: a social exchange perspective. *International Journal Of Human Resource Management*, 24(18), 3552-3575.

48 Boiral, O., & Paillé, P. (2012). Organisational Citizenship Behaviour for the Environment: Measurement and Validation. 109(4), 431-445.

# Chapter five

## Challenges

In this literature review we have been able to document how 1) responsible business behaviour creates business benefits generally, 2) intra-organisational dynamics shape discretionary pro-environmental behaviours in the workplace and 3) the factors shaping domestic smart meter adoption and use provide potential opportunities for employers to engage their employees with environmental issues for the benefit of both employee and employer.

The central conundrum for us has been that we do not have incontrovertible evidence that such engagement produces business benefits, as this is a new proposition for employers, only a hypothesis that supporting employees in adopting and using smart meters at home as part of a wider environmental management programme could benefit both employers and employees.

However, we know that creation of a 'smart grid' – which, as we have seen in our literature review, is already underway in other countries – will require not only widespread adoption of smart meter technology but large-scale changes in behaviour to optimise collective energy use, particularly in the transition to renewable energy sources.

'Smart meters are key enablers for consumer empowerment and for the take-off of energy service markets in the Smart Home. They will be used for billing purposes to quantify real-time consumption and generation, measure power quality, update instant electricity prices. However, as for electric vehicles, they should not be considered just as an additional component of existing electricity systems, otherwise their disruptive impact cannot be captured and their business case is negatively biased. By foreseeing the new system around smart meters, it is possible to exploit systemic effects and make sure that the deployment costs of smart meters are lower than the expected economic and societal benefits.'<sup>49</sup>

In addition to highlighting the specific benefits that could accrue to the employer and employee separately, there is an opportunity to engage employees with a higher aspirational goal – to help build a "smart grid" for the UK. Forward-thinking employers may wish to engage their employees in achieving this aspirational goal which transcends the boundaries of their own organisations.



49 Giordano, V., & Fulli, G. (2012). A business case for Smart Grid technologies: A systemic perspective. *Energy Policy*, 40(1), 252-259.



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# Appendices

## Smart Energy GB publications included in the review

- Is it time? Consumers and time of use tariffs (March 2015)
- Smart Energy GB: engaging Great Britain (June 2017)
- Smart Energy GB Consumer Engagement Plan and budget 2017
- Energising Health: A review of the health and care applications of smart meter data (this publication - which included a literature search - illustrated the depth of study desired for the current project)
- Smart energy for all (July 2015)
- Smart energy outlook (February 2017)
- A smart route to change: The application of behavioural science in supporting Great Britain's smart meter rollout and changing the way we use energy for the better (July 2016)
- Smarter Britain, Smarter Economy: Expert voices on smart energy and Britain's smarter future (November 2016)





