Principles of successful non-residential energy efficiency policy

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Abstract

Most organisations do not invest in energy efficiency even when it makes sense to do so. This is the "energy efficiency gap" that policymakers have struggled with for over 40 years. Current policy is based on overcoming the range of technical, economic and organisational barriers to energy efficiency that exist. However, governments are finding that energy efficiency policies are still not delivering their full potential.

Researchers now consider that policy should focus not simply on finding and overcoming barriers, but on how energy efficiency fits with the organisation's wider investment decision-making processes. The evidence is that energy efficiency happens when it is strategically important, or "salient", and that salience is strongly influenced by external drivers such as reputation and risk and also by the way different part of the organisation are connected and resourced.

These salience drivers are complex, but vary in a predictable way between organisations and sectors. This patterning could be used to open up new intervention points and approaches for policy to influence investment behaviours in businesses and the public sector. The experience of successful energy efficiency policies overseas supports this conclusion with case studies presented from Australia and Germany.

The overall message for policymakers is that effective policy depends not just on which policies are used, but how they are used together:

- Connecting policies together, for example by both exploiting reputational drivers and providing incentives to enable the organisation to respond.
- Deploying policies in the right order, for example by engaging with trade bodies to build confidence and capacity before regulating.
- Devolving policy towards regional and local agents and support networks that have better access to and understanding of the organisation's needs.

Introduction

The 2015 Paris Agreement marks a shift in the international climate policy regime from diplomacy to delivery. Countries must submit post-2020 national programmes, called Intended Nationally Determined Contributions (INDCs), and most have done so. However, the commitments they contain are projected to lead to a temperature increase of 2.7 °C (UNFCCC 2016), which is some way above the Paris Agreement ceiling of 2 °C. There is, in short, a global "implementation gap" between policy aspiration and policy impact.

The UK has an implementation gap of its own. In terms of ambition, the UK is seen as a policy innovator (Mallaburn & Eyre 2014) with the 2008 Climate Change Act (CCA) requiring at least an 80 % reduction in emissions by 2050 on a 1990 baseline. The Committee on Climate Change (CCC), set up by the CCA to hold the government to account, considers the UK to be on target until 2020. But this is largely due to supply-side policies such as electricity market reform, and the UK risks

missing its post-2020 targets without new demand-side policies (CCC 2016a).

Unfortunately non-residential energy efficiency policy has been on hold for a number of years. Funding for the Carbon Trust, set up to support non-residential energy efficiency in 2001, was withdrawn in 2012. Businesses complained that the policy landscape was too complex and expensive to implement and, as a result, a number of business energy tax, audit and reporting measures were put under review (HM Treasury 2015). Under new Prime Minister Teresa May, energy, climate and industry policy has been merged in a new department of Business Energy and Industrial Strategy (BEIS) with uncertain policy implications.

There are some positive signs. In July 2016 the government committed itself to the Fifth Carbon Budget under the CCA (CCC 2016b), which means reducing emissions by 57 % by 2030 (UK Parliament 2016a). The government has promised, at some point, to enshrine the Paris Agreement target of net zero emissions by 2100 into UK law (UK Parliament 2016b).

Most recently, as part of its wider Industrial Strategy policy (BEIS 2017a), BEIS has published a Clean Growth Strategy (BEIS 2017b) that sets out, in general terms, how it intends to deliver its Climate Change Act targets. The strategy contains an aim of improving non-residential energy efficiency by at least 20 % by 2030, with a commitment to consult a new package of measures to support business.

The CCC has conducted its own assessment of UK energy efficiency and heat policy to feed into the Clean Growth Strategy (CCC 2016c). As part of this work University College London (UCL) was invited to review the principles of successful non-residential energy efficiency policy from a UK perspective (Mallaburn 2016). This paper summarises the finding of this review for an academic audience.

The Energy Efficiency Gap

The central dilemma of non-residential energy efficiency policy is that most companies and public sector organisations, cost effective energy efficiency investments do not have strategic value, and as a result the business case for energy efficiency is not part of the organisation's investment decision-making process.

This is known as the "energy efficiency gap" – the wide disparity between what is apparently cost-effective and what is actually implemented in the real world (Hirst & Brown 1990). In the 40 years since energy efficiency policies were first developed, many governments, including in the UK, have struggled with this dilemma (Mallaburn & Eyre 2014).

In the early 1980s the dogma was that companies, as rational economic players, were ignoring energy efficiency because "hidden costs", such as lack of resources or management time, eroded the apparent profitability of the investment. It followed that government had no business intervening unless real market failures were involved, such as information asymmetries (Shove 1998). This "neoclassical" view formed the basis of information-based programmes such as the UK's Energy Efficiency Best Practice Programme.

