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THE HUMAN FACTOR IN ENERGY EFFICIENCY

Lessons from Developing Countries

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Contents

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This report is one component of a larger research project carried out by the German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE) that investigates behavioural barriers to energy efficiency uptake in emerging and developing economies at the firm and household levels. To our knowledge, this project represents the first systematic assessment of the application of behavioural insights to energy efficiency in an emerging and developing economy setting. It would not have been possible without the financial support of the German Federal Ministry for Economic Cooperation and Development and the UNIDO Climate Change Unit (Vienna) and the South African Industrial Energy Efficiency Project (IEEP) Management Unit. We are furthermore grateful to all interviewees, particularly our case study partners for their assistance and support during the project and for providing valuable comments on earlier versions of the case study chapters. All remaining errors are entirely ours.

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This report in brief

Energy efficiency has a plethora of benefits on the individual, organisational, and social levels. However, there is still a gap between knowledge and implementation. While market failure serves as an important barrier to energy efficiency uptake, so do the characteristics of human behaviour. Literature on human behaviour reveals many entry points for the inclusion of 'behavioural insights' in the design of energy efficiency programmes. Drawing from case studies on small and large industry in Colombia, India, South Africa, and Uganda, this report aims to provide practitioners with illustrations of how insights into human behaviour can be effectively integrated into energy efficiency programmes. The incorporation of behavioural insights should consider four aspects: the cultural context of the target group, windows of opportunity for the intervention, drivers and motivations, and the overall fit of the intervention with the package of measures.

PRINCIPLES OF SUCCESSFUL INTEGRATION OF BEHAVIOURAL INSIGHTS INTO ENERGY EFFICIENCY PROGRAMMES

- **Culture matters**. Co-design interventions with actors who know the context. While some behavioural principles are global, interventions often are not. Engage trusted stakeholders early in the process to understand and integrate cultural contexts.
- **Windows of opportunity** matter. Identify and choose the right time for your intervention.
- **Drivers** matter. Develop an understanding of people's situations, preferences, and motivations and use these as leverage points.
- **Test and adapt** your intervention. Even if you adhere to the principles above, an intervention can be ineffective or even bring about contrary results. Testing an intervention with a sample group before implementing it on a large scale is therefore vital.
- **Embed** behavioural interventions in a coherent package of measures that also addresses non-behavioural barriers such as market failures.

Source: The authors

The multiple benefits of energy efficiency, and why they often remain untapped

In a recent report, the IEA counts no less than fifteen benefits of energy efficiency in a non-exhaustive list (IEA, 2014). Some of these benefits tend to be of high priority for policy-makers, such as energy security, poverty alleviation, health, employment, and public budgets. Others offer a greater pay-off on the individual level (e.g. more disposable income) or the firm level (e.g. enhanced productivity). Energy efficiency is also good for the environment, reducing greenhouse gas emissions and local air pollution and contributing to natural resource management.

Developing countries typically feature a lower level of energy use per capita but a higher level of energy use per US dollar of their GDP than industrialised countries (WRI, 2014). These countries thus tend to suffer from energy scarcity at the individual level, but the energy available is often used unproductively. The need to use energy efficiently is particularly pronounced in developing countries where power outages may be frequent, hampering productivity and economic development and impeding energy access.

From a sectoral perspective, industry uses the highest energy share of all sectors globally (51 per cent), followed by transportation (20 per cent), the residential sector (18 per cent), and the commercial sector (12 per cent) (US EIA, 2013). Energy costs in industry are often not addressed directly, energy savings are rather seen as secondary benefits of other investments (OECD and IEA, 2014). However, energy efficiency investments could, often based on short payback periods, generate many benefits at the firm level, ranging from competitiveness to higher product quality and an improved working environment (OECD and IEA, 2014). This abundance of benefits should provide enough incentives for private actors to invest in energy efficiency, and for policy makers to support these investments. However, experience has shown that there is a gap between incentives and action (Jaffe and Stavins, 1994).

The energy efficiency gap is explained by a variety of barriers. Sorrell et al. (2011) list six categories: risk, imperfect information, hidden costs, access to capital, split incentives, and bounded rationality. Risk can either be technical (e.g. resulting from production disruption during installation of energy efficient technologies) or financial (e.g. resulting from variations in energy prices or the relative illiquidity of most energy efficiency investments). Imperfect information about the most efficient technological solutions may prevent investors from taking economically optimal decisions. Hidden costs relate to expenses on factors other than the actual investment outlay, such as training staff on new machinery or transaction costs due to the collection and analysis of information. Access to capital can be particularly restrictive for small enterprises or consumers who are not deemed creditworthy due to a lack of collateral. In a study on the Swedish foundry industry, for instance, access to capital was listed as the major barrier to energy efficiency investments (Rohdin et al., 2006). Split incentives are an issue when the actors investing in energy efficiency are not the ones reaping the benefits. A typical example is the insulation of rented buildings, with the owner having to invest and the tenants benefitting from lower energy bills. Bounded rationality refers to the limited ability of humans to process information, which can lead to the use of heuristics and to suboptimal decisions.

However, the 'human factor' as a barrier to energy efficiency goes beyond bounded rationality to sometimes even embrace irrationality. In contrast to the assumptions of neoclassical economics, humans often act contradictorily: they are biased towards the familiar and things they already own, holding on to them even in cases of economic loss; they prefer a limited number of choices over many; and they procrastinate. In contrast to maximising their self-interest, they can be motivated by altruism, fairness, and commitment, or by competing with others. These insights into human behaviour matter with regard to energy efficiency because they may uncover root causes of barriers to energy efficiency uptake which are not related to the above-mentioned market failures. Incorporating behavioural insights into energy efficiency programmes may help to motivate people to overcome this inertia.

The behavioural approach to energy efficiency is a research focal point at the German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE). The present collection of case studies is part of a DIE research project investigating energy efficiency decision-making in enterprises in Colombia, India, South Africa, and Uganda. The results clearly show that behavioural aspects matter, as investments in energy efficiency or energy savings have been blocked by non-rational mechanisms such as habits, faulty rules of thumb, or a preference for the status quo. However, energy efficiency uptake can be fostered by social impetuses such as comparison to others or esprit de corps in an ailing enterprise. Using these insights can provide managers and policymakers with new angles to approach energy efficiency and energy savings for the good of the individual, the enterprise, society, and the environment.

The boxes below outline the main findings of each case study and are followed by an overview of lessons for including behaviour in energy efficiency policy and programme design.

INDUSTRIAL ENERGY EFFICIENCY IN SOUTH AFRICA: CHALLENGING THE STATUS QUO WITH BEHAVIOURAL CHANGE

CASE STUDY PARTNER: United Nations Industrial Development Organisation (UNIDO), Industrial Energy Efficiency Project of South Africa, National Cleaner Production Centre, ArcelorMittal Saldanha Works

Economic downturn, energy supply shortages, and decreasing raw material quality have served as impetuses for energy efficiency uptake at ArcelorMittal Saldanha Works in South Africa's Western Cape. Behaviour change and process innovation have resulted in substantial energy savings, thereby contributing to plant competitiveness. Challenging the status quo, providing clear information to employees about energy efficiency, rewarding achievements, and drawing on social norms to create a focus on energy efficiency are some of the contributors to energy efficiency uptake. As this case demonstrates, behavioural insights can contribute near-term and low-cost opportunities for energy savings – especially important in the South African context in which they are greatly needed.

Author: Aurelia Figueroa

MANAGING UNCERTAINTY AND MITIGATING RISK TO PROMOTE ENERGY EFFICIENCY INVESTMENT DECISIONS IN COLOMBIA

CASE STUDY PARTNER: Inter-American Development Bank

Market gaps on both supply and demand sides have impeded the uptake of energy efficiency in Colombia amongst the hotel and hospital subsectors. Focusing on small and medium enterprises (SMEs), the Inter-American Development Bank in cooperation with Bancóldex has developed an innovative scheme seeking to recreate aspects typically found in an energy service company (ESCO) type model. This includes the introduction of quality assurance infrastructure and the provision of energy savings insurance in order to reduce uncertainty and mitigate risk. Although the intervention is still in the pre-implementation phase, it presents an interesting starting point to consider the related behavioural barriers that result in such market conditions. This study proposes means of addressing both the market failures and behavioural aspects, such as interventions to induce energy savings at staff and customer levels.

Author: Aurelia Figueroa

BEHAVIOURAL DRIVERS AND BARRIERS TO ENERGY EFFICIENCY INVESTMENTS OF MICRO, SMALL, AND MEDIUM ENTERPRISES IN INDIA

CASE STUDY PARTNER: Kreditanstalt für Wiederaufbau (KfW)

The analysis of the KfW programme 'Financing for Energy Efficiency Investments of MSME in India' in cooperation with the Small Industries Bank of India (SIDBI) is a particularly interesting case study for the field of finance and behaviour for two reasons: it comprises a technical assistance component and can be directly compared to a similar line of credit at SIDBI financed by the Japanese International Cooperation Agency (JICA).

SIDBI and the micro, small, and medium enterprises (MSMEs) are affected by different behavioural factors. Those influencing SIDBI are staff aversion to unknown and unclear programmes (ambiguity aversion), the framing and communication of the line of credit, and a lack of commitment and positive incentives. Those affecting MSMEs' decisions on energy efficiency investments are short-term thinking, a lack of business skills (e.g. inability to calculate payback periods), inefficient habits, and a preference for the current situation (status quo bias). Behavioural drivers that could encourage them to invest in energy efficiency are social comparisons, peer effects (e.g. learning from a similar enterprise in a cluster) and first-hand experience with energy efficient technology and energy management practices.

Author: Babette Never

ENERGY EFFICIENCY MANAGEMENT OF UGANDAN SMALL AND MEDIUM ENTERPRISES: ASSESSING THE ROLE OF BEHAVIOUR

CASE STUDY PARTNER: Ministry of Energy and Minerals Development, Uganda, and GIZ Promotion of Renewable Energy and Energy Efficiency Programme (GIZ-PREEEP)

In 2008/9 the GIZ Promotion of Renewable Energy and Energy Efficiency Programme (GIZ-PREEEP) and the Ministry of Energy and Mineral Development of Uganda (MEMD) ran an innovative programme targeting energy-intensive SMEs in different regions of Uganda. The programme aimed to improve energy management practices as well as to influence future investment decisions, using peer-learning and local networks.

This report identifies the following factors as major behavioural barriers to SME energy management in Uganda: short-term thinking and self-control problems (related to a lack of business skills), inefficient habits, a preference for the current situation (status quo bias), and trust issues, particularly between the utility provider Umeme and SME owners. Behavioural drivers that have been shown to work well or could do so in the future include more first-hand experiences, framing communication around losses instead of gains ('losing money with current practices instead of profiting through energy saving'), feedback, social comparisons, and peer effects (e.g. social learning). To make long-term behaviour change easier for SMEs, challenges such as limited access to financing, a lack of information on efficient products, and insufficient business skills also need to be addressed.

Author: Babette Never

Lessons learned

Adding behavioural aspects to a well-designed package of energy efficiency instruments can provide a powerful lever to enhance uptake. In a recent study on energy efficient light bulbs in Kenya, our team at the German Development Institute found that complementing a financial incentive with salient and easy to process information on the benefits of compact fluorescent lamps (CFLs) increased uptake from 23 percent to over 80 percent – about 60 percentage points. Furthermore, the added costs of providing such information were negligible. Behavioural entry points may thus provide powerful and efficient levers and have indeed been used successfully in other developmental contexts (see, for example, Banerjee and Duflo, 2011). The principle of loss aversion (Kahneman and Tversky, 1979) – which refers to the phenomenon whereby losses hurt more than gains satisfy – can be used to frame energy efficiency investments as avoiding the losses of business-as-usual practices instead of pointing out potential gains. The endowment effect (Kahneman et al., 1990) – a term that describes the behaviour which sees humans tend to value things they own more than identical things they do not own – can be used in 'take home and try out' elements of energy efficiency programmes. Social comparisons (Festinger, 1954) can be employed, for example, to support intraorganisational energy-saving behaviour by introducing competitions and awards. The importance of trust becomes particularly apparent in markets which lack the appropriate institutions to ensure contract fulfilment and accountability. This shortage opens avenues for alternative trust-building measures, such as certificates or labels, and emphasises the importance of locally trusted partners in programme implementation.

In the design and implementation of behavioural interventions using the above insights, four aspects matter: culture, windows of opportunity, drivers, and overall fit with the package of measures.

CULTURE

When a behavioural intervention is designed, it is vital to take the cultural environment of the target group into account. While some behavioural traits are shared amongst humans (based on our shared evolution and genetic code), culture also strongly influences human behaviour and with it the impact of behavioural interventions. Culture must be understood as a multilevel concept that reaches from the culture of the individual, the family, workplace, neighbourhood, nation, or religion to a global culture (Erez and Gati, 2004). Each level can influence behaviour. In our case studies we found several indications of culture as an enabler or barrier to energy efficiency and savings. In the South African case study organisational culture clearly enabled the implementation of energy saving measures. Behavioural nudges using the strong esprit de corps motivated employees to change their behaviour and to use less energy, thereby helping the firm to survive a financial crisis. The employees' feeling of empowerment was central. In the Ugandan case neighbourhood social norms prevented the owners of small enterprises from making use of low off-peak tariffs during late hours, since working in the dark would have been associated with electricity theft.

WINDOWS OF OPPORTUNITY

Choosing the right moment for an intervention (e.g. by making use of a window of opportunity) is a second important aspect. Habits, which are often particularly pervasive, can be easier to tackle in moments of disruption – whether at the personal, organisational, or even national levels (Thompson, 2011). The employees of the South African enterprise were particularly open to changing their energy-wasting habits since their factory was in a financial crisis. However, the window of opportunity need not be a drastic disruption in a person's living or working conditions. The breaking of a machine or an electric household item, for example, provides obvious windows of opportunity to purchase appliances that are more energy efficient.

DRIVERS

To influence people's behaviour, messages and interventions need to make use of the drivers of the target audience. 'Using less energy' as such is hardly ever the main motivation for investing in new technology or engaging in energy-saving behaviour. In contrast, if people are particularly motivated by competition, status, or helping others, they are likely to react favourably to respective interventions. Drivers specific to the situation of the target group can also play an important role, as was the case in the South Africa study.

OVERALL FIT

Behavioural interventions are not a silver bullet for closing the energy efficiency gap. They need to be part of coherent packages which address the most important barriers in a holistic manner. For example, in our studies on Ugandan and Indian small enterprises, managers often lacked basic business skills and were thus unable to correctly calculate payback periods and savings potential, which presented a strong barrier to energy efficiency investments. Thus in these instances, any meaningful package of measures would have to include skills development. Similarly, introducing risk mitigation instruments or simply making energy efficient technology available may be necessary to enable people to reap the benefits from using energy wisely.

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Industrial energy efficiency in South Africa:

Challenging the status quo with behavioural change and process innovation

AURELIA FIGUEROA

CONTENTS:

Economic downturn, energy supply shortages, and decreasing raw material quality have served as the impetus for energy efficiency uptake at ArcelorMittal Saldanha Works in South Africa's Western Cape region. Energy savings achieved through behaviour change and process innovation have resulted in substantial energy savings, thereby contributing to plant competitiveness. Challenging the status quo, providing clear information to employees about energy efficiency, awarding achievements, and drawing on social norms to create a focus on energy efficiency are some of the contributors to energy efficiency uptake. As this case demonstrates, behavioural insights can contribute near-term and low-cost opportunities for energy savings – especially important in the South African context in which they are greatly needed.

Introduction

The industrial sector accounts for roughly one-third of global final energy consumption and related emissions.

This proportion is often much higher in industrialising economies, where it may exceed 50 per cent (IEA 2013; IIASA 2012; UNIDO 2008; McKane 2010). In countries with a fast growing industrial sector, particular competitiveness benefits may be realised through the adoption of energy efficiency and complemented by substantial opportunities for upgrading. Farrell and Remes (2009) of the McKinsey Global Institute found that 65 per cent of potential

profits from energy efficiency are located in developing countries.

Yet the leading pursuit of industry is production, not energy efficiency, and numerous business concerns compete for resources and a sense of urgency. Often, industrial energy consumers may attempt to influence the price of energy rather than or before addressing their own means of consumption. Furthermore, the systems that make up the industrial production force are engineered to support reliability rather than efficiency (IIASA 2012; UNIDO 2008). Though reliability and efficiency are not necessarily at odds, the latter may require a dedicated effort to realise its potential outcome.

The focus of industrial energy efficiency interventions may often shift to technical aspects given the significant contribution of machinery to energy usage in industry. This focus, however, must take into account the human dimension as well. For this report, the working definition of 'industrial energy efficiency' comes from UNIDO (2008, 9), which holistically defines it as 'the amount of energy used to produce one unit of a commodity', which is 'determined by the type of processes used to produce the commodity, the vintage of the equipment used, and the efficiency of production, including operating conditions'. Industrial energy efficiency must thus include both technological and behavioural aspects – the latter of which is the focus of this report. Behaviour is frequently observed to contribute to or detract from energy efficiency efforts (Oikonomou et al. 2009; Never 2014; Gillingham et al. 2009; Pollitt/Shaorshadze 2011).

This paper focuses on South African industry and was supported by cooperation with United Nations Industrial Development Organization Industrial Energy Efficiency Project (UNIDO-IEEP) of South Africa, the National Cleaner Production Centre of South Africa (NCPC), ArcelorMittal Saldanha Works (AMSW), and other members of the Energy Intensive Users Group (EIUG) of Southern Africa. Interviews with AMSW staff and others engaged in industrial energy efficiency in South Africa contributed the basis for the research data.

This report specifically draws on the experience of AMSW as a participant in the UNIDO-IEEP, which recently became the flagship government programme for industrial energy efficiency. AMSW first engaged with the IEEP in 2010 to support the introduction of an energy management system (EnMS) along with energy systems optimization (ESO) measures in line with the international energy management standard ISO 50001.[2] An EnMS typically includes (a) a strategic plan involving measurement and management with the aim to improve continuously, (b) an overarching energy management team led by an energy manager with direct management report who is responsible for implementing strategy, (c) energy-purchase, -use, and -disposal policies and procedures, (d) continuous improvement projects, (e) a living energy manual, (f) context-specific key performance indicators, (g) and periodic progress reports on the aforementioned elements for management (UNIDO 2008). UNIDO-IEEP assisted AMSW plant engineers acquire in acquiring EnMS and ESO expertise by providing training, technical and advisory support in the implementation and installation of an EnMS along with other energy performance optimisation measures (UNIDO-IEEP 2013).

Technical efficiency change in the form of resource allocation improvements, production process management, and organisational change resulted in new-to-the-firm process and management innovations. The UNIDO-IEEP/AMSW intervention seeks to challenge the status quo regarding the identification of energy savings opportunities and to overcome the decision-making heuristics that may arise under circumstances of time scarcity. The intervention was both hindered and promoted by loss aversion – while imminent plant closure spurred action, it also impeded funding provision for technological upgrading, thus shifting the focus to low-cost behavioural change. EnMS and training components have contributed to energy efficiency awareness. Management practices have incorporated energy efficiency and made it an important topic in administration and procedure, thus contributing to a top-of-mind effect.