In the 1990s a series of studies of the US Federal lighting retrofit programme "Green Lights" cast doubt on the profit-maximising model (DeCanio 1998). Lighting retrofit was a mature, well understood, risk free investment option. However many companies still applied discount rates to these investments far higher than comparable, non-energy efficiency investments. The conclusion was that the neoclassical economic model was at best, an incomplete description of reality (DECC 2012).

Subsequent research revealed a range of organisational and behavioural barriers (DeCanio & Watkins 1998, DeCanio & Laitner 2003). Transaction cost barriers arise because organisations do not make rational decisions but instead display "bounded rationality" (Simon 1955), relying on rules of thumbs and routines to makes sense of complex situations. Organisations can also show systematic biases against certain investment outcomes such as status quo bias (Samuelson & Zeckhauser 1988) and loss-aversion (Kahneman & Tversky 1992).

Taken together we now know of roughly 70 barriers and market failures affecting energy efficiency which are normally sorted into 7 main groups (Sorrell 2011):

- Risk: energy efficiency investments represent a higher, perceived technical or financial risk than competing investments. For example, new technologies might not fit in the existing infrastructure, or the process might have to be disrupted to make the change.
- Lack of information: missing, opaque or incorrect information can lead to energy efficiency opportunities being overlooked. Information barriers operate on the organisation as a whole and within the organisation.
- Hidden Costs: engineering-based analyses may overestimate cost-saving potential by ignoring overhead and management costs, disruptions to production, staff replacement and training, and the costs of gathering, analysing and applying information.
- Access to capital: even cost-effective investments will not go ahead if the organisation has no up-front capital, or has difficulty raising debt. Investment could also be inhibited by internal budgeting procedures or investment appraisal rules.
- Principal/agent: energy efficiency investments aren't made if the investor cannot realise the benefits. For example, if individual departments are not accountable for their energy use they will have no incentive to improve energy efficiency.
- Bounded rationality: opportunities can be ignored because individuals within organisations do not make rational economic decisions owing to pressures on their time or attention, or their ability to process complex technical information.
- Biases: such as status quo bias and loss-aversion affect the weight that people give to costs relative to benefits, and are different to bounded rationality, which affects the way people process information.

The Current Policy Landscape

Most of today's energy efficiency policies were conceived and developed in the late 1990s and early 2000s and draw heavily on this "barrier-based" research (Harmelink *et al* 2007), including the current EU Energy Efficiency Directive (EU 2012). These policies generally fall into one of the following categories:

- Performance labelling for electrical goods allows customers to choose between efficient and inefficient goods based on the potential benefits.
- Performance labelling for buildings allows tenants and owners to choose efficient buildings using measures of their in-use or predicted energy use.
- Regulation through minimum technology standards removes inefficient buildings, technologies and products from the market.
- Energy audits are formal, structured reviews of energy performance with recommendations for improvement.
- Voluntary or Long Term Agreements are formal sectoral agreements to reduce emissions over a time period.
- Energy management systems (EMS) and standards set out a range of formal, integrated practices for measuring, reporting, managing and reducing energy use.
- Technical information and advice provides independent information that the market will not provide, for example on technology benchmarking.
- Standards of Performance schemes collect a small tax or levy on energy bills to pay for energy efficiency programmes.
- Public procurement exploits the buying power of public bodies by specifying efficient products or services.
- Financial incentives provide support for capital investment either directly as grants and loans or indirectly as tax breaks or cap and trade schemes.

The UK has also deliberately experimented with most of these policies (Mallaburn & Eyre 2014) primarily so that the economy could build capacity and expertise. For example the 2002 UK Emissions Trading Scheme was set up in advance of the 2005 EU ETS to give UK businesses early experience of allowance trading (DEFRA 2006). The Carbon Reduction Commitment (CRC, Carbon Trust 2005) took a similar approach for large organisations not covered by the EU ETS.

However, whatever their original intention, the impact of these early programmes was often not as great as expected. The Carbon Trust's audit programmes only implemented 30–40 % of identified measures (Carbon Trust 2013), meaning that over half of the cost-effective measures were being ignored (NAO 2007). The CRC saved energy but met resistance from business for being too complex and expensive to implement, and as a result is now being abolished (DECC 2015, HM Treasury 2016).