This report begins by providing an overview of the background conditions shaping the South African industrial and energy sectors and the role of AMSW in this context. It also outlines the IEEP project and then reviews the behavioural aspects of this energy efficiency intervention. It concludes with policy recommendations drawn from the analysis herein.

2 *AMSW does not yet have this certification, but it does have an internal audit score exceeding 96% per cent. Achieving certification will be a focus for 2015.*

Context

AMSW AT A GLANCE

AMSW is part of the South African extractive and mineral-processing industries, which have a significant role in the South African economy. It is one of two ArcelorMittal operations in South Africa that produce flat and long steel products, the other being Vanderbijlpark, which is roughly three times larger and is led by AMSW in cost performance.

AMSW is a fully integrated operation that began in 1998 and currently has 548 permanent employees. It produces 'clean' steel with almost no tin or copper impurities and focuses on hot rolled coil (HRC) products with a thickness of less than 1.6 mm, which are primarily for export to West and East African markets. AMSW's competitors are found in the international rather than domestic markets as hot rolling is only carried out in a few other countries (China, India, Japan, and Italy). On a global scale the plant is performing below average in terms of energy intensity (Jones 2014; Holcroft 2014).

In 2013 AMSW's HRC output was 1.2 million tonnes. The most electricity intensive process is thin rolling. Per tonne of HRC, 1,192 kWh were required and 3.19 tonnes of carbon were released. Of the total cost structure in 2013, energy-related expenditures accounted for 44 per cent, of which 19.4 per cent was spent on coal, 14.7 per cent on electricity, 7.5 per cent on coke and 2.5 per cent on liquefied petroleum gas (LPG). Energy requirements differ amongst the production phases. Iron making is coke and coal intensive, the water treatment plant is electricity intensive, and the reduction process is electricity and LPG intensive. Average electricity demand is 160 MW at an annual cost of ZAR 750 million. Average daily electricity consumption is 3 GWh, while water consumption is 8 million litres (world best for an integrated steel plant).

AMSW's original business case was based partly on low-cost electricity. Electricity costs have changed from approximately ZAR0.30/kWh at the plants establishment to approximately ZAR 0.61/kWh today (Jones 2014; Van Zyl 2014). These rising prices in combination with the 2008 electricity supply challenges and decreasing iron ore quality (which impacts energy demand) have affected the AMSW plant's competitiveness. AMSW is the biggest electricity user in the Western Cape and has had an almost fully stable electricity supply except for in 2008.

AMSW's energy challenges are compounded by the rising energy demand that stem from declining iron ore qualities, which are the result of decreased iron ore metal contents and increased silica levels (5.6 per cent in January 2014). Ore quality variation affects the amount of energy needed for the reduction reaction required to produce iron. In this case additional slag (lime and dolomite) and processing fuels are necessary, which involves more coal in the corex process and more electricity in the midrex process (to melt the increased amount of dolomite necessitated by poorer quality iron ore). This is a growing challenge which is being exacerbated by broader energy-supply challenges in the country (Van Zyl 2014). AMSW is considering renewable energy distributed generation technologies to meet their growing energy needs along with the possibility of a local liquefied natural gas (LNG) import terminal to serve the Western Cape (Holcroft 2014).

The 2008 global economic downturn and the recession that followed greatly impacted on the steel industry. This contributed to a critical juncture facing ArcelorMittal and constructed what numerous interview partners referred to as a 'burning platform' on which energy efficiency decisions found impetus. In 2009 the request to implement an EnMS was made to the AMSW board. At that time world steel prices were very low in the wake of the 2008 economic crisis, energy costs were impacting profitability, and the plant was at risk of closure. In an effort to stem financial losses and increase profitability, an EnMS was initiated which focused on low capital expenditure efforts, consisting primarily of behavioural change and process innovation and complemented by technology upgrading. Plant energy efficiency

Table 1:Energy efficiency projects and related components	
Project type	**Components**
Systems	Reporting, ISO 50001, control items, management infrastructure
Operational efficiency	Air separation units, ArcelorMittal best practices, water treatment plant, rotary hearth furnace
Efficiency innovation	LPG, conarc energy input, O_2 purity
Tariff structure	Engage load shedding to align with different tariff time periods
Technology	Variable speed drives, waste heat utilisation (rotary hearth furnace), lighting replacement

Source: Van Zyl (2014)

was systematically targeted through an EnMS and management infrastructure. In May 2010 an energy manager was appointed and later joined by three more engineers to form an energy management team, which sought to identify energy savings opportunities and develop corresponding projects. In January 2011, AMSW joined the UNIDO-IEEP programme. Today AMSW has three staff members wholly dedicated to energy management (Van Zyl 2014).

Process and organisational innovation have been dominant features of this intervention as they are relatively low-cost options compared to technological upgrading. Cost-saving projects related to energy demand were undertaken in the areas of technology, operational efficiency, efficiency innovation, tariff structures, and systems. Details are found in Table 1. An initial investment of ZAR 500,000 in energy efficiency was offset in less than four production days and savings are estimated to reach ZAR 362 million by 2016. LPG savings totalled 42 per cent in a three-year period (Van Zyl 2014).

ENERGY AND INDUSTRY IN SOUTH AFRICA

Energy is a top-three expense for most South African industries, along with raw materials and labour. Energy availability and pricing, amongst other factors, greatly portend business competitiveness and sustainability. Lower electricity rates have given heavy industry short-term cost advantages while contributing to longer payback periods for energy efficiency investments. Widespread rolling blackouts in 2008 and other structural obstacles have highlighted the necessity for energy efficiency improvements (de la Rue du Can et al. 2013) in South Africa. The energy supply challenge is aggravated by rising energy prices and shortages. Historically, electricity prices have been low and included subsidies, meaning that large industrial and public sector consumers have paid as little as ZAR 0.18 per kWh, or approximately one euro cent (IEA 2013). Energy supply shortages have affected all sectors nationwide and have especially impacted energy-intensive industries, which have a driving role in the South African economy.

An impending carbon tax and energy shortages also present significant near-term challenges to business profits. At the United Nations Framework Convention on Climate Change 15th session of the Conference of the Parties in 2009, South Africa committed to greenhouse gas (GHG) emissions reductions of 34 per cent by 2020 and 42 per cent by 2025. The relevant regulations will come into force in 2015, though the included carbon tax will not take effect until 2016. During the first phase each tonne of equivalent carbon dioxide (CO2e) will cost ZAR 120 with a 10 per cent annual increase. Relief measures will be put in place with each tonne of CO2e costing ZAR 12–48 for the iron and steel sector (National Treasury 2013).

Electric power consumption has been rising steadily apart from 2009 (due to the fallout from the global financial crisis). In 2011 national consumption stood at 237.466 GWh (World DataBank 2014). In 2013, 72 per cent of primary energy consumption was sourced from coal, 22.2 percent from oil, 2.9 per cent from natural gas, 2.5 per cent from nuclear energy, and less than 1 per cent from hydroelectricity and other renewable energy sources (BP 2014). Almost 90 percent of grid electricity is supplied by coal-fired power plants. Nuclear energy produces approximately 5 per cent, while the remainder is produced by hydroelectric and pumped-storage stations (DOE 2014). Eskom, a public electricity utility wholly owned by the South African government and the largest electricity producer in Africa, supplies 95 per cent of the country's electricity (EIA 2014). In 2011 net electricity generation amounted

to 243,700 GWh (EIA 2013), while CO_2 emissions from fossil fuel consumption totalled 461.47 million metric tonnes (EIA 2013).

Since 2009 there has been a trend of annual tariff increases (IEA 2012). The government's National Energy Efficiency Strategy has recognised low prices as a barrier to energy efficiency, echoing the finds of Popp (2002) that higher energy prices may promote energy-related innovation. It has thus incorporated an environmental levy in the electricity tariff to fund energy efficiency and demand-side management (DSM) programmes and also intends to establish a 'cost reflective electricity tariff by 2015' (de la Rue du Can et al. 2013, 3).

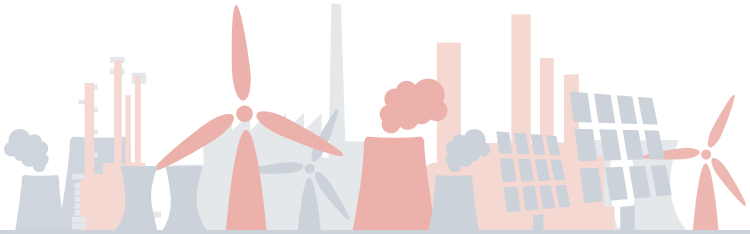
The National Energy Regulator of South Africa (NERSA) is responsible for regulating electricity, piped gas, and petroleum pipeline industries. Further responsible ministerial agencies include the Department of Energy (DOE), which is authorised to implement energy efficiency policies; the Department of Trade and Industry (DTI), which aims to enhance South African industrial competitiveness and promote international trade; and the South African National Energy Development Institute, which conducts energy research and is a successor of the National Energy Efficiency Agency and the South African National Energy Research Institute (de la Rue du Can et al. 2013).

Between 1990 and 2011 GHG emissions in the industrial sector increased by 194 per cent, by far the largest sectoral increase in this time period (WRI 2014). In a 2000 GHG inventory process, the iron and steel industries were found to have emitted 15,956.63 MtCO2e (National Treasury 2013). The iron and steel industries require energy input from coal, natural gas, electricity, and liquid fuels. Energy intensity reduction was halved in the iron and steel sector between 1993 and 2006 (Inglesi-Lotz/Pouris 2012). Still, in comparison with those that share a similar steel production process (Canada, the European Union, and Taiwan), South Africa fares poorly on the measure of average consumption of electricity per tonne of steel produced (WEC 2013).

ENERGY EFFICIENCY AND DSM MEASURES

Load shedding or planned rolling blackouts were introduced by Eskom at the start of 2008 in response to electricity supply challenges (IEA 2013). Ongoing power shortages, electricity price increases (which despite year-to-year variance remain ongoing), and the looming potential of a carbon tax have spurred the creation of energy efficiency and DSM programmes. Several industrial energy efficiency initiatives are underway, including the Energy Efficiency Accord, which is a public–private partnership between the National Business Initiative (NBI) and the DOE and was launched in 2005. DTI hosts the Manufacturing Competitiveness Enhancement Programme, which will aim to fund businesses' energy efficiency programmes as part of the industrial policy action plan (Van Es 2014). Fiscally, companies may also avail of energy efficiency tax allowances for industrial projects provided for in Section 12i of the Income Tax Act (IEA 2013). Convening forums are also present. The EIUG, whose members account for roughly 44 per cent of electrical energy consumption in the country, works with the NBI Leadership Group on Energy Efficiency. The Energy Efficiency Leadership Network also brings together fifty-eight major South African companies that have agreed to demonstrate leadership in energy efficiency.

The National Energy Efficiency Strategy has set a nationwide target of 12 per cent energy efficiency improvement by 2015 as compared to the business-as-usual projections from 2000, which were measured as a reduction of energy usage per ZAR of GDP. In 2004 NERSA introduced the Regulatory Policy on Energy Efficiency and Demand-Side Management for the South African Electricity Industry. This makes energy efficiency and DSM measures a prerequisite for electricity distribution licensing. NERSA also developed the ratepayer-financed Energy Efficiency/DSM Fund (which was administered by Eskom but later ceased due to insufficient funding), outlined the roles of ESCOs, and created an accreditation system for independent monitoring and verification entities (IEA 2013).



Before coming to an end, the ratepayer-funded programme was available to municipal distribution companies, industry, and third-party ESCOs. It developed rapidly between 2007 and 2009 when load shedding impacted industrial performance. In 2010 the DOE endorsed the Standard Offer Programme, which offers a price for energy savings (ESMAP 2011). In 2011 a performance contracting model was introduced, which facilitated the purchase of verified bulk energy savings by Eskom from developers with multiple, high-cost projects that generated savings of at least 30 GWh over three years (IEA 2013).

Eskom has had energy efficiency and DSM programmes in place since 2004. Recently, certain programmes were put on hold for new submissions (Blaine 2014; Webb 2013). In response to electricity constraints, Eskom announced in July 2014 that low-cost and rapid implementation projects complying with the ESCO model would be considered for funding (Eskom 2014). The incentive schemes for industry include three programmes: Standard Product, Standard Offer, and Energy Service Company (ESCO). The Standard Product programme provides pre-approved rebates for expected energy savings with full payment awarded once the project is commissioned. It has been expanded by the Aggregated Standard Product programme, which allows developers to aggregate individual projects with a contract size of 1–5 MWh.

The Standard Offer programme permits energy efficiency payments to be made at a fixed rate over a fixed period. The ESCO programme provides demand-based payment for verified savings at a price of ZAR 0.50–0.70 per kWh for projects with savings ideally over 1 MW (Mewalala 2014; Thorby 2014; Institute for Industrial Productivity nd).

Eskom also uses performance contracting, whereby it purchases bulk verified savings across sites and technologies from a sole project developer. The minimum project size must be 30 GWh over a three-year period with a rate determined through fixed offer or competitive bidding, which can vary between ZAR 0.55 per kWh (peak) and ZAR 0.10 (off-peak). Industry has mostly used ESCO performance contracting and the Standard Offer programme, though the former has been more popular due to its ability to provide customised solutions for the specialised nature of the industrial sector (Mewalala 2014; Thorby 2014).

The UNIDO-IEEP and AMSW approach

While energy has always been a leading cost outlay for AMSW, energy efficiency was not always approached holistically. Although energy efficiency is a driver of plant competitiveness, it must compete for attention. Most relevant in the South African context are skill shortages and labour unrest (Ottermann 2014).

Organisational barriers were also an issue. Energy efficiency tasks were spread across the plant in separate units without proper oversight and fell into a type of 'no man's land', where they were avoided as a common burden, impeding action (Van Zyl 2014). The IEA (2012a, 12) notes the challenges the absence of an overarching energy management system can present: 'Individual energy management components on their own will not lead to sustained energy management and on-going improvements. Rather the sum of the actions, processes and systems – i.e. energy management systems – will improve energy performance.' The EnMS implemented at AMSW was to this end an important element of uniting and delegating energy efficiency tasks. Capital restrictions resulting from budget shortfalls and administrative hurdles, status quo management processes, low levels of awareness, knowledge-sharing barriers, and a lack of urgency, inter alia, were also challenges.

The energy efficiency progress made at AMSW, while not complete, exceeds that made by its peers, including the other ArcelorMittal steel operation in South Africa, Vanderbijlpark. Some contextual differences exist between the two (e.g. AMSW is one-third the size of Vanderbijlpark) or the noted, but harder to quantify, social norms of the plant which have facilitated the change efforts. In the literature

there are similar examples of the barriers within and the explanations for differences between the companies with regard to operations. Financial access (Farrell/Remes 2009) and knowledge-flow barriers (Meyers 1998) are both identified as barriers to technological change in energy efficiency. A firm's governance structures (Quereshi/Te Velde 2006), size, and sector-specific features (Cainelli et al. 2006) may also explain differences in energy intensity. The specific intervention factors which impacted energy efficiency at AMSW were the EnMS that was established, training, the social norms of AMSW, management involvement, finance, and communication.

Initially, focus was placed on raising awareness and energy coordinator training. Later, there was a greater emphasis on capacity-building over mere instruction in order to empower employees with the ability to identify opportunities rather than to simply implement top-down directives. Resource, policy, and strategy support were sought to facilitate bottom-up energy efficiency (Van Zyl 2014).

The programme foresaw the challenges of a necessary philosophy change including the subsequent filtering down of this change to all levels of operation. To distribute change agents, it identified energy champions in different areas, who were made responsible for raising energy awareness with the goal of generating spin-off. The dedicated energy coordinators at each plant component helped champions to become more capable energy custodians in their respective work areas. Energy champions are frequently electrical engineers. It is important that they have or develop a passion for energy efficiency and that they are known so that they can be approached with bottom-up and experience-driven ideas for energy efficiency (Van Zyl 2014). Prindle (2010) and IEA (2012a) similarly note the importance of identifying problems and experience-driven change possibilities.

Distributing responsibility and providing autonomy, as was done in this case through bottom-up energy efficiency initiatives, can contribute to building employee 'ownership' of objectives by assigning higher levels of control. Organisational design can contribute to decentralised frameworks which encourage feelings of ownership. Knowledge similarly contributes to ownership. Employees who understand the goals, mission, and performance of their organisation may develop psychological ownership (Pierce et al. 2001).

Decentralised or self-initiated change, such as that espoused as part of this intervention, can encourage feelings of ownership of the process amongst employees, whereas imposed change may provoke resistance (Dirks et al. 1996). Ownership can also help to convince employees that issues are worthy of their attention (Pratt/Dutton 2000). Ownership feelings can also apply to organisational practices, which is important in the context of energy behaviour change (Kostova 1998).

ENERGY MANAGEMENT IMPLEMENTATION

The basis of the EnMS was the World Class Manufacturing (WCM) programme, which focuses on reliability and availability. Indeed, it is not uncommon for energy efficiency initiatives to build upon existing continuous improvement structures (IIASA 2012). Interviewees saw the WCM programme as an essential element of energy efficiency because it ensures stable inputs, optimises processes, and manages costs. The WCM scheme may also be referred to as total productive plant maintenance (TPM) in other companies or as lean manufacturing in Germany. The WCM programme focuses on the total production system, including both lean manufacturing and TPM aspects, and incorporates the Six Sigma principle of controlling input to control output quality. The key component of the WCM programme is autonomous maintenance, which refers to the routines followed in daily equipment inspection that reduce delay times and create a stable platform. The WCM programme developed reliable operations which made optimisation possible (Van Zyl 2014; Du Plessis 2014).

The energy project manager is the primary EnMS implementer. He or she provides feedback on performance and implementation, ensures that energy coordinators are aware of the energy plan, and resources for implementation. Together with energy team leaders, the energy project manager develops plans and targets, prepares progress reports, coaches and assists energy coordinators in their efforts. Implementation ideas, decision, and actions are decentralised to varying degrees, which is essential given that production is specialised and each phase has its own energy mix (Jones 2014).

Energy plans have to reach the shop floor and be integrated into standard operating procedures (SOPs). Energy efficiency opportunities are identified in each project area, and the energy manager assists by preparing capital expenditure proposals and presentations. The energy manager also manages projects that cross boundaries – for example, efficiency improvement at the water treatment plant, which supplies a service to the various production units. The energy manager must also be a philosophy change manager as maintenance and breakdown avoidance, rather than energy efficiency, have been the historical pursuits of shop floor staff. Even electrical and environment engineers do not necessarily look at their work place from an efficiency perspective in a production context (Jones 2014).

TRAINING

Skill shortages have been a barrier to energy efficiency and training has been a driver of energy efficiency implementation at AMSW. Education and training were facilitated by involvement in UNIDO-IEEP and human resources policies facilitated on-the-job training. Employee training contributed to process innovation in the firm by providing an 'innovation dynamo' or 'dynamic factors shaping innovation in firms which draw on and are influenced by transfer factors' and broader framework conditions. Transfer factors contributed to the uptake of information. This includes both external and internal engagement, for example through the UNIDO-IEEP and internal training procedures. Social and cultural aspects at AMSW facilitated knowledge linkages, effectiveness, and flows (OECD 2005, 6).

The DTI (2013) in its Industrial Policy Action Plan notes the broader barriers presented by skills shortages and misalignment, especially regarding 'sector-specific skills strategies and programmes'. South African industry contributes significantly to national training efforts: 'Business enterprises are important as creators of human capital for the innovation system, not simply as employers of human resources' (OECD 2007, 156). This is reflected by the proportion of business enterprise expenditure on research and development in the country, which is especially large relative to other emerging and developing economies (OECD 2007).

Factors impeding energy efficiency training are its focus on technology, high staff turnover, and lack of time resources. External training and certification programmes often neglect behavioural elements. For instance, despite behavioural aspects being a common thread throughout all or most aspects of EnMS, the Certified Energy Manager five-day course is centred upon technology because participants typically come from an engineering background (Van Es 2014; Ottermann 2014). High staff turnover makes it difficult to maintain high skill levels throughout the company and necessitates further ongoing training efforts. Time resources must be accounted for when allocating training resources, in order to ensure a critical mass of knowledge and ability.

In South Africa the broader skills shortage can be attributed to high turnover rates. AMSW employees, for example, are often lost to foreign operations (in Kazakhstan, Sierra Leone, and Ghana) which pay more. Thus at AMSW training is ongoing to ensure skill levels and also because 'most optimized industrial systems lose their initial efficiency gains over time due to personnel and production changes' (UNIDO 2008). The large presence of external contractors on-site may be another testing element to the extent that training differs amongst the population. The training of only one person is another barrier, as the individual's knowledge cannot be implemented if he or she becomes unavailable or otherwise distracted. This can only be overcome by training more than one person on each element (Van Zyl 2014).

Training is designed to be broad-based in order to encourage a wider social norm at the plant, which actively seeks energy efficiency opportunities and implements them. This is necessary to overcome earlier social norms formed in the historical context of cheap electricity and is pursued with a hands-on approach by the UNIDO-IEEP and AMSW. Such training is essential for elements of the EnMS, which use a decentralised, bottom-up approach. More practically, it can be done in an on-the-job setting, thus keeping people on the worksite and minimising the impact on production line operation. Formal training can to this end be problematic because it takes people out of the work place and has an opportunity cost – both notable challenges in a production context. On-the-job and active learning also develop staff members' skills to independently identify energy efficiency opportunities and allow instructors to identify unforeseen training opportunities. Post training, energy awareness should become a part of skill set evaluations and be continually measured (Van Zyl 2014; Ottermann 2014).

SOCIAL NORMS AND MANAGEMENT INVOLVEMENT

Interviews with AMSW staff revealed that there was a general behavioural code at the company. For example, before the EnMS had been implemented, people did not consider turning off lights when leaving a space. Now, this measure is a part of the company's energy savings culture. Interview partners frequently cited AMSW's esprit de corps as the key element behind the programme's success. This includes responsibility and courtesy as elements of the body politic and a short distance of authority, or relatively close relationship between senior plant management and shop floor staff. Efforts are made to enhance and build upon this spirit through employee recognition, examples of which include company publication spotlights and gifts. Such efforts are designed to create a link between actions and implications, which interview partners said elicited more resolve to act (Van Zyl 2014; Jones 2014). Similar to training, personnel turnover and the large number of contractors on-site – approximately 600 per day – pose a challenge to maintaining the plant culture.

Management plays a key role in shaping this culture by providing leadership, motivating, and allocating resources including funds and staff. Interview partners in the broader South African context also consistently identified management involvement as a sine qua non of the successful implementation of energy efficiency upgrades, especially when behavioural change is required. As one observer put it, 'If the factory manager is not in head, feet and soul, it's not going to work ... if you really want to implement behavioural change in a large organisation, it takes leadership' (Ottermann 2014). This is echoed by Prindle (2010, 19) in which 75 per cent of survey respondents 'identified senior management, including the CEO, as the key champions of their energy efficiency strategies.' It is important for the general manager to foster interest and leadership because there may be a disconnect between management and operations, especially when management is not drawn from the ranks of facilities operation – which is often the case (UNIDO 2008).

Where possible, it is important to draw energy managers from the operations ranks. This is because 'Managers, whether at the C-level or plant level, are not typically drawn from the ranks of facility engineering and often have little context for understanding the economic consequences of energy-inefficient operations and practices. It is this lack of awareness and the corresponding failure to manage energy use with the same attention that is routinely afforded production quality, waste reduction, and labour costs that is at the root of the opportunity' (McKane 2010, 8). This was likely a substantial benefit in the AMSW case as the first energy manager came from the operations ranks.

FINANCE

Financing has been reported by Prindle (2010) to be the largest obstacle to energy efficiency upgrades. In the AMSW context financial matters are still the driving force behind energy efficiency investment decisions, meaning no- and low-capital improvement options are still preferred (Holcroft 2014). While it is not difficult to present a compelling financial case for energy efficiency, it still remains a challenge to get management to consider energy efficiency at the same level as all other issues (Van Es 2014). In general, both AMSW and non-AMSW interview partners acknowledged the difficulty in obtaining approval for projects involving capital expenditures. Thus the no- or relatively low-cost nature of behavioural interventions is advantageous.

It can also be challenging to justify expenditures to create savings given the time delay between investment and return that may accompany energy efficiency efforts – though the behaviour change characterising this intervention largely consists of immediate gains without capital outlay. In general, amongst South African industry, interview partners noted that maximum accepted amortisation periods can be up to two years, though shorter time periods of six months or less are preferred. When submitting proposals for capital expenditure, you need to generate awareness of energy costs, be able to show real budget benefits, and provide some type of visual aid explaining energy efficiency. Another obstacle may arise if a technology (such as energy metering devices) is deemed to be an unjustified expenditure by financial officers who may not understand its potential impact on energy efficiency. Yet, without the feedback technologies such as metering provides, you cannot change behaviour without the important element of measurement (Van Zyl 2014, Jones 2014).

This is indicative of a divide between financing departments and implementers, which is certainly not unique to this circumstance. Financing often forms a barrier for reasons beyond pecuniary concerns. When those in charge of fund disbursement lack the technical expertise to judge the potential value of energy efficiency projects (whether technological or behavioural), the resulting uncertainty and ambiguity may hinder or preclude decision-making processes (UNIDO 2008). Calculation methods may also be a barrier. At AMSW, for instance, the internal calculator used to determine payback is extremely conservative. It assumes a worst case scenario of actual payback plus one year, whereas actual payback periods have proven to be much shorter. While this may facilitate prudent decision-making, it may also forestall or prevent otherwise beneficial expenditures.

Capital may often be a constraint to energy efficiency investments. The UNIDO-IEEP intervention presents a promising alternative to capital-driven energy efficiency uptake, demonstrating that significant energy efficiency improvements may be realised without large capital outlay. This points to the potential of interventions which focus not only on financial capability but human capability. In order to realise behaviour driven uptake, knowledge capacity needs to be increased through training and a better understanding of plant performance and operations.

COMMUNICATION

AMSW has implemented its communication strategy through poster drives, hosting competitions for innovative savings ideas, exchanging light bulbs from home with LEDs, and organising outreach events at work, inter alia. One such example of work-based outreach was carried out during a health and safety day, during which the energy team hosted a stall to educate staff on energy costs. To make the information more tangible, the energy team had a bicycle energy generator to show staff what type of energy is required to generate electricity. The aim of such activities is (a) to ensure there is an understanding of energy efficiency's potential to contribute to plant competitiveness and (b) to engender the drive to innovate and secure the future of the company (Holcroft 2014).

The best type of communication is recognised to be that which involves an interactive component. Communicating on the job and spending time on the shop floor can contribute to winning the hearts and minds of people. Storytelling can also be an engaging and interactive means of communication. When explaining what actions can achieve, it can be useful to do this in terms of direct variable costs because this is a system employees already understand (e.g. if they save a tonne of coal, they know how much money they have saved, which relates back to factory performance), which then contributes to the calculation of their bonuses (Ottermann 2014).

Behavioural barriers and drivers approach

Behaviour is by no means the only aspect of energy efficiency or of an EnMS, but it is important. Energy efficiency requires a focus on not only technology but also the behaviours which surround technology adoption, operation, and performance.

It requires balancing the equipment of production with the behaviours of its human operators. As many interviewees explained, you can purchase the best-performing, most modern, most expensive equipment and machinery, but this investment comes to naught if operators do not pay proper attention, have the knowledge, and/or care to maintain and run it properly.

Given the entrenched habits of equipment operators, it is necessary to make a concerted effort to realise behaviour change. As Du Plessis (2014) points out, 'Behaviour is the key platform on which you need to build for energy savings. The moment you're not constantly looking at the controls, the system will revert to its prior inefficient means of operating.' Many interview partners highlighted behaviour change as the most important element of an EnMS.

SOCIAL NORMS AND DEFAULTS

Social norms and management involvement at AMSW were frequently cited as an essential input in realising behavioural change. These factors and related impacts may indicate the presence of social norms, which have been demonstrated to 'not only spur but also guide action in direct and meaningful ways' (Schultz et al. 2007, 429). Social norms were observed before the specific energy management intervention and contributed to its implementation. Thus despite employees not previously switching off lights when leaving a room, norms of respect for the workplace were activated to spur energy efficiency uptake.

Social norms in this sense may find a foundation in ownership levels, which can be fostered through decentralised management structures (e.g. those used in the implementation of the EnMS). Ownership applies not only to physical matter, but also to the goals of an organisation (Pierce et al. 2001). These factors matter because as Rodgers and Freundlich (1998) demonstrate, ownership can influence a sense of deeper responsibility. Strong linkages between employee and organisation can also influence a higher sense of responsibility for work products (Dipboye 1977; Korman 1970).

Outreach mechanisms seeking to install energy efficient behaviours as the 'default' choice have used social norms as a basis. Default settings look to take advantage of the status quo bias (Samuelson/ Zeckhauser 1988). Similar to the classification presented by Bicchieri (2006, 5), who claimed that 'Norms are one class of default rules', the connection of norms and default choices has been exhibited in this case. Duhigg (2012) refers to these underlying factors as 'keystone habits', which have the potential to drive initiatives and change other habits.'

There is evidence to show that when the 'green' choice is made the default choice, it is selected more often (Pichert/Katsikopoulos 2007). There are, however, two sides of the default coin: one that engenders efficiency, and one that presents habitual barriers to energy efficiency uptake. Defaults and the status quo must thus be challenged before they can become positive foundations upon which to build behaviours. New opportunities for the development of social norms need to be identified, communicated, encouraged, and rewarded through positive feedback (e.g. public praise, financial reward). This should be pursued in an ongoing fashion to avoid accepting existing gains as sufficient, or worse, to exhibit complacency and contribute to rebound effects. The EnMS has challenged default choices to identify energy wasting practices.

STATUS QUO BIAS

A barrier to energy efficiency in this and many other contexts is status quo bias, or the hesitance to make changes to the current situation (Samuelson/ Zeckhauser 1988). As Van Zyl (2014) put it, this intervention involved 'challenging and questioning everything'. AMSW operationalised this by reviewing 'assumptions and changing operational principles

and processes.' This required examining production processes at a micro-level to identify opportunities for energy saving. For example, it was discovered that a 250 kW pump could be switched off given that the remaining four were optimised in terms of flow and pressure. This change resulted in annual savings of ZAR 1.1 million (Van Zyl 2014).

Behaviour change requires constant monitoring to continually challenge status quo bias (Frost 2014). The status quo may not be visible from within an organisation, which may thus justify external involvement, such as engagement in a programme like UNIDO-IEEP. It is important to acknowledge the ongoing nature of the behaviour upgrading process. As one interviewee put it, 'You will never reach the stage where you can say you have completely arrived' (Ottermann 2014). It may also be necessary to assure employees that the ongoing questioning of the status quo is done not from a standpoint of mistrust, rather from one of continuous improvement (Van Zyl 2014).

TIME POVERTY

The impending closure of the plant placed increased focus on production levels, thus intensifying the rivalry between maintenance and processing, which is often present in industrial settings. Interrupting production processes to pursue other goals, such as efficiency, is often not considered a possibility (Theart 2014; Van Zyl 2014). This 'fire fighting mode' invokes the perception that there are not any resources to allocate (Van Zyl 2014). In behavioural sciences this is referred to as 'tunnelling', meaning 'to focus single-mindedly on managing the scarcity at hand ... scarcity leads us to tunnel and neglect other, possibly more important, things' (Mullainathan/Shafir 2013, 29).

Tunnelling results in changes in our decision-making methods, causing us to magnify costs while minimising benefits (Mullainathan/Shafir 2013). This can especially impact energy efficiency, which may sometimes involve a near-term expenditure of time or capital with a more distant pay-off, though in this case however, the benefits were immediate and occurred without (significant) capital outlay. To overcome this challenge in the future, AMSW has delegated staff to dedicate themselves to energy savings. This creates time, resources, and a mandate for energy savings amongst the pressure to keep production rolling non-stop (Van Zyl 2014).

LOSS AVERSION AND AMBIGUITY AVERSION

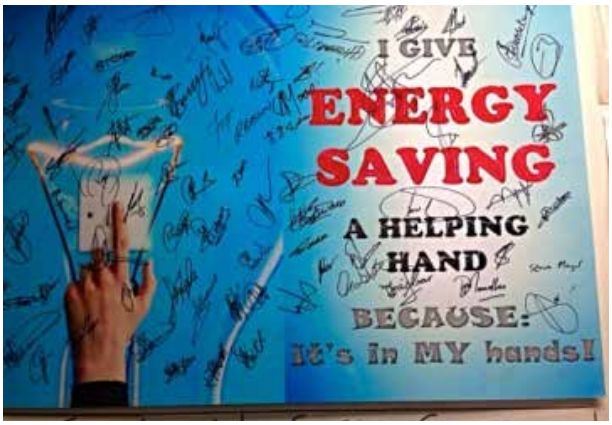
Upfront costs, uncertain payback, and numerous investment factors make energy efficiency decision-making susceptible to loss aversion and ambiguity aversion. Loss aversion is one aspect of prospect theory, which outlines how decisions are affected by reference points that are frequently anchored in the status quo or a point of aspiration (Tversky/Kahnemann 1992, Kahnemann/Tversky 1979). In prospect theory, contexts of risk and uncertainty introduce further decision-making distinctions. For instance, decision-makers are more risk averse in circumstances of potential gain, whereas those in circumstances of potential loss more often exhibit risk-seeking behaviour. This theoretical construct can be observed in this intervention. Energy efficiency was not pursued to the same extent in circumstances where it was 'merely' a potential gain of more profit. However, when the decision-making behind it occurred in a context of potential loss (in this case plant closure), upper management decided to 'bet' on energy efficiency. Times of crisis and change may present windows of opportunity in which to influence behavior, as Thompson et al. (2011) find through various case studies.

Loss aversion and ambiguity aversion impact financing decisions and in this case have been exhibited in the reluctance to fund energy efficiency projects. To reduce the potential of a decision-making heuristic to become a barrier to an otherwise economically rational investment, efforts should be made to reduce ambiguity by educating financial decision-makers. Framing energy efficiency as potential 'lost savings' or waste avoidance may be helpful in making use of this heuristic (Van Zyl 2014; Van Es 2014). Loss aversion should not, however, be confused with actual liquidity constraints, which may impact decision-making (Never 2014).

AWARENESS

To draw attention to energy efficiency, AMSW raised awareness through information campaigns and other communication measures. Graphic 1 illustrates the integration of behaviour into communication methods. In this case, committing to saving energy was made public by displaying a poster bearing employee signatures. Public commitments have been demonstrated to have a higher impact on energy savings than non-public commitments (Pallak/Cummings 1976). They also lack top-down mandates, which have been known to engender apathy rather than communal interest.

GRAPHIC 1:
Public commitment to energy efficiency



Figueroa, Aurelia (2014)

Feedback has been an important and multidimensional aspect of communication. At the operational level, staff is provided with feedback on the outcome of specific tasks in order to facilitate learning and offer encouragement. In one effort focused on saving energy during shutdowns, a comparison between providing feedback (treatment) and not providing feedback (control) revealed that future savings were greater when feedback was provided. According to Daamen et al. (2001), tailored information has a greater impact than non-tailored information when giving feedback. Providing timely feedback on recent events has also been demonstrated to have greater value (Hertwig et al. 2004) – for example, providing information on the specific energy use of a machine at appropriate time junctures, such as after certain operation phases.

The measurement requirements of the EnMS and ISO 50001 facilitate feedback. A challenge before EnMS implementation was that although energy efficiency efforts may have been underway, they were not being measured or quantified. This contributed to lost momentum and staff members feeling disassociated with the whole process. Components of the EnMS thus seek to make information and outcomes visible to staff members by, for example, requiring reports on energy savings (Jones 2014). Feedback mechanisms have similarly demonstrated an effect in the household setting (Allcott 2011) and in combination with other inputs, such as goal setting (Abrahamse et al. 2007).

Providing reminders can also contribute to the top-of-mind effect, especially when financial incentives and specific goals are referenced (Karlan et al. 2012). To maintain a top-of-mind effect for the broader energy efficiency agenda at AMSW, the topic has been woven throughout time and spatial elements and into different agendas. This includes, for example, a daily, weekly, and monthly energy-costs report that is broken down by different end uses. The value of integrating energy in management and administrative infrastructure is echoed by McKane (2010, 1): 'Companies that treat energy as a manageable resource and integrate their energy programme into their management practices have an organizational context to continually seek opportunities for optimizing their energy use.' At AMSW, one means of keeping energy top of mind (for the purpose of price arbitrage rather than energy efficiency) was the presence of wall clocks throughout workspaces, which clearly illustrated electricity pricing mechanisms (red denotes peak hours; yellow, standard hours; and green, off-peak hours) (Graphic 2). This could be complemented with energy-use information and expenditures to reap top-of-mind benefits.

GRAPHIC 2:
Placing energy costs at the top of the mind

Figueroa, Aurelia (2014)

Discussion

Contextual factors and concerted efforts have contributed to energy efficiency uptake at AMSW. The 'burning platform' presented by imminent plant closure, increasing energy prices, falling iron ore quality, and social norms facilitated the uptake of energy efficiency measures.

The EnMS mechanised the contextual factors, building on these and other elements (such as the WCM programme) to integrate energy efficiency as a goal. In addition to the implementation of an EnMS, participation in UNIDO-IEEP enabled AMSW to improve skill levels and equip staff members with the capability to identify and implement energy efficiency measures. These 'soft' and managerial components of the EnMS (which includes culture, leadership, dedication, and acceptance) are all important elements of organisational change (IEA 2012).

Though technology upgrading may be more appealing, or 'sexy' as some interviewees referred to it, changing operator behaviour is an essential challenge and a necessary input for broader energy efficiency. Technology alone cannot be relied upon to realise energy efficiency gains as 'The use of Energy (sic) efficient components does not guarantee the efficiency of the overall industrial system' (IIASA 2012, 536). Given the integral role behaviour plays and the often frugal nature of behavioural interventions, a possible guiding point for energy efficiency programmes could be to make behaviour change an initial and recurring step to address the eventual setting in of status quo bias.