Other countries are also finding that policies were not delivering their full potential: voluntary agreements and energy audits in Sweden (Stenqvist & Nilsson 2012; Larsen *et* al 2006, Karlsson et al 2012) and policies at State and Federal level in the USA (Khanna *et al* 2007, Hayes *et al* 2013). A similar picture exists in the EU (Rezessy & Bertoldi 2011, ADEME 2012) and the IEA (IEA 2016). Clearly policies designed to overcome barriers are not enough on their own to close the energy efficiency gap.

Salience – the strategic value of energy efficiency

THE INVESTMENT PROCESS

Many authors now consider the barrier approach to be flawed because it retains the implicit assumption that organisations will behave rationally when barriers are removed (Jaffe & Stavins 1994, Shove 1998, Biggart and Lutzenhiser 2007). Instead barriers are seen as operating in a "socio-technical" landscape (Guy 2006). Policies to overcome barriers are blind to this organisational context, and their shortcomings could be because they are perturbing a complex system in unpredictable ways (DECC 2012).

This approach is useful because it explains how energy efficiency is seen as part of the investment decision-making process (Cooremans 2011) and compared to other investment opportunities. For energy intensive companies, energy is highly salient because it makes up a large proportion of their costs. But for other organisations, energy is a marginal, invisible non-core issue delegated down the corporate hierarchy to operational teams such as facilities or estate management.

But many companies do invest in energy efficiency despite all the barriers working against it. For example, utility companies were found to be more likely to install efficient lighting (DeCanio & Watkins 2008) and lease efficient offices (Eicholtz *et al* 2010). Clearly something was happening in these companies that was raising energy from its lowly operational status to something more strategic. This propensity of an issue to noticed and acted upon is called "salience" (DECC 2012).

Cooremans (2012) showed how salience works as part of the energy efficiency investment decision-making process. Investments are not simple yes/no decisions but follow a more nuanced process with a beginning, middle and end. Issues first become salient during an early identification phase, possibly amplified by a sensitising event that distracts the organisation from its core business and allows it to focus on new opportunities (Dieperink *et* al 2004). This is followed by a diagnosis phase where options are assembled and analysed and solutions are proposed and costed.

It is only during the final evaluation phase where the surviving investment options are compared using economic analysis tools such as NPV or payback before being presented to the Board for final decisions to be made. This is the stage where most research and policy attention has focussed. However, by this point, energy efficiency may have been filtered out at an earlier stage in the process and would no longer be an option for policy to work on (DECC 2012).

SALIENCE DRIVERS

For non-energy intensive organisations, the salience of energy use, and the socio-technical landscape in which it operates, is highly complex. But there is a predictable pattern (DECC 2012). The salience of energy efficiency is generally stronger in larger companies compared to smaller ones, and in the public sector compared to the private sector. Research into these variations have revealed three factors, or drivers of salience:

- External drivers such as reputation are strongly influential in organisations that deal directly with the public such as retail (Janda 2002), or in sensitive fields like forestry, oil and gas (Prindle & Fontaine 2009, Cox 2012, Bansal & Roth

2000). Other drivers include the need to attract and retain high quality staff (Mori & Welch 2008).

- Internal drivers influence how energy efficiency is noticed, perceived and acted upon (Pellegrini-Masini & Leishman 2011). Salience is more common in organisations where there are strong connections between energy teams and senior managers (Prindle & Fontaine 2009, Martin *et al* 2012).

The way energy efficiency is presented internally, or "framed" is also important, both in the terminology used (DECC 2012) and by emphasising the wider benefits of energy efficiency where carbon savings have little recognition (Bicknell & Skumatz 2004, Jennings & Skumatz 2006).

- Sectoral drivers such as business-to-business (b2b) networks and supply chain partners can be strongly influential because local agents are more familiar and are seen as more knowledgeable and trustworthy than government (Dieperink *et al* 2004, Paramonova, S. *et al* 2014).

Also some sectors are more "cohesive" than others, for example those with well organised sector associations and trade bodies (Bansal & Roth 2000). Good practice can also spread very quickly through informal networks (Cordano *et al* 2010).

"What Works" in energy efficiency policy

The attraction of salience to policymakers is that it places energy behaviours – and our attempt to influence them – in a broader and more realistic organisational context so that there is a clearer connection between the policy intervention and the eventual effect on the organisation and the market it operates within. Two international examples show how this works in practice.

COMMERCIAL AND PUBLIC BUILDINGS

UK non-residential building emissions are broadly the same in 2016 as they were in 2002 (CCC 2016a) despite gradually tightening UK building regulations and the EU Energy Performance of Buildings Directive (EU 2010). An important reason for this is the "performance gap" where the actual energy performance of a new building is up to 5 times worse than the performance predicted at the design stage (Carbon Trust 2009). Recent industry research (Low Carbon Innovation Group 2012, Cohen & Bordass 2015) shows that, for the UK, the performance gap results mainly from a "design for compliance" regulatory culture that focuses on technologies that improve the predicted rather than actual performance of the building.