Energy efficiency, particularly non-tangible behavioural aspects, may be accompanied by ambiguity in terms of pathways and goals. Unlike technology upgrading or renewable energy installations which consist of equipment with expected output values, the benefits of behavioural change may be more difficult to quantify or visualise. This highlights the value of pilot projects, because 'once people have seen success, it becomes easier to replicate' (Jones 2014). Pilot projects may reduce the ambiguity aversion often associated with behavioural change, help raise awareness, and generate tangible knowledge.

The value of external intervention has also been demonstrated in this case and is echoed by UNIDO (2011), which found that the likelihood of introducing new efficient technology increased with previous experience in energy efficiency technology investments and energy management innovation. 'This means that the introduction of energy efficiency projects in developing countries' firms is crucial to guarantee they can continue to invest in energy efficiency in the future' and that 'Firms' energy management factors are crucial to increase the likelihood to invest in energy efficiency' (UNIDO 2011, 111, 114). Similarly, firms are more likely to invest in energy efficiency if they already have energy audit procedures in place and are planning near-term energy efficiency interventions. This highlights the effect of programmes such as UNIDO-IEEP to generate ongoing returns related to the provision of energy audits, training, and other inputs.

Training is a key element to realising energy efficient behaviour change. At AMSW, however, existing training programmes (e.g. the Certified Energy Manager course) do not include a behaviour component. Interviewees also stated that the UNIDO energy management programme did not include a behaviour element to a great enough extent. This may be a reflection of the engineering background of trainers and trainees alike but should be reviewed, and opportunities to integrate behaviour in energy efficiency training and capacity building should be sought. The high number of contractors at AMSW also presented a challenge to social norms. It may thus be worthwhile to work with contracting agencies and other companies which use these services to develop training programmes which would ensure a more uniform approach.

Awareness and education are essential for sustainable energy efficiency programmes. The focus placed on energy efficiency may at one point engender fatigue or apathy towards the subject. Adopting innovative behavioural insights can help to counter this. For example, gamification, or the use of games

to engage users, can provide a way to measure and reward workplace behaviours to encourage ongoing change in a more fun and interactive way for employees (Mehta/Kass 2012; Post 2014). Seeking ongoing opportunities for employee ownership can foster change attitudes while generating bottom-up drive for energy efficiency. Taking energy efficiency beyond the workplace may also increase behavioural sustainability. One way of turning energy efficiency into a holistic pursuit amongst staff would be to provide employees with LED bulbs for home use. Another option could be to reward energy efficiency in the workplace with energy efficiency upgrades in the home, sponsor free household energy audits, or host employee competitions for home energy efficiency.

The status quo attitude about where energy efficiency skills are needed should also be tackled. Finance was a constraining factor in this case study – indeed, in many contexts globally. The 2008 global economic downturn exacerbated this by further constricting budgets and encouraging hesitance to invest in plant efficiency upgrades, particularly given that plant closure was under consideration. Sometimes, barriers may be related to the inability of financial managers to assess the value of energy efficiency investments which, normally, relate to topics outside their areas of expertise. Equipping finance staff with the resources to assess energy efficiency investments may help to overcome obstacles related to decision-making heuristics. While training on energy efficiency may not be feasible or necessary, a tangible demonstration of its potential value could reduce ambiguity in the decision-making process. This could, for example, consist of taking finance staff on a plant tour so they can learn about the nature of the upgrades or providing them with clearly quantified values of past upgrades in understandable terms.

Accounting methods may also need to be reviewed to ensure they are properly valuing energy efficiency investments. Other forms of financing, such as off-balance sheet financing, should be sought where appropriate or necessary. In the broader context the general novelty of energy efficiency measures may also result in reluctance on the part of financial institutions to provide funds for energy efficiency measures – especially for those that involve small transactions, where the costs of due diligence and other factors may be considered too high and undermine any potential value to the bank (Ismail 2014). Energy efficiency programmes should entail financing options that bring energy savings closer to the consumer by offering loans which redistribute the financial burden. In situations of capital constraint, behaviour should furthermore be promoted as a potentially no- or low-cost option.

Financial scarcity must be balanced with time scarcity. Especially in a manufacturing and production context, the focus on output often crowds out efficiency concerns. It is thus essential to create space, mandates, and measurements for energy usage. If energy is given a budget, it may achieve a similar level of concern as other business considerations. Interview partners stressed the importance of leadership buy-in in realising behaviour change, as it is essential for mobilising resources and setting priorities. Where possible, energy managers should have a first-hand appreciation of operations. Extending onwards from plant leadership, it is also important to identify and empower energy site/team champions and equip them with the skill sets they require to spearhead efforts.

Moving forwards, South Africa's economic growth will continue to place demands on the electricity system – per annum GDP growth is expected to average 4 per cent in the medium term (OECD 2012). Electricity supply must furthermore be balanced with the government's climate change mitigation pledges. These and other factors highlight the important role of energy efficiency and DSM. To support these measures, the government should provide greater pricing clarity, which would make the valuation of energy efficiency more reliable. Changing commitments exhibited in the second and third multiyear pricing determinations are an example of this. For example, whereas the second was quite progressive with its featured price increases and DSM fund, the third included lower price increases and reduced DSM funding.

Naturally, energy-pricing policies also contribute to the valuation of energy efficiency projects in South Africa and elsewhere. As long as electricity and coal prices remain low and fail to price in externalities, an obvious price motivation will be absent. At the same time, policymakers should be cautious to focus on technology fixes for energy efficiency and develop their own and the public's awareness about the role of behaviour change in energy efficiency and

conservation. This may be supported by the inclusion of behavioural insights in energy efficiency support programmes. For example, the energy efficiency incentive schemes provided by Eskom are solely focused on technology improvements. While this is understandable given the more forthcoming quantification of savings available, this should not preclude similar support programmes for behaviour change.

Behaviour change can offer unique and hard-to-replicate competitive advantages and is necessary in a world of ubiquitous technology, which can no longer be relied on to maintain a cutting edge (Van Zyl 2014). In contexts of constrained capital or surplus alike, behaviour change should be an initial and repeated effort in energy efficiency programmes. Several elements of behavioural theory have demonstrated the impact of this intervention, serving at one point as barriers and at another as drivers. Systematic analysis is an important factor in identifying barriers to and drivers of energy efficiency.

Behaviour change should be a continuous process. New opportunities should be sought, and the status quo challenged to avoid complacency. Developing and harnessing social norms can contribute to organisational change, building upon awareness and training inputs. Upgrading policy and financial frameworks to support behavioural change can further support energy efficiency in industry and in society more broadly.

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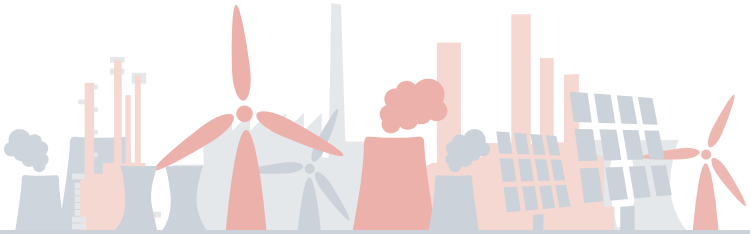

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Energy efficiency management in Ugandan SMEs: Assessing the role of behaviour

■ BABETTE NEVER

CONTENTS:

Introduction: Behave and save?

Energy costs often make up a large part of the business expenses incurred by small and medium enterprises (SMEs) in Uganda and thus affect their competitiveness and profitability.

Such energy costs can be reduced by investing in energy efficient equipment and/or improving energy management practices. Given its potential benefits, one could expect the demand for energy efficiency to be high.

The clustering of SMEs in residential areas and the outskirts of major towns has already put a lot of pressure on the grid, even though only 15 per cent of the Ugandan population has access to electricity. Load shedding is no longer due to shortages in supply, but to technical and maintenance operations on the network. Energy demand is currently rising at a rate of 10 per cent annually and expected to rise by 7–9 per cent annually in the coming years (Whitley/Tumushabe 2014). The costs for grid extensions and renewable energy off-grid solutions remain high, while investments in energy efficiency are generally far less expensive. Increasing energy efficiency efforts thus makes sense from both a demand- and a supply-side point of view.

Currently, however, the potential for energy efficiency is not being fully exploited. Uganda is not the only country with an energy efficiency gap: both industrialised and developing countries are struggling to deal with this issue. Market failures, a lack of information and awareness, and badly targeted incentives and tariffs are amongst the most common barriers to energy efficiency (IEA 2010; Gillingham et al. 2009). Recent research on energy consumption in industrialised countries has shown that behavioural factors (e.g. people's tendency to keep hold of technologies they already own even though they

are costly, to procrastinate, or to react to losses more strongly than to gains) may provide explanations for the failure of respective policy and market incentives (Gillingham/Palmer 2013; RAND 2012; Pollitt/ Shaorshadze 2011).

The starting point for the DIE study was the analysis of psychological drivers of and barriers to energy management – specifically, the non-technical barriers to energy efficiency uptake, the mindsets of SME owners/managers, and the factors that drive or impede their decision-making on energy issues. SMEs in Uganda are particularly interesting in this respect for two reasons: first, the Deutsche Gesellschaft für Internationale Zusammenarbeit's (GIZ) Promotion of Renewable Energy and Energy Efficiency Programme (PREEEP) and the Ministry of Energy and Mineral Development of Uganda (MEMD) ran an innovative programme targeting energy-intensive SMEs in different regions of Uganda. The programme aimed to improve energy management practices as well as to influence future investment decisions, using peer learning and local networks. Second, the utility provider Umeme has introduced group metering for many SMEs in the past few years to counter power theft and offer lower electricity tariffs. This new system has created additional incentives for energy management, including behavioural ones.

The findings of this report are based on 45 semi-structured interviews conducted with SME owners/ managers, experts on SMEs and energy management, and stakeholders in Kampala and the eastern region of Uganda in April 2014. Of the 29 SME owners/managers interviewed, 12 took part in the MEMD/GIZ-PREEEP programme, while 17 received no energy training. This enabled an in-depth comparison of the impact of information and training on the mindset and practices of SMEs. The analysis also draws on a range of project-related materials provided by the MEMD and GIZ/ PREEEP.

This paper identifies (i) short-term thinking and self-control problems (related to a lack of business skills), (ii) habits and a preference to not change anything about the current situation (called status quo bias in behavioural sciences), and (iii) issues of trust and mistrust, particularly between the utility provider Umeme and the SMEs, as the major behavioural barriers currently affecting SME energy management in Uganda. Drivers of behaviour that already work well or could do so in the future include more first-hand experiences, framing communication around losses instead of gains ('losing money with current practices instead of profiting through energy saving'), feedback, social comparisons, and peer effects such as social learning (see Section 4). To make long-term behaviour change easier for SME owners/managers, some other challenges also need to be addressed – for instance, a lack of access to financing, a shortage of information on efficient products, and insufficient business skills.

The report is organised as follows: the second section gives an overview of the context conditions that shape the development of the Ugandan energy sector, on the one hand, and the business environment of SMEs, on the other hand. The third section provides a brief description of the MEMD/GIZ-PREEEP intervention, while the fourth section examines behavioural drivers and barriers. The final section concludes with a set of policy recommendations based on the preceding analysis.

Context: Energy and SMEs in Uganda

Power supply and costs, the policy environment, and non-energy-related challenges (e.g. access to financing) affect SME owners'/managers' decision-making on energy issues.

Although SMEs have virtually no influence over power supply, power costs, or the political framework, access and affordability are important to them. There are several other challenges faced by SMEs in daily operations that do, however, directly depend on SME owners/managers themselves and which are often fortified by the economic situation of Uganda, as the interviews showed.

POWER SUPPLY: ACCESS AND AFFORDABILITY

Hydropower plants produce 80 per cent of the grid electricity in Uganda, followed by thermal power plants (10 per cent) and co-generation of biomass (7 per cent). In 2012 2,850 GWh of grid electricity were supplied, of which two-thirds were used by the industrial and business sectors. Grid electricity makes up only 1.3 per cent of the energy mix in Uganda, while fuel wood accounts for roughly 80 per cent (Whitley/Tumushabe 2014). The Bujagali Hydropower Dam has led to a decrease in load shedding in the central and eastern regions, but power cuts still affect SMEs there. This, however, is due to technical network issues rather than an actual lack of power supply. In other parts of Uganda, though, load shedding persists, affecting the production and competitiveness of businesses. Projections estimate that supply shortages will again become more widespread after 2015 and will continue at least until the planned Karuma Hydropower Dam is connected to the grid (Rieger 2013). Complementing grid electricity with renewable energy off-grid solutions is therefore necessary. In the commercial sector only a few large sugar cane mills are currently making use of this possibility. SME owners/managers, however, are unable to pay for renewable energy technology; in fact, most cannot afford a generator to back up grid electricity either.

The electricity tariff in Uganda is subject to revision by the Electricity Regulation Authority every three months, which adjusts the tariff according to changes in the inflation rate, exchange rate, and international fuel prices. In the second quarter of 2014 the commercial tariff for small enterprises using three-phase electricity ranged from UGX 570 (peak, 6pm–12am) to UGX 457 (shoulder, 6am–6pm) to UGX 354 (off-peak, 12am–6am). A connection to the electricity grid cost UGX 326,000 (with a pole) or UGX 98,000 (without a pole) – a substantial cost for a business starting up. Medium-sized enterprises and groups of SMEs that have been put on one electricity meter qualify for a slightly lower tariff if the load supplied does not exceed 500 kVA. Many of the SME owners/managers interviewed for this report actually used single-phase electricity, thus qualifying as domestic users, which meant they were charged UGX 517 per kWh regardless of the time of day. When asked about the level of the tariff they were paying, the figures given by many SME owners/managers deviated substantially from the actual tariff charged. It is possible that people simply did not know the tariff or do not differentiate between the tariff, other charges on the bill, or possible fines. Perceptions of price and affordability are likely to play an important role.

Additionally, many of the SME owners/managers interviewed complained that electricity tariffs had increased a lot in the past few years, making them pay much more than their counterparts in Kenya, Ethiopia, or Rwanda. This is not entirely true, as the comparison in Table 1 shows. An SME in Kenya is often larger and produces more than an SME in Uganda – economies of scale have to be taken into account here. The reason why most SME owners/managers interviewed in Uganda share the feeling that tariffs are consistently increasing may be partly due to the quarterly price readjustments. Changes in consumption are another possible explanation.

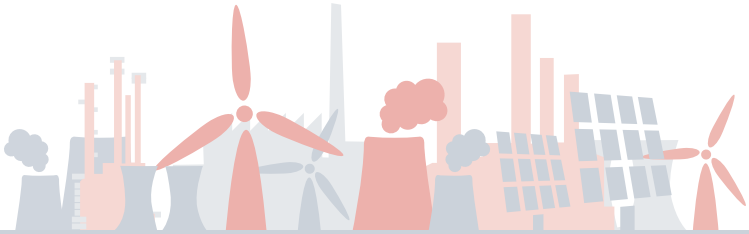


Table 1: Regional comparison of electricity tariffs				
	Uganda (UGX)	**Kenya (KES)**	**Tanzania (TSHS)**	**Rwanda (RWF)**
Commercial	**415 volts**	**240 volts**	**230 volts**	
Peak	569.7 (€0.16)			168 (€0.18)
Shoulder	475 (€0.13)			126 (€0.13)
Off-Peak	354 (€0.10)			96 (€0.10)
Average	474.4 (€0.13)	12 (€0.10)	273 (€0.12)	130 (€0.13)
Fixed monthly charge and kVA per kWh	3,360 (€0.95) /kVA n.a.	150 (€1.23)/kVA n.a.	n.a.	unclear
Medium Industrial	**415 volts**	**400 volts**	**400 volts**	
Peak	542.3 (€0.15)			168 (€0.18)
Shoulder	452.2 (€0.13)			126 (€0.13)
Off-Peak	331 (€0.09)			96 (€0.10)
Average	452 (€0.13 €)	8.7 (€0.07)	221 (0.10 €)	130 (€0.13)
Fixed monthly charge and kVA per kWh	22,400 (€6.33)/ 16,644 (€4.71)	2,000 (€16.36)/800 (€6.54)	3,841 (€1.65) /16,944 (€7.29)	unclear

Source: Umeme, KPLC, TANESCO, EWSA.

REGULATORY CONTEXT AND GOVERNMENT PRIORITIES

In 1999 Uganda began to restructure its power sector (by unbundling utility services into separate entities for generation, transmission, and distribution. The goal to attract private sector investments and participation in electricity generation has only partly been attained. Customers almost exclusively interact with the distribution company Umeme, which has led some of them to blame Umeme for things that are controlled by other institutions in the power sector – tariff setting, for instance, which is in fact the responsibility of the Electricity Regulation Authority.

The Electricity Act of 1999, the Energy Policy of 2002, and the Renewable Energy Policy of 2007 constitute the main regulatory framework of the power sector. Apart from the different entities responsible for electricity generation (Uganda Electricity Generation Company), transmission (Uganda Electricity Transmission Company), distribution (Umeme), and oversight (Electricity Regulation Authority), there is an Electricity Disputes Tribunal, which was created in 2003. Under the premises of Umeme, the tribunal deals with customer complaints. It has the mandate to hear and determine electricity disputes between consumers and the public bodies charged with the generation, transmission, and distribution of electricity in Uganda. None of the SME owners/managers interviewed were aware of this tribunal.

The medium-term strategy of the MEMD emphasises increasing electricity generation and access to modern energy services through rural electrification and renewable energies. Other priorities include energy efficiency (MEMD 2013). Having supported SMEs with energy training courses in 2008–2010 together with GIZ-PREEEP, the MEMD is currently focused on large industry because the impact is expected to be more substantial and easier to quantify. This change in focus has also been influenced by the advancement of climate change policy, as higher amounts of carbon emissions can be saved in large industry.

The Uganda National Bureau of Standards supported MEMD in developing minimum energy performance standards for five kinds of technologies. Thirteen standards and test procedures for air conditioners, compact fluorescent lamps (CFLs) and fluorescent tubes refrigerators and freezers, three-phase motors, and small motors were gazetted in 2013.

Political backing for SMEs on various issues such as financing, capacity building, and taxes has been scattered between various government ministries and departments. A lack of supporting services has been identified as a hindering factor for SME growth in Uganda in the past (Nuwagaba/Nzewi 2013; Ishengoma/Kappel 2011). The Ministry of Trade and Industry Cooperation is currently setting up an SME directorate that has been earmarked to coordinate all governmental activities with regards to SMEs in order to avoid duplication. This should make it at least somewhat easier for SME owners/managers to know whom to address with their concerns.

Apart from the tariff structure, the introduction of bulk metering is the energy regulation that most strongly affects SMEs. In 2010 Umeme introduced bulk metering to counter widespread power theft and to offer SMEs and other groups the possibility to qualify for a lower tariff. Of the SME owners/managers interviewed, the number billed on one group meter ranged between five and twelve. Group members are allowed to have sub-meters to control their individual consumption, but the group receives only one electricity bill, delivered to the chairman of the group. If one member of a group steals power, the others have to pay for it – thus it is a strong social control.

In practice, however, the bulk metering system has problems. For instance, many SME owners/managers do not know that they can have sub-meters, while others can no longer access their meters for readings, because Umeme has locked them. Some do not understand the bill, or it does not add up. There have also been allegations of corruption and bribery involving both the group chairs and Umeme staff. In addition, not all groups have been switched over to a lower tariff despite being eligible. Umeme has successfully managed to curb some distribution losses with this system, but actual up-to-date figures are not available. The challenges experienced with bulk metering also affect energy saving behaviour and the impact of energy training (see Section 4).

ECONOMIC SITUATION AND NON-ENERGY-RELATED CHALLENGES FOR SMES

SMEs' energy-management possibilities and capacities are influenced by the economic situation in Uganda as well as general business challenges. The SME sector in Uganda is composed of a high number of informally operating businesses: 90 per cent of SMEs are small enterprises or microenterprises, while only 10 per cent are medium-sized enterprises. The Uganda Bureau of Statistics (2011) defines an 'SME' as a business that has up to 50 employees and an annual turnover of up to UGX 10 million. Productivity levels in the SME sector are often low, and forward linkages to larger industries that create value chains are largely missing (Kappel/Lay/Steiner 2005). Only the tea and sugar industries and some of the fruit suppliers are organised in value chains.[3] Participation in value chains facilitates access to differentiated markets and is generally said to be conducive to economic development, though most SMEs produce for the local community market. On the one hand, this is a demand-driven process; on the other hand, most SMEs do not produce the quality necessary to be a supplier for a larger industry.[4]

In many cases, Ugandan SME owner/managers do not possess sufficient business and financial skills. Other challenges faced by SMEs that were mentioned during the interviews – and have been cited in the literature – are high transport and transaction costs, limited access to finance, a lack of working capital, a lack of skilled labour, and high taxation for those in the formal sector (Mawejje 2014; Nuwagaba/Nzwei 2013; Ishengoma/Kappel 2011; Mugune/Obwona 2001). Concerning the lack of capital, the interviews showed that there are SME owners/managers that suffer from a real lack of capital due to low levels of income, while others simply perceive a lack of capital. The latter is a result of poor business acumen and behavioural barriers (i.e. short-term thinking and self-control problems), which then lead to acute liquidity constraints again (see Section 4). Some SMEs thus have opportunities to break out of the vicious cycle of liquidity constraints but lack the know-how and the behavioural disposition to recognize and/or exploit these opportunities. Banks charge between 22 and 25 per cent annual interest for loans to SMEs, while microfinance institutions (MFIs) charge 4 per cent per month. Given that most Ugandan MFIs use a standard payback period of six months, these interest rates are rather high, even if the inflation rate of 6.7 per cent (April 2014) is taken into account. Most of the SME owners/managers interviewed cited the rigidity of payback times as a reason for not taking

3 *Interview with Expert 13.*
4 *Interview with Experts 5 and 13.*

out a microfinance loan – for example, the payback period often starts almost immediately after the loanee has received the credit. Both the MEMD and some donor organisations such as the KfW are in the process of setting up special SME funds to counter this problem. The difficulty in accessing financing is one of the primary reasons why SME owners/managers do not invest in more energy efficient machinery; this is even the case for those who planned to do so as a result of energy training they received.

A final challenge affecting SME owners/managers is a general lack of information about the quality of technology and the availability of machinery. In many instances they simply do not know which machines are energy efficient or where to get such information. Even those that have the relevant information often do not know where to buy such technology. Misunderstandings of what energy efficiency is aggravate this problem. MEMD needs to work jointly with the Uganda Bureau of Standards to put more effort into developing and enforcing further standards for energy efficient machinery as well as raising awareness about standards and how to identify them.

The role of energy training

The 2008/9 programme 'Training of Entrepreneurs and Trainers of Trainers on Energy Efficiency Improvements and Energy Management' conducted by the MEMD in partnership with GIZ-PREEEP aimed to support the energy management of SMEs as part of the Ugandan poverty-reduction strategy.

The programme was based on several observations: SMEs generally lack the information and money necessary to invest in energy efficient equipment, appliances and measures. The size and organisational and revenue structures of both micro and small enterprises in particular are quite specific and not necessarily as structured as are those in the industries. They typically use older and often improvised technologies, experience high employee fluctuation (often employing casual workers), and are run by people with an education that often does not exceed primary school level. A number of entrepreneurs are in business to make quick money and are unaware that energy management is a key way to streamline a business to make it profitable. Many SMEs are now organised under associations that advocate their interests (e.g. Uganda Small Scale Industries Association).

The MEMD/GIZ-PREEEP programme therefore focused on energy-intensive SMEs (e.g. grain millers, woodworkers and metal fabricators) that were organised in some form – for instance, in a local association – and had similar production processes. The intervention was piloted in south-western Uganda and then extended to the eastern and northern parts of the country, which allowed for the development of a training package that could be easily tailored to other areas.

SPECIFIC GOALS

The MEMD/GIZ-PREEEP intervention addresses problems primarily related to the process layout of SMEs, equipment installation, electrical connections, lighting, housekeeping, operation and maintenance, safety, and production practices, including waste management. The specific goals used as performance indicators were as follows:

- Ability to read electricity meter and record energy use (units and money)
- Access to and use of energy, maintenance and production record book
- Non-use of incandescent bulbs in SME
- Ventilation of dust from mill cyclone out of building and into a sack
- Collection of hulled grain into troughs
- General housekeeping
- Installation of belt guards (correct number of belts and pulleys)

CHARACTERISTICS OF THE PROGRAMME

The programmed consisted of four stages: a baseline survey, the training of SME owners/managers and trainers, the implementation of the training goals, and an evaluation phase.

The baseline survey for each region identified the structure, needs, and interests of the SMEs and their associations. It also documented the practices at the beginning of the programme so that its impact after finalisation could be measured. The surveys covered the areas of design, installation, operation, maintenance, and energy management practices in enterprises in Jinja, Mbale, Lira, and Apac.

The training courses were announced on radio because in most parts of Uganda radio ads have been found to be more effective than advertisements in brochures or newspapers. The workshops in Mbale and Jinja took place in January and February 2008 and were attended by 120 and 84 SMEs, respectively. The training courses in Lira and Apac took place in December 2009 with 64 and 70 participating SMEs, respectively. There was no participation fee; rather, the decision was left to the partnering business associations as to whether they wanted to make a contribution.

The training courses were structured as two-day workshops and included an additional day for those participants that were selected as trainers for the implementation phase. The first two days incorporated a range of presentations on energy management in general, energy efficient technology, waste management, and minimising production costs, which were followed by question and answer sessions. Additionally, participants conducted two group exercises. The first exercise taught them how to calculate an electricity bill by relating production to units of electricity used. The second exercise focused on energy savings in lighting by having participants calculate the monthly cost of electricity when CFLs and ordinary bulbs are used, the savings obtained, and the payback period. The SME participants each received an energy savings checklist to take home. The recommended measures were grouped into 'no cost' (e.g. good housekeeping, record keeping, meter reading, and working off-peak), 'low-cost' (e.g. efficient lighting, preventive maintenance, safety wear, and improved material handling), and 'high cost' categories (e.g. installation of new efficient mills).

Those selected to be trainers at the end of the second day received additional training from consultants specialised in engineering and energy auditing ('training of trainers'). The experts took the future trainers to three different SMEs to further explain energy efficiency by way of practical examples and to demonstrate how to help SMEs implement the energy-saving methods from the checklist and the good housekeeping measures they had learnt. Over the next six months, the trainers had to visit the SMEs allotted to them at least three times and document their visits with photos. Interim and final reports by the trainers were collected, both by telephone and in written form, and analysed by GIZ-PREEEP, both by telephone and in written form. The programme officially ended after six months. In some areas award ceremonies were held to present participants with certificates.

MONITORING AND EVALUATION

MEMD/GIZ-PREEEP undertook monitoring activities in 2010, 2011, and 2012, producing several evaluation reports (GIZ-PREEEP 2012, 2011a, 2011b, 2008a, 2008b). They found that the SME owners/managers had incorporated some of the energy management practices learnt at the training, but not all of them. Most participants had retained between one and three elements of the training, with the use of energy efficient lighting being the most common. Many participants were still able to read their electricity meters and bills, although not all recorded their consumption or could relate consumption to the production process. No-cost and low-cost measures were generally more widely practiced than high-cost measures (e.g. buying new technology or exchanging parts). A lack of awareness of which technology is actually energy efficient, the availability of such technology, and the ability to finance these investments are key constraints here.

GIZ-PREEEP also conducted a feedback survey with the participants themselves to get their take on the training. Some of the findings and suggestions coincided with the suggestions of the trainers and local programme advisors – for instance, the recommendation to lengthen the duration of the workshop to three to five days. It is very likely that the participants were overloaded with new information on a range of topics

that were new to them and went beyond energy. In many cases the issue of how to implement energy-saving measures only arose once participants were back at their own businesses. Both the participants and the trainers therefore advocated local demonstration centres that would allow SME owners/managers to acquire information on energy saving, including energy efficient machinery, and to actually see first-hand what the implementation of measures looks like. The new bulk-metering system has caused many SME owners to have difficulties reading their meters and bills because their training was based on the previous individual-metering system.

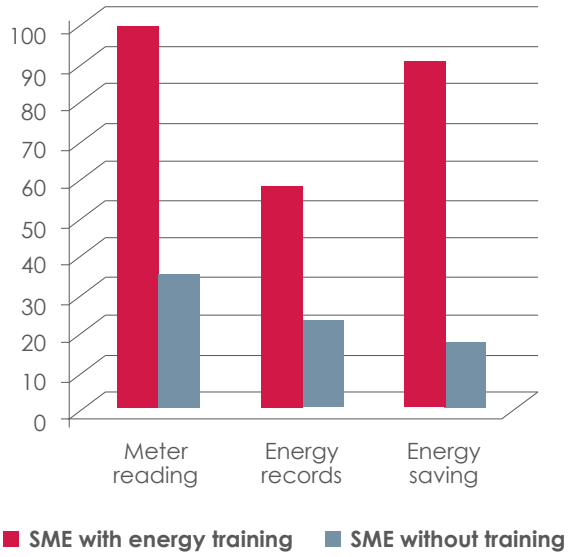
LONG-TERM IMPACTS: DIFFERENCES BETWEEN SMES WITH AND WITHOUT ENERGY TRAINING

The following section updates the findings of the GIZ-PREEEP monitoring and evaluation reports, where necessary, and compares the group of SME owners with some energy training with those without any energy training. Further possibilities of and challenges to achieving long-term impacts and the sustainability of the programme will also be briefly discussed.

Overall, the impact of the GIZ-PREEEP energy training course is still clearly visible. SME owners/managers who participated in the training are generally more aware of energy management, understand the concept of energy saving, and engage in some energy-saving practices. The GIZ-PREEEP finding that most of the SME owners/managers only retained a few things from the training still applies. Amongst the training participants interviewed, grain millers were more likely to use more than one energy management practice within the business and were more open to low or medium cost measures. Metal fabricators were more likely to replace machinery in the future (high cost), but typically only implemented one or two no-cost measures, such as switching off machinery when not in use. Since the overall number of trained SME owners/managers interviewed here was small, it is not clear whether this is a general trend or not. Most of those that received energy training knew that their equipment was old, but few actually managed to buy new equipment.

All of the SME owners/managers surveyed here that took part in the energy training still remembered how to read their electricity meters. However, only two-thirds of them actually recorded their consumption and kept those records to calculate their electricity bill in advance (see Figure 1). Of the seventeen SME owners without any energy training, only six knew how to read their meters and only three kept energy records. There was a big difference between the groups in terms of their basic understanding of energy saving and having positive attitude towards it.

FIGURE 1:
General energy management of SMEs (in %)



Note: Total number of SME owners/managers surveyed with energy training: 12. Total number of SME owners/managers without energy training: 17

For almost all the SME owners/managers interviewed, there was a clear difference between having an awareness of energy saving and having a deeper understanding of the topic. This confirms GIZ-PREEEP's finding that many training participants encountered problems once they returned to their own business and tried to apply what they had learnt. In spite of the GIZ-PREEEP energy training, awareness of energy efficiency and energy management in the SME sector in Uganda is still very low. Many of the experts interviewed identified a lack of awareness and understanding as one of the main challenges when it comes to SMEs and energy.

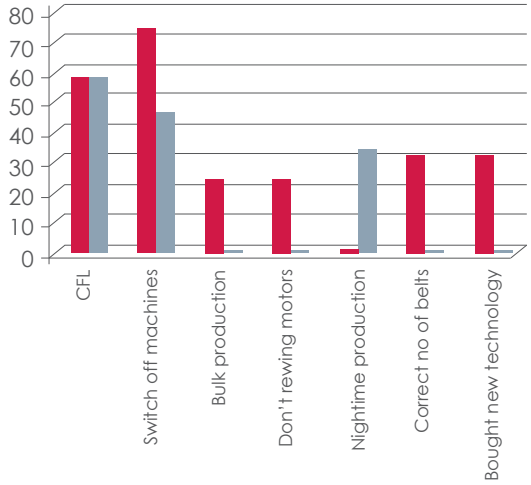
While many of the training participants know that efficient machinery is about electricity consumption rather than more output or productivity (commonly associated with more horsepower), they are unable to identify such machinery. Misconceptions about

what efficiency is prevailed amongst the untrained SME owners/managers and even amongst some of the training participants. To overcome this requires more awareness raising and the implementation of technology standards. Local demonstration centres that allow for hands-on experience could help to enhance SME owners'/managers' understanding of the concept of efficiency (see Section 4).

As regards more specific energy-saving and energy management practices, the use of CFLs and the practice of switching off machines not in use are widespread amongst both trained and untrained SME owners/managers (see Figure 2). The discrepancy between trained and untrained SME owners concerning the use of CFLs ('energy savers', see Figure 2) stems from the fact that the former tend to work outside in daylight or have workplaces where sufficient daylight can enter through windows and/or open doors, which reduces the dependency on electrical lighting for production. More than 50 per cent of the interviewed SME owners/managers avoided allowing machines to run idle, which shows that even those without training can make the connection between the running of machinery, the electricity consumed, and the bill received at the end of the month. Only very few businesses practiced any of the other measures learnt during the training workshops. Of the four SME owners/managers who actually invested in new technology, only one actually bought a new machine. Two others bought second-hand machinery that they hoped would be more energy efficient and more productive (but did not really know). And one chose to exchange parts of his motor instead of replacing the whole huller. More SME owners without any energy training made use of the lower tariffs at night on several occasions per month than those with training. All SME owners/managers voiced concerns about shifting all their production to night time because they would lose customers to their competitors who produce during the day and also because employees would be able to more easily steal produce in the dark. Many also did not want to be associated with power theft: if you work at night, people think you are stealing power. Now that Umeme is imposing heavy fines for power theft, it seems that SME owners/managers have ceased stealing altogether or do it even more secretly to avoid being caught or reported by competitors.

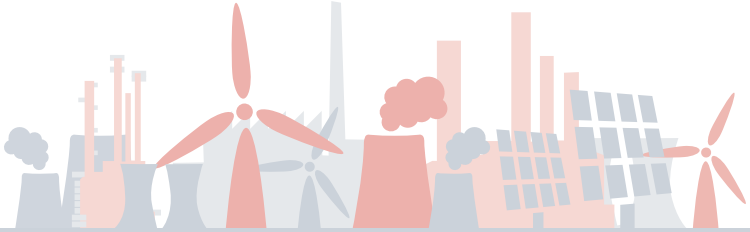
Note: Total number of SME owners/managers surveyed with energy training: 12. Total number of SME owners/managers without energy training: 17

FIGURE 2:
Specific energy saving practices of SMEs (in %)



Several SME owners/managers who took part in the GIZ-PREEEP energy training course have stopped energy saving or keeping energy records out of frustration with Umeme and/or the bulk-metering system. This negatively affects the long-term impact and sustainability of the GIZ-PREEEP programme as well as potential peer learning through word of mouth. There is evidence of a lack of trust on two levels: between the bulk-metering group and the elected group chair, and between the bulk metering group and Umeme. Allegations of fraud and bribery have been made by all parties on both levels. More awareness raising on how to save energy with no-cost and low-cost measures is necessary to clearly prove to SME owners that such practices cost less than bribing Umeme or the fines associated with stealing power.

Currently, the long-term impact of GIZ-PREEEP's energy training is being somewhat undermined by difficulties linked to Umeme and the bulk-metering system. It is possible that this will change over time as people begin to increasingly understand and accept the bulk-metering system. The MEMD/GIZ-PREEEP training has actually equipped SME owners/managers with many of the tools necessary to deal with bulk metering and engage in group energy management. In many cases, however, the prevailing attitude to bulk metering amongst SME owners/managers acts as a constraint. If administered and explained carefully, bulk metering generally has the potential to effectively support demand-side management.



Behavioural drivers and barriers

Behavioural insights can provide very useful starting points for measures targeting long-term change. Understanding the barriers that impede the uptake of more energy management practices amongst SMEs in Uganda is the first step.

These behavioural barriers are short-term thinking, self-control problems and giving in to temptation, inefficient habits, a preference for the status quo, and a lack of trust.

The second step is to analyse those behavioural drivers that already facilitate programme implementation to determine whether they can be used even more explicitly in future activities. These drivers are hands-on experience, loss aversion, feedback mechanisms, social comparisons, and peer effects. In practice, many of these behavioural drivers and barriers are related to and impact each other. They are not necessarily specific to Uganda or even developing countries, as they can occur in industrialised countries as well.

SHORT-TERM THINKING

Short-term thinking in the context of Ugandan SMEs means that owners/managers do not plan ahead till the end of the month, the end of the season, or the end of the year. Income is often immediately spent on the most pressing need at that moment – be it raw materials or a child's school fees. This practice is not inherently wrong in the context of real liquidity constraints. There is, however, a difference between making a decision having evaluated both the short term and long term and always making decisions based solely on short-term considerations. In the day-to-day business of SMEs, short-term thinking and self-control problems often correlate. The former describes the human mind's tendency to focus on the present and the near future when faced with immediate costs or benefits instead of planning for the long term. Long-term planning becomes more likely when all costs and benefits are in the future (Camerer/Loewenstein 2004). For Ugandan SME owners/managers, the absence of business plans and bookkeeping practices reinforce this tendency. Focusing on the present – referred to as the immediacy effect (Laibson 1997) – is also connected to an individual's inclination to not care enough about his or her own future self and results in procrastination or difficulties in committing to long-term investments (e.g. saving). Mullainathan and Shafir (2013) argue that the feeling of scarcity, or poverty itself, acts like a constraint in poor people's minds, automatically capturing most of an individual's cognitive capacity. The resulting focus on immediate needs causes them to neglect other issues (Mullainathan/Shafir 2013). Whether this applies to SME owners/managers in Uganda is difficult to say without more extensive psychological testing. But the majority of those surveyed seemed to be afflicted by a combination of short-term thinking and self-control problems, which were sometimes reinforced by other behavioural barriers. De facto liquidity constraints as a result of overall poverty levels often exist in parallel.