There is now growing evidence from Australia (Bordass & Cohen 2016), the US (Eicholtz *et al* 2010) and, more recently, Singapore (BCA 2017) that regulatory and market approaches based on in-use energy performance are delivering significant emission reductions. The National Australian Built Environment Rating System (NABERS) appears to be particularly effective. NABERS provides in-use energy performance ratings based on a 5-star system, with 2.5 stars the median and 4.5 stars representing best practice.

NABERS began as a voluntary scheme in New South Wales in 1998. Initially it only covered the "base building": the parts of the building controlled by the owner or developer. In 2004, Federal and State governments and the property investment industry began to specify minimum NABERS standards. Take-up accelerated significantly, allowing the Federal government to mandate the possession and disclosure of NABERS ratings for large buildings from 2011.

Official government and investment reports (Commonwealth of Australia 2016, IPD/Commonwealth of Australia 2013) are showing that NABERS has transformed the market. 80 % of base buildings are now rated and the average has risen from 2.9 stars in 2000 to 4.2 in 2014. CO_2 emissions have been cut by 32 % since 2005. Investors are reporting significant improvements in key asset value indicators such as lease length and vacancy rates. Average rents are 9 % higher and operating costs 8 % lower.

NABERS works because performance-based labels allow tenants to choose efficient buildings in response to salience drivers such as the reputational benefits of occupying highly-rated headquarters buildings. The demand created by tenants increases the asset value for developers, and a "virtuous circle" is set up with supply and demand feeding from each other.

In addition, NABERS is built on a number of crucial policy and market interventions that, over time, have maximised the effectiveness of the scheme:

- The scheme was voluntary at the start so that the industry could be involved in the scheme design and roll-out and to help to build confidence and capacity.
- Flexibility was built in from the start so that the scheme could learn from its mistakes, for example to identify and shake out glitches in the software and benchmarking tools.
- The 5-star system rewards success, which allowed "quick wins" to accumulate, reinforcing industry credibility and support and setting benchmarks for others to meet.
- This positive culture made it a lot easier for government to introduce procurement standards in 2004 and eventually to mandate NABERS in 2011.

INDUSTRIAL COMPANIES AND SMES

Industrial energy efficiency networks in Germany (Koewener *et al* 2011) are designed to accelerate the take-up of energy efficiency measures by industrial companies. They are distinctive because their management and delivery is highly devolved. Networks are managed by local agents, such as business groups, trade bodies and banks, with central government playing a back-seat role.

The German programme began in 2009 as a publicly-funded pilot of 30 company networks run by LEEN GmbH, a subsidiary of the Fraunhofer Institute, the state innovation and research agency. Each network comprises 10–15 companies, with each paying 10 % of network costs (typically €6,000–8,000 pa). SMEs receive 60–80 % grants, but were expected to make a contribution themselves. Capital investment finance is provided by a combination of local banks, loans from the state bank KfW and government bodies such as the Bundesamt für Wirtschaft und Ausfuhrkontrolle (BAFA)".

Networks are commissioned by a local initiator who is responsible for developing and steering the network and for measuring and reporting the results. The initiator usually devolves the day-to-day operation to a network coordinator who recruits the participants and ties together the various elements

and partners, and often also an engineering consultant who provides the energy audits and technical advice. The networks are implemented in three stages:

- The acquisition phase, lasting 3–9 months, when the network initiator selects the network manager and the consultant recruits the member companies.
- The review phase, lasting 5–10 months, where each company is audited and a target set for energy intensity and carbon savings each year.
- The network phase, lasting 2–4 years with 2–4 meetings a year. The way the network meetings operate varies considerably, but typically there are five activities:
  - Capacity building – education and training from the network team and experts.
  - Tools and software – tailored support for auditing, monitoring and implementation.
  - Peer-to-Peer support – exchanging ideas and experiences with network members.
  - Reporting and feedback – case studies and problem-solving sessions.
  - Mentoring – support from local businesses, often through the supply chain.

The pilot networks ended in 2014, and results showed energy intensity savings of 2.2 % p.a., which was twice the national average for industrial companies (Koewener et al 2014). The lessons learned were used to design a new Energy Efficiency Networks initiative (http://www.effizienznetzwerke.org/initiative), run jointly by the Federal government and industry, aiming at establishing 500 networks by 2020. The initiative is a key element of the government's National Action Plan Energy Efficiency (NAPE) that began in 2014. To date, more than 150 energy efficiency networks have been set up comprising around 1,500 companies. The intention is to save 75 PJ PEV and 5 million tons of CO_2 by 2020.