SELF-CONTROL PROBLEMS

A lack of self-control is often the reason SME owners give in to temptation and end up, for example, spending money allocated to the business on household items or giving up on a savings target. Investing time, effort, and money into larger long-term targets is often harder. Only two of the SME owners/managers interviewed managed to buy new equipment with money they had saved, while two others used informal lending. Generally speaking, taking out a loan is not a worse option than saving. But in the current situation in Uganda with its high interest rates, saving over a longer period of time could actually be less costly. One of the SME owners/managers who managed to successfully save had the following to say:

'In Uganda, people don't know how to save. One day, they save. The next day, they spend the money on a beer or something for their girlfriend. But you have to forego other things, otherwise you never manage to save.' [5]

Many SME owners mentioned school fees and other family priorities as obstacles to saving. Others said seasonal work and income fluctuations made it hard to save for more than two or three months. The same reasons were also often cited for a lack of working capital. Here, a case-by-case analysis would be necessary to determine how much the inability to save is due to a business's/household's (a) actual lack of

5 Interview with SME 18.

capital (e.g. due to a lack of income, school fees, and other financial responsibilities) and (b) psychological barriers (i.e. self-control problems) and insufficient business skills (which can negatively influence perceptions of capital levels).

HABITS AND STATUS QUO BIAS

Habits are the patterns of behaviour in which all human beings engage in their daily lives. Deeply engrained habits are hard to change, and to do so often requires a conscious effort, good reasons, and constant reminders. In Uganda both industry and SMEs are subject to the habits of their owners, managers, and/or employees through these actors' operation of machinery and equipment, which has direct consequences for electricity bills. Some of these owners, managers, and employees refuse to change their inefficient practices, arguing that they have operated their machinery in the same way for many years with no harm to the equipment. According to the experts interviewed, this attitude is prevalent amongst lower-level management in larger industry, where the same engineers have been in charge of the machinery for a long time. When trying to break inefficient habits, many SME owners/managers tend to revert to old practices if they are not continually reminded to change the patterns of the behaviour in question or subjected to some form of monitoring by the government or donors. Efforts to break with habit can be undermined by a preference for the status quo.

Status quo bias describes a cognitive preference for the current situation (Samuelson/Zeckhauser 1988). Any change from the present state of affairs is perceived as a loss. Amongst the SME owners/managers interviewed, status quo bias was expressed as resilience to certain best business practices. They preferred to run the business the way their fathers had previously run the business, instead of trying out new methods. People tend to prefer the status quo particularly if they are uncertain or unconvinced of the benefits of changing. Some of the owners interviewed also blamed Umeme for everything, refusing to take any responsibility for their own energy consumption and refusing to change anything. Overall, however, the challenge posed by poor habits is greater than the status quo bias. As one commentator said: 'After the programme ends, people go back to their old ways of doing it, thinking, "Maybe next time I'll do it."[6]

The habit of switching off lights when leaving a room or cleaning technical equipment daily or even monthly can make a difference to the electricity bill. In many of the SMEs visited, switching off both lights and machinery when not in use has become standard practice; maintenance and housekeeping measures, however, have not. Although the direct impact of these last two practices on energy consumption is less obvious, they can actually reduce energy costs by up to 10 per cent (GIZ-PREEEP 2008a).

Habits are essentially automatic responses developed by people through repeating the same action in the same situation or context (e.g. waiting for customers at your mill every morning triggers the habit of talking to your neighbour instead of maintaining machinery). Changing habits may require several measures at the same time. For instance, information and educational measures that aim at changing an individual's intention to do something may work well for weaker habits (e.g. explaining the costs and benefits of energy saving on the radio). Stronger habits, however, in addition to information and education may require measures that modify the triggering environment (Verplanken/Wood 2006). The introduction of bulk metering, for example, altered the triggering environment of Ugandan SMEs, leading owners/managers to reconsider practices of power theft and general energy management. The weakness or strength of a habit depends on the degree to which the action is automated (the more unconsciously performed, the stronger the habit), the frequency with which it is exercised, and the stability of the context in which it is performed. Attitudes and beliefs about a specific issue are also important factors in influencing habits that can be addressed by awareness-raising campaigns and specifically framed communication (see Section 5). Once an individual or SME owner/manager has committed to changing something about his or her energy practices (by publicly voicing his/her implementation intention, paying a workshop fee, or receiving incentives) reminders of the intended change and positive feedback for any small changes made are likely to work well (see Section 5) – for example, the best-practice award at the end of the GIZ-PREEEP training programme that rewarded initial changes was well received by the SME owners/managers.

6 *Interview with Expert 7.*

TRUST

Trust can be decisive to the uptake of new goods and services in sub-Saharan Africa, as different studies have shown (e.g. Giesbert/Steiner 2011; Thornton et al. 2010). In Uganda trust and mistrust are central to many SMEs owners'/managers' energy-related behaviour. Almost all those interviewed voiced concerns about Umeme's interaction with them. Frustration with the bulk metering system, (perceived) fraud, and unclear electricity bills as well as experiences with quick disconnections and bribery have led to a relation of deep mistrust between Umeme staff and most SME owners/managers. Many complained that Umeme does not act like a service provider (in handling complaints or explaining bills or sub-metering) and that they feel they are being overcharged. In some cases Umeme has restricted access to the central group meter, meaning SME owners can neither perform monthly readings themselves to control their consumption nor carry out readings when Umeme staff or sub-contractors come to take their own meter readings for billing purposes. In one particular instance an individual meter was not only locked (sometimes still enabling a view of the meter through an obersation slit) but also fenced off so that the owners were deprived of any control over their electricity consumption. Although Umeme's rigorous efforts to prevent power theft are understandable, the resulting tensions between Umeme field staff and SME owners is undermining the trust necessary between a service provider and a customer. Moreover, SME owners/managers cannot effectively engage in energy saving if they cannot compare and control their consumption.

At times, there is also a lack of trust between SME owners/managers. For example, several of those who participated in the GIZ-PREEEP energy training workshop tried to relay what they had learnt to their peers. Their peers, however, generally did not believe them, fearing such 'advice' to be nothing more than a strategy to harm their interests and gain a competitive advantage. This is rather problematic given that in many cases the adoption of energy-saving practices by SME owners/managers depends on them seeing how their peers use new practices and/or different equipment to save energy.

Some SME owners/managers also had trouble finding trustworthy vendors of machinery and raw materials, giving examples of how they had been cheated in the past. Regarding the future implementation of labels and standards, several experts have cautioned that the imitation of labels or switching of labels to uncertified products by some vendorsundermines customer trust in these standards.

In terms of information sources, radio (in rural areas and smaller towns and newspapers (in the cities) are trusted entities. First-hand experience with new machinery or practices helps people to build trust. At least for some SME owners/managers, business associations like USSIA are a trusted source of information and training. However, others have also voiced dissatisfaction with how USSIA operates.

Generally, SMEs owners/managers expect a lot of support from the government, in both monetary and non-monetary terms. Many said they were waiting for the government to come and help them. Despite this, there is also a general fear amongst Ugandan SME owners/managers of being controlled. After all, even for the largely informal SME sector, participation in government programmes often comes with at least partial formalisation (e.g. business registration and taxes). Another reason seems to be a general mistrust of governmental service provision. This situation of expectation on the one hand and deep suspicion on the other hand has created a lock-in situation for parts of the sector.

HANDS-ON EXPERIENCE

In terms of proven behavioural drivers that can be used more widely in the Ugandan business sector, hands-on experience is one of the most important for both SMEs and larger industry. To actually see a new practice being performed or energy-saving technology being operated in an environment similar to one's own business (e.g. another SME or a demonstration site) is very helpful to SME owners/managers. Several experts and SME owners/managers stressed that first-hand experience is crucial to understanding and accepting energy management. This is because uncertainty decreases and trust is built up when learning switches from passive to active learning (Hamilton/Thompson 2007; Hoch/Deighton 1989). On a cognitive level, the human brain processes a 'real', physically close object in a more concrete way than information conveyed through a picture which leaves some distance, both physically and mentally (Trope/Liberman 2010).

Existing misconceptions of what energy saving and energy efficiency mean can also be countered by hands-on experience. Many Ugandan languages do

not have a literal translation for the term 'efficiency', making an immediate understanding more difficult. This kind of language barrier is more easily overcome by directly seeing what is meant, which is why experts and the local trainers implementing the MEMD/GIZ-PREEEP energy training suggested setting up local demonstration centres. These sites would serve as points of information about best practices, products, and standards as well as vendors and prices. Letting centre visitors or programme participants try out equipment (possibly also by taking it home for a trial period) would have two effects on behaviour: first, uncertainties or perceived risks would decrease because people would be able to get more familiar with the technology or product. Second, it would increase people's perception of ownership, which increases through touching (Peck/Shu 2009) – it is also harder to let go of something already in one's possession. The combination of hands-on experience and the careful use of sentiment arising from an endowment effect (which refers to people's tendency to overvalue things they already own (Thaler 1980)) could be applied in future programmes seeking to introduce and diffuse new energy efficient technologies.

LOSS AVERSION

According to Tversky and Kahnemann (1992), individuals react more strongly to messages that convey losses than those that express gains because losses loom larger in people's minds. For example, saying 'You are losing 10,000 shillings a week by leaving your machines running between customers' is likely to trigger more reactions than telling owners 'Switching your machines off while you wait for the next customer saves 10,000 shillings a week.' With regard to developing countries, Clist et al. (2013) and Ito and Kono (2010) found evidence of loss aversion in the micro-insurance sector in Uganda and India, respectively. The Uganda Cleaner Production Centre already implicitly uses this behavioural insight in their training programmes, explaining to each company what amount of money it is losing per month through its current practices, before turning to different energy saving measures. Framing communication around losses is likely to help spark interest in energy saving in general and could be used in future programme advertising as well. To achieve a real change in behaviour in the SME and industry sectors in Uganda, this framing of communication should be accompanied by other explanations and demonstrations to allow for in-depth understanding – it should not induce fear of doing everything wrong.

FEEDBACK, SOCIAL COMPARISONS, AND PEER EFFECTS

Behaviour can be strongly influenced by feedback based on comparison with others, general social comparisons, and peer effects through learning from or sharing experiences with each other. The only energy-related feedback available to businesses in Uganda relates to their consumption and their monthly electricity bills. While keeping energy records and saving energy serve as an indirect feedback mechanism through lower bills, more direct feedback to the consumer is possible. Comparing a company's electricity consumption to neighbouring companies and giving a few specific energy-saving tips could be very useful in raising awareness. Such comparison-based feedback on electricity use has been shown to reduce electricity consumption, albeit by a rather small percentage (0.3–6.3 per cent reduction in the electricity bill) (Allcott 2011). In the Netherlands the combination of feedback with tailored information – thus avoiding choice and information overload – and goal setting has proven useful given that households react differently to different incentives (Abrahamse et al. 2007). In Uganda introducing such social feedback on the electricity bill would make more sense for large, clustered industry with individual electricity meters than for SMEs under bulk metering. For large industry, including information about energy audits or power factor correction on the bill could be helpful. For feedback and social comparisons to work within a group of SMEs under bulk metering, the current challenges of mistrust, a lack of information, and frustration would need to be resolved first.

Often, the Kenyan economy serves as a benchmark for Uganda. Several SME owners/managers interviewed compared their own situation to that of their peers in Kenya, Tanzania, Rwanda, and Ethiopia. This type of social comparison could be used as a driving force in future programmes – for instance, in communications ('60 per cent of Kenyans save energy in their business – you can, too') or in training workshops (showing photos and best practices from the region).

Both energy-training participants and experts underlined that peer learning is working well and is appreciated by SME owners, even though the

willingness to believe and share information outside of a training setting may sometimes be low for competitiveness reasons. During the energy training, SME owners showed a lot of interest in one of their peers who managed to produce high-quality, super-grade flour with just one pass through the huller, instead of three. Good practices tend to spread by word of mouth, even if it takes time and is hard to steer. Still, future programmes or local associations should look to expand their efforts to instigate peer learning. As one interviewee said: 'If you really go to each SME and say, look your neighbour did it this way and that is how much he saved, that would help, learning more from each other.'[7]

It is important to make engagement in energy efficiency social and attractive (not necessarily financially) to people in a way that appeals to existing social norms and attitudes and also motivates groups of people to attend relevant events. In the past, MEMD/GIZ-PREEEP has had several positive experiences in social settings with raising awareness of and interest in energy efficiency by, for example, organising social street events and 'see-for-yourself' exhibitions. The energy training programme also incorporated a vital social component by successfully using the local networks of the USSIA. In fact, local social networks play a key role in the development and use of social capital. For energy programmes, this means using the 'pull factors' of peers and familiar surroundings to introduce new and efficient technologies, benchmarks, and best business practices. Peer dynamics also offer possibilities for social learning – that is, learning from each other through exchanging or developing ideas jointly.

7 Interview with Expert 2.

Policy recommendations and conclusions

Inducing a lasting change in energy management behaviour requires both time and a diverse set of instruments that address both existing behavioural and non-behavioural barriers to change.

The main constraints to SME development and investments in energy efficiency are the difficult access to financing and a lack of business skills. These need to be addressed in parallel to any intervention that targets behavioural barriers in order to increase the probability of lasting change. The main behavioural barriers identified amongst SME owners/managers are a lack of trust in Umeme, uncertainty about products and vendors, short-term thinking, self-control problems, inefficient habits, and a general unwillingness to change anything about the status quo. Driving factors that could be used to further influence SME owners'/managers' behaviour are communication framed around losses rather than gains, feedback, social comparisons, hands-on experience, and peer learning.

The preceding analysis provides a starting point for more specific recommendations in three areas: policy and regulatory frameworks, future training and workshops, and future communications.

POLITICAL SUPPORT AND REGULATORY FRAMEWORK

The current efforts of the MEMD to set up a funding scheme (that includes low-interest loans and credit possibilities for energy efficient technology) especially for SMEs is very useful. Once the intervention is underway, it will be necessary to launch a communication campaign to inform SME owners directly via radio or text message using USSIA and Uganda Manufacturers Association networks.

More political support and programmes to develop SME owners'/managers' business skills and bookkeeping know-how are required to help with business planning and counter short-term thinking. The integration of a basic business-planning module combined with practical experience in an SME could be an option for secondary school syllabuses. For GIZ and other donors, combining energy training with more classic vocational training over a longer time period could be a useful option.

Since the MEMD oversees the different entities in the power sector, it is in a good position to support Umeme in its work and to emphasise the need to build trust between the utility provider and its customers. Providing more extensive explanations of electricity bill items (e.g. the kVA charge) and access to electricity meters and sub-meters for readings would go some way to increasing customer trust. If Umeme's data collection and management system allows it, combining comparative feedback on the electricity bill with specific energy saving tips and/or information is an option that should be explored by the industry. Before any larger changes to the billing system are made, however, a pilot project should be conducted first to measure the actual impact.

The current efforts of the Uganda National Bureau of Standards to establish benchmarks and equipment standards already include some energy efficient appliances and machinery. Still, it is necessary to both expand benchmarks and standards and control their implementation, particularly on the district and local levels. The potential of decentralised structures has not yet been fully exploited. The MEMD should consider setting up regional or local information and demonstration centres in collaboration with business associations that support the enforcement of standards and offer advice on energy efficient technology and best practices in energy management.

Prepaid metering counters power theft while enabling direct, immediate control of consumption. Many SME owners would prefer prepaid electricity meters to post-paid or bulk metering. This, though, is not an option for industry, medium-sized enterprises, or even very productive small enterprises that use a lot of electricity. However, for micro and small enterprises that use single-phase electricity and/or have low levels of productivity in remote areas (e.g. wood fabricators), introducing prepaid electricity instead of extending bulk metering could be more effective.

TRAININGS AND WORKSHOPS

The MEMD/GIZ-PREEEP energy training workshop already implicitly incorporated certain behavioural insights (e.g. the use of locally trusted networks and trainers, rewarding initial commitment through a best-practice certificate, practical exercises, and peer learning possibilities). Some of the communication material only used clear pictures in order to avoid information overload. However, some SME owners may have been presented with too much information and too many choices of energy saving possibilities in the brochures they received. Therefore, prolonging the training and possibly even repeating parts of the training after 6–12 months is likely to lead to a higher-learning effect because participants will not be overwhelmed by a large amount of diverse information in a short period of time.

SME owners/managers and industry employees require a lot of first-hand experience with new, efficient technology and energy management practices to understand its use and to reduce uncertainty and possible mistrust. Future training could include visits to SMEs where energy management has been successfully improved or providing efficient equipment to SME owners/managers for a trial period to allow them to practically apply their newly acquired energy recording skills. Such approaches would help the learning process, facilitate trust building, and encourage SME owners/managers to buy the equipment following the trial period (endowment effect) (it would be necessary to ensure that information on where to buy the equipment is available); they may even lead to new (efficient) habits.

The more explicit triggering of commitment and implementation intentions present additional options for future workshops. An option would be to ask SME owners/managers or an employee of a large company to tell one of their peers about a chosen aspect of the training and send a text message stating 'I am an energy saver' once they have done so. Upon receiving this message, a small reward (financial or non-financial) would be delivered. Once people have committed to a small thing, convincing them to commit to

other, more difficult practices often becomes easier. Provoking concrete implementation intention works along the same cognitive lines, especially if the intentions are made public. The GIZ-PREEEP programme asked each training participant to write down what they would change and by when they would do so. The participants then kept hold of these implementation plans. Making these plans or targets public by sharing them with the other participants could be a powerful add-on in future training courses.

Training technology providers and vendors could be a way to address the mistrust SME owners have of the market. Those who complete such a training programme could then be rewarded with, for example, a 'trusted seller of energy-saving technology' poster or button they could wear (backed by quality control). This would help SME owners/managers and other customers to develop a positive, trust-based relationship with vendors and lead to an effective commitment to energy efficient technology.

Finally, reminders in different forms are important to help overcome short-term thinking and self-control problems. These can take the form of repeated monitoring exercises or frequent visits to SMEs by trainers or USSIA officials. Reminder text messages on a regular basis have worked well in other donor programmes (e.g. in Kenya).

COMMUNICATION

For all communication to target groups, it is essential that information is concise and salient. Radio adverts, shows with question and answer sessions, pictures, posters, and photos are likely to work better than long texts that present too many options. People tend to be averse to too many ambiguous choices – for example, a list of 20 energy saving tips is less likely to instigate action than a list of 5 tips. Up-to-date information (e.g. on specific loan opportunities) and reminders (e.g. to workshop participants about their implementation intentions) are also important.

In message framing, the use of different social comparisons could be useful. This could, for example, consist of feedback on bills or advertisements employing regional or even domestic comparisons. To maximise trust and credibility, it is advisable to use locally trusted people or channels of communication. Face-to-face contact (e.g. going directly to an SME, company, or household) is likely to work better than communicating from a distance. Messages could also be framed more strongly around losses suffered by not saving energy than around gains. Any communication that exploits loss aversion has to be careful not to scare people or spread more uncertainty.

In general, a combination of measures that uses incentives, rewards for changed behaviour, and control is likely to work best. To ensure that the specific measures employed to change behaviour actually have the desired effect, it is advisable to carry out small pilot studies that compare SMEs subject to the new measures with control groups.

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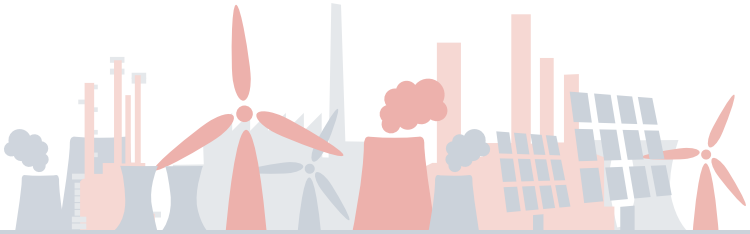

Managing uncertainty and mitigating risk to promote energy efficiency investment decisions

The Inter-American Development Bank/Bancóldex energy efficiency support programme

■ **AURELIA FIGUEROA**

Market gaps on both supply and demand sides have impeded the uptake of energy efficiency in Colombia amongst the hotel and hospital subsector. Focusing on small and medium enterprises (SMEs), the Inter-American Development Bank in cooperation with Bancóldex has developed an innovative scheme seeking to recreate aspects which may be found in an energy service company (ESCO) type model.

This includes the introduction of quality assurance infrastructure and the provision of insurance to guarantee energy savings to reduce uncertainty and mitigate risk. While the intervention is still in the pre-implementation phase, it presents an interesting starting point to consider related behavioural barriers that result in such market conditions. This study investigates potential means of overcoming decision-making barriers to energy efficiency uptake. It both proposes means of increasing energy efficiency within the scope of the programme and suggests further means of behavioural change to increase energy efficiency.

CONTENTS:

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Introduction

Energy efficiency investments frequently offer economic value, albeit at varying payback rates dependent upon contextual conditions including energy prices, financing options, and technology factors

Yet, uptake lags worldwide across sectors. Many factors contribute to this, including technical, financial, regulatory, and behavioural barriers. Market failures also plague energy efficiency, with imperfect or asymmetric information, principal/agent problems, and externalities being frequently cited (IEA 2013, Ryan et al. 2011).

This report will review an initiative designed to promote energy efficiency investment amongst small and medium enterprises (SMEs) in the Colombian hotel and hospital subsectors. This paper is one output of a broader research project on energy efficiency and behaviour in developing countries conducted at the German Development Institute/Deutsches Institut für Entwicklungspolitik (DIE). It analyses the proposed structure of the Inter-American Development Bank (IDB) and the Banco del Comercio Exterior de Colombia, S.A. (Bancóldex) energy efficiency support programme for hotels, clinics, and hospitals. The IDB/Bancóldex intervention will seek to fill market gaps and overcome decision-making barriers on both the supply and demand side to promote investment in energy efficiency.

The findings of this report are based on interviews with IDB staff and grey and secondary literature. Descriptions of the programme are based on ongoing interviews with IDB staff unless otherwise noted.

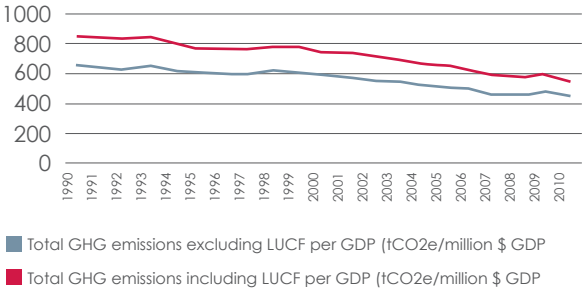
In the following sections, this report will provide context on the energy sector in Colombia, detail the IDB/Bancóldex intervention, explore the behavioural barriers and drivers which may be present when the scheme is implemented, and present a closing discussion. Several behavioural-related barriers were anticipated ex ante: low levels of information and awareness, loss and ambiguity aversion, perceptions of risk, and uncertainty. Both customers and financial officers exhibited a lack of information, which resulted in uncertainty about return on investment (RoI) and inaccurate calculations of the economic benefits of energy efficiency upgrade measures (CIF 2013). These factors contributed to loss and ambiguity aversion, preference for known risks over unknown risks, and perceptions of risk and uncertainty. These have also been demonstrated to impact decision-making in extra-rational manners. Thus, taking behavioural insights into account when designing energy efficiency interventions can help to overcome barriers related to uptake.

Context

ENERGY PROVISION AND FINANCE IN COLOMBIA

Historically, Latin America has had the world's lowest carbon-intense electricity sector given its high share of hydroelectricity use. Increased amounts of natural gas for power generation have, however, contributed to rising emission rates (CIF 2013; Yepez-García et al. 2010)

FIGURE 1: Colombian GHG emissions per unit of GDP, 1990-2010



There has been a relative decoupling of gross domestic product (GDP) growth from emissions in Colombia between 1990 and 2010, as illustrated in Figure 1 (World Resources Institute 2014). The country's electricity emission factor as measured by tonne of CO_2 per GWh dropped from 181.3 in 1990 to 127.3 in 2006 (Sheinbaum et al. 2011).

Colombia currently has an electricity access rate of 94 per cent (100 per cent urban and 76 per cent rural) and sources most of its energy from hydropower (80 per cent) and natural gas (13 per cent). Coal, renewable sources excluding hydroelectric, and oil account for the remaining supply. In 2011 electric power consumption was 52,857 GWh (World DataBank 2014). In October 2013 the total installed electricity generation capacity was 14.4 GW (EIA 2014). Electricity demand is expected to increase at a rate of 3.7 per cent annually until 2020 (Viscidi 2010). Although Colombia regionally accounts for a relatively small market share of total electricity production in Latin America (4.6 per cent in 2005, with Brazil and Mexico accounting for 36 per cent and 21 per cent respectively), it has the largest coal reserves. The country's proposed plans to develop coal-fired power plants are the only significant propositions in the region and underline the urgency of energy efficiency interventions from a climate protection perspective (Yepez-García et al. 2010; CIF 2013).

From a competitiveness perspective, the high cost of electricity in Colombia compared to its neighbours further underscores the need for energy efficiency. The average commercial sector electricity tariff in Colombia is US$0.22 per kWh, putting the country's electricity costs in the region's top third. Amongst its immediate neighbours it has the highest costs. Peru's electricity costs are less than half at US$0.10, while Venezuela's are the lowest in the region at US$0.02. Meanwhile, Ecuador's costs are less than one-third of the regional average at US$0.07 (OLADE 2011). The differences in these costs can be attributed to high subsidy regimes in these countries – in Ecuador and Venezuela, for example, these exceed 5 per cent of GDP (IMF 2013).

The Colombian electricity sector was deregulated in the mid-1990s as a part of a broader Latin American trend. These changes were spurred in part by a nationwide blackout in 1991 caused by droughts related to El Niño. The Ministry of Mines and Energy devolved electricity sector supervision powers to various agencies including the Energy and Gas Regulatory Commission (CREG) and the Mining and Energy Planning Unit (UPME). CREG was created in 1993 and has oversight of public and private energy companies and develops the tariff structures. Law 142 and Law 143, which governed the electricity sector, were enacted in 1994. This introduced one of the first market systems for wholesale electricity transactions in Latin America. This was followed years later with the launch of an energy exchange in the country in 2010 (Viscidi 2010; Pombo/Taborda 2005). The electricity challenges presented by El Niño are expected to increase in the context of climate change, which further underlines the need for demand-side management and diversification of energy sources (Magrin et al. 2007; CIF 2013).

The Colombian government has regulations (Law 691/2001 and Decree 3683/2003) and a resolution

(180919/2010) that address energy use, energy efficiency, and alternative energy sources. The National Programme for the Rational use of Energy and Energy Efficiency (PROURE) – Colombia's overarching energy efficiency law –covers residential, industrial and transport energy use (World Energy Council 2014). PROURE aims to decrease energy intensity, increase and improve energy efficiency across sectors, and promote alternative energy sources with the purpose of increasing energy security, increasing productivity in energy intensive sectors, improving quality of life, and reducing greenhouse gas (GHG) emissions (Martinez/Piña 2014). Law 697, which was passed in 2001, established responsibility of the Ministry of Mines and Energy for energy efficiency and created PROURE and its legal and regulatory framework (OLADE/UNIDO 2011, 17).

SMEs in Colombia are defined according to the number of employees and the value of their assets. Small enterprises have 11–50 employees and assets of up to US$1.1 million. Medium-sized enterprises employ 51–200 and have assets of US$1.1–US$6.7 million. The role and contribution of SMEs to the Colombian economy is unclear and varies greatly due to challenges in measurement, which are related to the informality of the sector. SME policy coordination is lead by the Ministry of Commerce, Industry and Tourism (MCIT) which has jurisdiction over the National System for the Support and Promotion of Micro Enterprises and SMEs. Government SME financing programmes consist of partial credit guarantees and long-term development funds (Stephanou/Rodriguez 2008; Schau et al. 2013; BiD 2009). Most beneficiaries of this programme qualify as SMEs according to above-stated criteria.

Financial markets in Colombia are at varying levels of development and sophistication. Capital markets are young with constrained offerings, making commercial and microcredit loans the most common for enterprises. For SMEs, a lack of access to financial services is frequently cited as the main business constraint, however, which leads them to make use of informal lending sources. Obstacles to financial access for SMEs stem from the limited scope of financial institutions, inflexible lending procedures, and difficulty in valuing SME assets and corresponding lending risk. The loan products that are available to SMEs are rather limited and standardised across banks. The lack of tailored financing options partly stems from banks' limited knowledge of the SME sector. The legal and contractual system in Colombia is further noted to pose challenges for SMEs in terms of credit and financial service access – challenges echoed in the reasoning for the IDB/Bancóldex intervention (Stephanou/Rodriguez 2008; BiD 2009).

ENERGY EFFICIENCY FINANCE IN COLOMBIA

Hurdles in the financing process are present in the local financial institutions (LFI) model, which usually applies a traditional 'asset-based' lending approach in regard to energy efficiency financing. This limits the loan amount to a maximum value of 70–80 per cent of the value of the financed assets or provided collateral. This is a barrier because LFIs give limited or no collateral value to energy efficient equipment despite the revenue that would be generated by energy efficiency investment projects. Since future cash flow is not recognised, this value cannot be used as a basis for a firm's loan repayment or to increase borrowing capacity. Even if this value were recognised, the inability to validate the risks associated with energy efficiency projects would still prevent significant LFI engagement (IDB 2013).

The defining feature driving the IDB/Bancóldex intervention is the absence of an energy service company (ESCO) model in the Colombian energy efficiency market and the related market gaps, which are interpreted as investment barriers (CIF 2013). The programme is designed to distribute risk amongst market actors and reduce the risk burden on decision-makers in order to facilitate energy efficiency investment decisions. It also seeks to generate expert involvement to account for knowledge gaps in the market, which may hinder financing and accurate energy auditing, inter alia.

The IDB/Bancóldex programme is structured to replicate certain aspects of the ESCO business model. ESCOs provide a range of services, though '[t]he fundamental concept of the ESCO business model is that the customer does not have to come up with any upfront capital investment and is only responsible for repaying the investment made or arranged by the ESCO' (IFC 2011, 3). Further services provided by ESCOs may include energy audits, the development of engineering designs and technical specifications, the arrangement of external financing and financing provision, and

TABLE 1:

Table 1:Barriers and proposed drivers to energy efficiency investment uptake	
Barrier	**Required input (affected stakeholders)**
Technical	Independent assurances that technical services providers have the requisite technical expertise and equipment to support the structuring and implementation of energy efficiency projects and that they are able to provide warranties for energy savings (local financial institutions, customers of energy efficiency upgrades)
Legal	Transparent and standardised contractual arrangements regarding what type of services are provided, how service providers guarantee energy efficiency project performance, and what arbitration and remedies are available if promised savings do not materialise (customers, service providers)
Insurance	Offering compensation or insurance coverage in the event that the anticipated RoI is not realised in order to overcome barriers related to the risk of energy efficiency investment (customers)
Standards	Low trust requires the development of clear standards for monitoring and verifying energy savings and a reliable system to carry out these activities (customers)

Source: Author's own representation based on IDB documentation

the monitoring and maintenance of energy savings during the payback period, which are in turn used to finance project capital investment in a specified time frame. If rates of return are not met, ESCOs are usually responsible for paying any difference – an important tool in mitigating risk for project developers and beneficiaries (IFC 2011; Bertoldi et al. 2006, 2007; Bleyl-Androschin/Ungerböck 2009).

In some contexts technical and financial capacities would both be assumed by the ESCO business model. In Colombia, while there are many companies that can advise on energy efficiency, most of them lack sufficient capital to directly invest in the purchase of technology and to assume the corresponding risk – a situation that introduces financial barriers to energy uptake. The IDB/Bancóldex intervention looks to fill the resulting gaps by facilitating finance on both the supply and demand sides. For the former, it provides expertise for banks to make the evaluation of loan applications easier. For the latter, it provides insurance guarantees to lessen the risk for the customer by replicating the risk assumption that may occur in ESCO models, whereby the service provider must assume the risk of not realising planned savings (CIF 2013). It further provides a standardised contract to reduce uncertainty, technology and service provider validation, energy savings insurance, and monitoring, reporting, and verification mechanisms.

The development of the ESCO market in Latin America has been somewhat uneven. For instance, Brazil has become a market leader, while countries like Mexico and Uruguay have also seen some progress. In most countries, however, market advancement has been hindered by a lack of institutional frameworks (IFC 2011). To respond to these perceived market gaps, the IDB/Bancóldex programme aims to address four types of related barriers: technical, legal, insurance, and standards. The nature of the challenges associated with each are outlined in Table 1.

Sarkar and Singh (2010) found barriers of a market, financial, technical, regulatory, institutional, and informational nature amongst developing countries. Barriers to the development of energy efficiency in Latin America include insufficient knowledge about energy efficiency and the economic decision-making it may lead to, market inefficiencies resulting from mistrust about the financial feasibility of energy efficiency investments, the lack of a fully established ESCO market, and mistrust in the SME sector regarding the quality of technical assistance provided by energy services providers (UNECLAC 2014).

THE IDB APPROACH

Even though this programme has not yet been implemented, its objective to manage perceived and real risks associated with the finance of energy efficiency interventions make it an interesting departure point from which to consider behavioural barriers related to energy efficiency finance. The IDB/Bancóldex intervention will be implemented in Colombia's four different climate zones (i.e. the Caribbean and Pacific lowlands, Andean highlands, savannah, and rainforest) in order to explore which technologies are appropriate for each of these climatic areas. The programme will support the

reduction of natural gas use for heating purposes and promote investments in six areas: air conditioning and refrigeration systems unit replacement, air conditioning control systems, high efficiency boilers, solar systems for hot water, pool acclimatisation, and co-generation.

The IDB/Bancóldex scheme focuses on the hotel and hospital service subsectors in Colombia, a relatively homogenous grouping because both carry out the same essential task of hosting people. Approximately ninety hotels and thirty-four health clinics will be supported by investment financing. The programme will aim to reduce energy intensity while realising environmental and gender equity co-benefits (the Colombian service sectors disproportionately employ women: 76 per cent in 2012) (IDB 2013; World DataBank 2014). The majority of hospitals in the country operate on a small scale, with approximately 72 per cent hosting less than 50 beds (IDB 2012).

The IDB/Bancóldex scheme is part of the Colombian investment plan for Climate Investment Funds (CIF), which includes several interventions aimed at promoting the scale-up of energy efficiency investments, particularly in the service sector. This intervention is part of a long-term cooperation between the Colombian government and the CIF to successfully implement the country's long-term low-carbon growth plan. It is part of an overall US$90 million flagship facility approved by the IDB in collaboration with the International Finance Corporation and Clean Technology Fund (CTF) to support Bancolombia and other financial institutions in backing energy efficiency, cleaner production, and renewable energy projects in Colombia. It will provide total project funding of US$20 million to commercial banks (IDB 2011; CIF 2013).

Financing will be disbursed through Bancóldex to first-tier financial intermediaries and related SME investment projects (IDB 2014). The financing model includes three components: (i) a credit line from Bancóldex for eligible LFIs to be distributed as sub-loans to eligible hotels and hospitals/clinics in accordance with appropriate terms and conditions, (ii) technical advice from energy services providers to beneficiary firms, and (iii) risk management tools, which include performance insurance policies, performance-based payment systems for energy services providers, standardised contracts, and technical verification standards (CIF 2013).

In essence, the programme aims to promote energy efficiency uptake amongst relevant stakeholders (i.e. lending agencies, service providers, and beneficiary firms). It comprises five key components:

- Development of standard, legally binding contractual terms that clearly establish rights and obligations of both beneficiary firms and technical services providers
- Quality assurance of technical services providers
- Development of methodologies, protocols, and systems to monitor, validate, and verify energy savings
- Establishment of an insurance policy that covers technical risks associated with the services offered by technical services providers and other performance-related factors
- Promotion of pilot projects and demonstrations to engage potential beneficiary firms and build awareness

The financing scheme is conducted in two phases consisting of (1) project validation and credit approval and (2) implementation, monitoring, and reporting. Phase one comprises twelve steps, which are illustrated in Figure 2. The process begins with a service provider assessing potential energy savings. If this is favourable and the customer wishes to continue, financing and technical proposals and contracts are initiated. Risk assessment is then undertaken by the LFI and the independent Colombia Institute of Technical Standards and Certification (Icontec), the national standardisation body. The quality of technical proposals is evaluated along with the expertise of the technical services provider to determine if implementation is feasible. If the assessment is positive, Bancóldex approves funding to the LFI.

The commercial bank then disburses funds to the customer. Following a six-month interval, the third-party validator will then check on the progress of the implementation process, which includes installation, a monitoring plan, and the decommissioning of old equipment. Any failures at this stage would result in the disbursed credit being returned to the LFI/ Bancóldex. Presuming there were no failures, the technical services provider must then submit to

the external validator a detailed design of project operations and maintenance along with a monitoring plan detailing how energy savings and GHG emissions reductions will be estimated, monitored, and reported. The technical services provider then receives a partial payment from the contracting firm for the project design. The remaining payments are based on project performance. Pending validation, the technical services provider then buys a performance insurance policy from a local insurance company – the beneficiary thereof is the contracting firm.

The incentives provided by the IDB/Bancóldex programme will aim to address the four types of challenges related to the risk perceptions of potential beneficiaries and LFIs (i.e. technical, legal, insurance, and standards) by promoting an enabling environment through the creation of technical backstopping, investment financing, and risk management tools. Investment financing will be provided at terms and conditions that, unlike the present valuation model, account for the costs and returns of energy efficiency investments to increase capital availability. Risk mitigation will be offered through local insurance providers, while technical backstopping will be based on the involvement of different field experts.