From a salience perspective, the value of the network approach is that they are exploiting the sectoral drivers operating between companies and local business groups (DECC 2012). For example:

- The pooling of management resources, coupled to federal incentives and KfW loans or other support programmes, overcomes organisational and financial barriers and keeps costs under control.
- The pooling of local best-practices leads to the advice and support being seen as more trustworthy and relevant compared to utility or government programmes.
- The involvement of external managing agents (coordinator, consultant, engineer) forces the company to take the process seriously.
- The peer-pressure effect of a collective target has a significant reputational effect because it encourages member companies to try to outdo each other.

The key factors are considered to be focus and trust (Koewener 2011). Companies with many competing priorities and a profit line to worry about are unlikely to focus for too long on a distant, centrally managed programme, especially when the funding dries up.

But when local actors are involved, the situation changes. SMEs will already be involved in and trust many of the support groups exploited by the networks. Sharing your problems with your peers is usually very effective. The involvement of larger companies as mentors adds credibility especially if the SME is in the supply chain.

Policy Implications

The attraction of salience as a concept to policymakers is that it describes how issues such as energy efficiency, that are of marginal importance to most non-energy intensive companies, rise in strategic importance in response to internal organisational changes and external "salience drivers" such as reputation and peer pressure. Policies like those described above are successful because they manipulate these drivers in ways that resonate with their target companies.

To summarise our understanding of salience:

- Organisations rank investment opportunities according to their salience. For most, energy costs are not material so investing to save energy is not a strategic priority.
- Investment decisions are also not binary but more nuanced, with distinct stages. Currently policy tends to only focus on the last, economic stage of decision making, which may be too late.
- As a result, energy efficiency policy should focus not just on energy costs, but on salience drivers such as risk, value, reputation, productivity, competitiveness and peer reward.
- Salience is also strongly influenced by organisational factors such as management structure and expertise, availability of resources and capital and accounting issues.
- These internal and external salience drivers vary in complex ways both within and between organisations but patterns are emerging that are beginning to be mapped.

Based on this, and drawing from the successful policies, we can start to sketch out some policy design principles:

- Policy needs to differentiate both between organisations and sectors and to support investments as the move along the decision-making process.
- To do this, the government needs to understand how salience drivers vary between target organisations and sectors and to segment policies accordingly.
- The government has a clear, active role by developing policies that influence salience drivers, and support and incentivise organisations as they respond.
- However, where the salience drivers are strong, the government's role can be limited, leaving the organisations themselves to do the "heavy lifting".
- The most effective policy will often be some degree of regulation, especially if it is carefully planned and has the support of the industry.

- Piloting – "learning by doing" – is important to build capacity and market expertise in government and to build confidence in the target organisations and sectors.

The overall lesson is that effective policy depends not just on which policies are used, but how they are used *together*. The need for integrated policies to address complex market transformations is not new (Sovacool 2009). However a salience perspective shows us what policy integration actually means in practical terms to change an organisation's investment behaviour.

There are three aspects to this that inform how policies should be implemented:

- Triggering and maintaining the salience of energy efficiency investments relies on **policy connections**, for example by exploiting external salience drivers like reputation and at the same time providing incentives to enable the organisation to respond effectively.
- Policies like NABERS shows the value of **policy sequencing**: working over an extended period in collaboration with the target market to build confidence and capacity so that policy can be gradually tightened, and ultimately curtailed as the market responds.
- Policies like the German networks show the value of **policy devolution** away from central government and towards regional and local change agents and support networks that have better access to and understanding of the organisation's needs.

Taken together, a salience perspective opens up significant opportunities for policymakers struggling with the energy efficiency gap in a post Paris Agreement world. Salience provides a new perspective on how organisations view and respond to policy, and provides new opportunities for policy to influence investment behaviour.

But salience also represents a significant challenge for government because it means balancing public authority and accountability with market knowledge and influence. Most governments address this by working in partnership with a dedicated programme delivery agency or by developing an in-house programme management capability, or a combination between the two.

However the UK government chose not to take this approach. It stopped supporting the Carbon Trust mainly because it felt that the organisation was outside its control (Mallaburn & Eyre 2014). But with public funding still scarce, it is highly unlikely that the market will be able to deliver the required savings without some kind of market-based support. The government will have to resolve this dilemma if it is to deliver on its obligations.

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