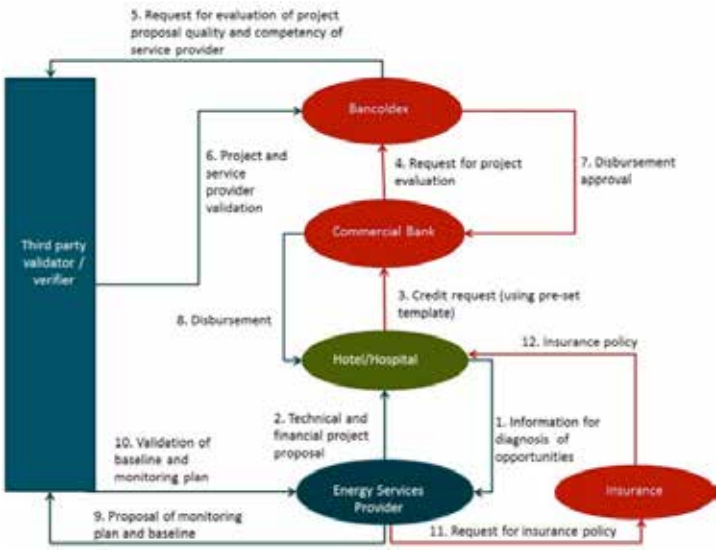
MITIGATING RISK TO SPUR FINANCE

In phase two – which consists of implementation, monitoring, and reporting – procedures differ depending on whether the customer agrees with the energy-savings reports prepared by the technical services provider. As a starting point, the technical services provider is contracted by the beneficiary firm to prepare periodic energy-savings reports during the implementation phase. If the customer is satisfied with the energy-savings reports, it pays the technical services provider a previously established percentage of the contract. The beneficiary firm or the technical services provider supplies Bancóldex with monitoring reports at least annually during the loan repayment period.

If there is a disagreement over an energy-savings report, the customer sends the report to an external verifier contracted by Bancóldex who then assesses the report and the actual generated energy savings. If there is a shortfall compared to the original anticipated savings, the customer is not required not make performance payments to the technical services provider. If the amount withheld is not enough to cover the energy-savings shortfall, the beneficiary firm can make a claim on the performance insurance policy to cover the difference. Reporting to Bancóldex still occurs at least once a year.

An overall programme evaluation will be carried out after five years and assess the productivity, competitiveness, and technological changes of the firms supported (treatment group) and those not supported (control group). This will include an analysis of the impact of risk management measures including the use of insurance, standard contracts, and other elements. The IDB/Bancóldex programme has a system in place to monitor, verify, and report energy savings for each project. Validation will be conducted by energy services providers who will be tasked with estimating potential energy savings, developing monitoring plans, and measuring and reporting energy savings and GHG emissions reductions. They will be supervised by Icontec, which will review the operation of the project, the maintenance design, and the monitoring plan for energy savings and GHG emissions reductions.

FIGURE 2:
Phase one of the financing scheme



Source: IDB 2013

Barriers and drivers of energy efficiency

In Colombia market gaps have contributed to energy efficiency investment barriers. These are partly related to risk aversion and uncertainty on the part of various actors. While these are not strictly behavioural barriers, they are defining characteristics of this case.

From the perspective of energy efficiency decision-making – which the IDB/Bancóldex intervention attempts to influence to increase uptake – behavioural theory can be usefully drawn upon, particularly in its relationship to decision-making theory. Including behavioural insights in the IDB/Bancóldex programme design will not overcome all barriers to energy efficiency, especially in contexts of broader structural challenges (e.g. low levels of financial or technical capacities). However, to the extent that energy efficient decision-making may be influenced by extra-rational factors, behavioural insights may inform how to shape programmes and policies to positively impact uptake. Of the four major strands of behavioural economic research (prospect theory and loss aversion; inconsistent time preferences and hyperbolic discounting; information, mental accounting, and framing; and social preferences and aspects) (Never 2014), prospect theory, time preferences, and information seem to contribute most to the behavioural context of such an intervention.

RISK AND UNCERTAINTY

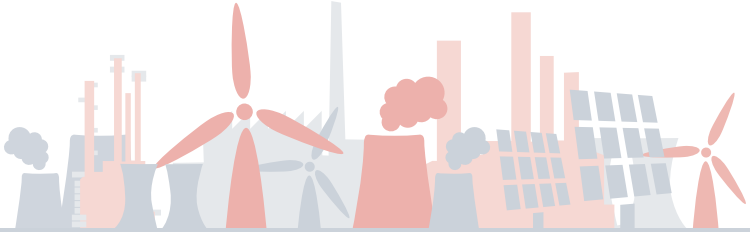
Managing uncertainty and mitigating risk are imperative to facilitating the decision to invest in energy efficiency. Knight (1921) draws a boundary between uncertainty and risk. In conditions of risk enough known variables exist so that outcome probabilities may be determined; however, only subjective probabilities can be calculated in conditions of uncertainty. Others, such as Ellsberg (1961), see an overlap between the two – that is, some uncertainties may be risks. The proposed structure of the IDB/Bancóldex intervention aims to reduce uncertainties related to, for example, payback periods, energy savings, and project performance. The reduction of uncertainty could then facilitate the involvement of other necessary stakeholders, while risk may be mitigated by insurance provision. This strategy addresses the lack of a developed ESCO market in Colombia.

The importance of managing uncertainty related to energy technology performance has been underlined by Greene (2001) and Bjornstad and McKee (2006), who found that this was even more meaningful to potential consumers than uncertainty about future energy prices, another frequently cited barrier. The IDB/Bancóldex intervention aims to foster certainty in this respect through clear contractual terms and well-defined stakeholder expectations. Initial stakeholder consultations revealed the most important elements of the programme for firms, energy services providers, and commercial banks to be the standard contract and insurance policy – both of which are likely to be key elements of uncertainty management and risk mitigation. For insurance providers, the independent monitoring, reporting, and verification (MRV) system, which assesses the quality of services provided by the energy services providers, was the most important element.

When decision-making involves many unknown factors, individuals may exhibit choice avoidance, which is referred to as ambiguity aversion (Ellsberg 1961). The preference for known risks over unknown risks (Ellsberg 1961) may similarly result in inaction and status quo bias (Samuelson and Zeckhauser 1988) because the potential risk of foregone gains associated with maintaining the status quo is preferable to the results of an uncertain change. Contexts of uncertainty and risk mingle with these decision-making heuristics. Both shape this intervention and may contribute to some of the decision-making barriers developed below.

PROSPECT THEORY

Energy efficiency investments which involve decisions on technology, brands, timing, capital outlay, contractor, loans, and other factors may fall into extra-rational decision-making traps, such as have been outlined in a number of theoretical constructs. Prospect theory focuses on the extra-rational impact of



losses and gains and risk and uncertainty on decision-making (Tversky/Kahneman 1992; Kahneman/Tversky 1979). It is a departure from expected utility theory (Bernoulli 1954/1738) – which assumes individuals are not affected by reference points, because they are solely driven by wealth attainment – and builds upon earlier critiques of and departures from the expected utility model (Simon 1956; Allais 1953; Ellsberg 1961). In essence, prospect theory argues that decision-making is influenced by different valuations of losses and gains – the former being seen as more costly than the latter, leading to related behavioural barriers, such as loss aversion (Kahneman/Tversky 1979) and the endowment effect (Thaler 1980), that can impede decisions involving change and progress.

SHORT-TERM THINKING

Inconsistent time preferences which include phenomena such as hyperbolic discounting essentially refer to differing decisions on the same issue at different points in time. For example, many people would like to save on electricity bills, but they put off upgrading to more efficient bulbs or insulation. This frequently results in short-term thinking, whereby decisions are made for current comfort rather than future benefit. Energy efficiency investments typically face the challenge of reconciling certain near-term costs with potentially uncertain or risky future benefits (Weber/Johnson 2012). Though the future self values savings, the present self cannot seem to dedicate the required resources. The IDB/Bancóldex intervention and indeed other ESCO and government-funding models (will) try to address this barrier to energy efficiency by bringing energy savings closer to the consumer. For instance, a customer might only have to pay upon realising savings, which would reduce energy efficiency decision-making to an essentially time- and cost-neutral process, ceteris paribus.

INFORMATION AND AWARENESS

Information is a key element with respect to each of these barriers. Behavioural barriers to energy efficiency investment are spurred by the depth and diversity of information that may be required to make a decision (e.g. which technology, provider, loan to choose). Therefore, information – whether related to awareness (e.g. acquiring knowledge about energy efficiency) or to complexity and ambiguity (e.g. sorting through energy efficiency information) – can be considered to present a first barrier. Inaccurate information hinders appropriate valuation and impacts the willingness to pay and discount rates, which are key factors, amongst others, in energy efficiency investment decision-making. The resulting investment inefficiencies may contribute to what is popularly termed 'energy efficiency gaps' (Allcott/Greenstone 2012; Tsvetanov/Segerson 2013).

The average consumer lacks in-depth knowledge and/or information on energy savings technologies, which can lead to flawed valuations of the savings potential of energy efficiency upgrades. Accurate valuations require knowledge of many factors, including future energy prices, usage forecasts, energy efficiency ratings, and a calculation of all these factors to reach a total energy cost (Allcott 2011). This is problematic because it is suggested that consumers are not adept at making such calculations (Turrentine/Kurani 2007). The clarity, salience, and impact of short-term costs are important in determining the actual utility of information provided to foster energy efficiency investments and should be included in relevant programme communications (Wilson/Dowlatabadi 2007).

In some cases the provision of savings information has reduced implicit discount rates by a factor of five (Min et al. 2014). The interconnected factors of consumer discounting and energy-savings expectations contribute to the formulation of high discount rates (Sanstad et al. 1995), which impact investment decisions. In the structure of the IDB/Bancóldex intervention, technical services providers will supply this important economic valuation input, which can help reduce discount rates and facilitate energy efficiency uptakes. Clear and understandable valuations may further contribute to making the potential gain of investment clearer and the loss associated with the status quo more salient.

Discussion

The design of the IDB/Bancóldex intervention presents several interesting points for discussion (though no lessons can be drawn yet from outcomes). It potentially offers a framework that accounts for risk, uncertainty, and the resulting lack of trust in energy efficiency programme designs – in this case specifically in the absence of ESCO-type business models and trusted actors.

While these are not distinct elements of behavioural barriers, they have shaped energy efficiency decision-making. Especially in this regard, it presents a useful structure as ESCO business models are not yet globally pervasive, particularly amongst developing and emerging economies. By integrating risk-management tools, performance-dependent financing, and quality-assurance structures, the IDB/Bancóldex programme represents an alternative to the ESCO model. In the absence of an ESCO business model which facilitates energy efficiency uptake, the structures created by this intervention may be used in other circumstances where similar behavioural barriers and market gaps exist.

Despite replicating the ESCO-type business models, the IDB/Bancóldex programme has, however, introduced complexity and transaction costs. While it is not yet possible to estimate the impact of this on uptake, a reasonable concern may be that this discourages potential customers. Behavioural insights may be drawn upon to identify means of encouraging energy efficiency investment decision making. Where possible, further efforts should be made to limit burdens on the customer. One potential option could be to make the acquisition of financing and administrative requirements the responsibilities of energy services providers, which would eliminate some steps in the process for the customer. A potential issue here, however, could be that an energy services provider may have a less creditworthy background than the customer (i.e. the hotel or hospital). Efforts should also be made to ensure that information and communication regarding the programme is presented concisely in order to prevent the potential decision-making heuristics that could arise when information is complex and/or ambiguous. The IDB/Bancóldex scheme may also seek to draw upon behavioural insights from prospect theory, for example, to highlight the potential profit losses due to a lack of energy efficiency uptake.

In addition to or in the absence of this intervention, governance mechanisms may be implemented to fill similar roles in uncertainty management and risk mitigation. For example, contracts with energy services providers could be standardised to reduce uncertainty about the contracting process – which, in this case, would be supported by Bancóldex. A model contract could then be developed for use in other specific projects (e.g. ventilation systems) once the IDB/Bancóldex programme has been implemented and lessons learned have been built upon. This could reduce barriers for energy services providers who have technical knowledge but may lack administrative capacities and remove risk for consumers who may be unsure of what contracts should entail.

Quality-assurance infrastructure for energy services providers could similarly contribute to reducing risk and uncertainty. In the United States, for example, the National Association of Energy Service Companies (NAESCO) sponsors an accreditation programme for energy services providers, ESCOs, and energy efficiency contractors. A comparable body in Colombia could perform a similar role to NAESCO as well as other functions related to the development of the energy services providers sector. As the Colombian market develops, Icontec (the standardisation body that will support risk assessment in the IDB/Bancóldex intervention) could have a role to play in creating an accreditation body or rating process for energy services providers.

Insurance is the key element in mitigating risk for energy efficiency investments. Another important factor for reducing risk is performance-based remuneration mechanisms. Whereas the ESCO business model requires energy services provider to assume

performance risks, the IDB/Bancóldex programme introduces performance pay and requires energy services providers to finance an insurance policy. The risk insurance element is seen to be important for the customer and bank alike as it will secure their respective capital outlay in the case of savings shortfalls. The expertise that will be provided through third-party validation will ensure the involvement of insurance brokers, who may otherwise not enter the market due to a lack of expertise.

Prima facie, risk insurance is an appealingly straightforward means of risk management. To avoid potentially unnecessary costs, however, it is important to consider whether other approaches can be used to mitigate risk. The extent to which insurance will be relied upon to mitigate risk would present a threat should insurance companies be unable to provide the requisite services. Conversely, if an insurer refuses to provide premiums, this could introduce a significant barrier in the system. An alternative strategy could be to establish a joint fund operated by technical services providers to be used for disbursement in cases of savings shortfalls while maintaining performance-based contracting methods. In order to prevent potential free-riding challenges, contributions could be determined by the number of payouts associated with a company in a given time period. Independent certification of trusted service providers as well as governmental awareness campaigns should complement these measures to reduce uncertainty and increase trust in a developing ESCO market. While such mechanisms would take time to develop, these could contribute to the build up of trust in the energy services market.

The finance mechanisms proposed by the IDB/Bancóldex intervention also provide food for thought with regard to policy and programme design. A primary financial barrier was the application by LFIs of a traditional 'asset-based' lending approach to energy efficiency financing, which limits the loan amount to a maximum value of 70–80 per cent of the value of the financed assets or provided collateral. However, LFIs give limited or no collateral value to energy efficient equipment despite the cash flow that would be generated by energy efficiency investment projects. Since future cash flow is not recognised, it cannot be used as a basis for companies' loan repayments or to increase borrowing capacity. This in turn requires additional internal credit capacity from firms to finance such projects.

These regulations echo an increased focus on capital requirements following the 2007/8 financial crisis. Basel III, for example, will build on this and could present barriers to the financing of energy efficiency and renewable energy projects, which often depend heavily on project finance loans. Proposals have been made to protect sustainable economic activity from the introduction of regulations, such that financial and environmental policies are aligned. This includes central bank monetary policy measures that facilitate bank credit provision to sustainable economic activity (UNEPFI 2014) and the redistribution of renewable energy project investment portfolios to other investors (Narbel 2013). Amongst those recommendations made by the United Nations Environment Programme Finance Initiative (UNEPFI 2013) is the inclusion of 'green' bank assets as collateral for central bank loans. This resembles what will be implemented at the customer and LFI levels with the IDB/Bancóldex intervention, whereby the anticipated savings from energy efficiency projects may be used for collateral.

This IDB/Bancóldex programme, which acknowledges behavioural barriers to energy efficiency investment, is still focused on technology upgrading. As has been illustrated in other circumstances, including case studies in this volume, behavioural change can lead to the realisation of significant energy intensity reduction in the industrial and commercial sectors – often at low cost. Where possible, efforts should also be made in the planned energy auditing process to conduct behavioural audits to identify low- and no-cost options for energy efficiency to be implemented by staff members at all levels, and tailored to the energy behaviours entailed in their job descriptions. This is important not only as a stand-alone input, but also as a measure to develop social norms related to energy efficiency, which will contribute to the efficient operation of new technology acquisitions.

From a customer-of-the-customer perspective – that is to say, the guests of the hotels and hospitals – programmes that encourage energy efficient behaviour would also be worthwhile. A growing body of evidence indicates that interventions in this respect may be most effective. For example, notices related to conserving water by reducing linen washing have been shown to be more effective when phrased in a peer-group sense (e.g. 'fellow hotel guests') or as provincial norms rather than as a simple appeal for environmental stewardship (Goldstein et al. 2008; Reese et al. 2014). In

hospitals, where patient well-being is paramount, this principle may be less readily applicable, but it could still be applied in other areas (e.g. staff resource-use behaviour).

The structure of this IDB/Bancóldex intervention is a useful point from which to consider the impact of behaviour on decision-making regarding energy efficiency investments. As in many national contexts, market gaps present practical barriers to energy efficiency uptake while contributing to behavioural barriers. The provision of expertise, quality assurance, uncertainty reduction, and risk mitigation have been proposed as measures to fill market gaps and overcome decision-making barriers. Additional efforts to streamline the programme and further integrate behavioural insights could help to increase uptake and identify further savings opportunities. Should the IDB/Bancóldex intervention be successfully implemented, it could turn out to be a useful example upon which to develop future programmes that also seek to overcome these common barriers to energy efficiency investment uptake.

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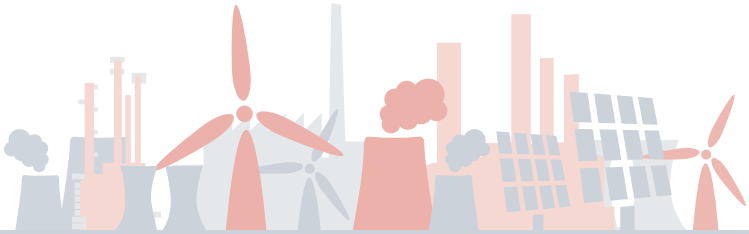

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Behavioural drivers and barriers to energy efficiency investments of MSMEs in India

BABETTE NEVER

CONTENTS:

Behaviour and finance: Two sides of the same coin

A lack of capital and insufficient access to finances are the most commonly cited reasons for not investing in energy efficient technology, particularly amongst small and medium-sized enterprises (UNIDO 2011).

In India the level of energy efficiency varies a lot between sectors and also depends on firm size and exposure to international influences. Micro, small and medium-sized enterprises (MSMEs) often have outdated technology and inefficient production practices. With approximately 29.8 million MSMEs currently operating in India (Government of India 2009), the scale of the challenge for the energy system, the impact on the environment, and the health of the employees working with old equipment are issues that cannot be neglected. Although Indian MSMEs have a 15–20 per cent higher energy-saving potential than large companies in the same sector (KfW 2008), they face greater challenges in accessing suitable financing.

The International Finance Corporation (2012) estimates that Indian MSMEs have a total finance gap of US$418 billion (equity and debt finance gap combined). How much of this gap can be attributed to energy efficiency investments is unclear, but modern energy efficient technologies are generally more costly than investments in buildings or raw materials, for example. Only 1.8 million Indian MSMEs are registered and therefore count to the formal sector. Access to formal banking is more difficult for non-registered MSMEs as not only do they struggle to fulfil banks' requirements, banks are reluctant to lend to MSMEs because of the risk of repayment failure. The Indian government is trying to address this problem through a mandatory priority sector scheme, which will require all domestic banks to reserve 40 per cent of their loan portfolio for underfinanced priority sectors (e.g. agriculture) and microfinance schemes.

Babette Never

Behavioural drivers and barriers to energy efficiency investments of MSMEs in India

Public-sector banking has a long history in India and continues to dominate the banking landscape. As a state-owned bank, the Small Industries Bank of India (SIDBI) is obliged to support the government's MSME policy implementation measures. It is also the main public entity charged with financially assisting MSMEs. SIDBI's major source of business is the refinancing of Indian banks. About a third of all operations conducted concerns direct lending to clients. The vast majority of its customers (about 80 per cent) have long-standing relationships with the bank, with branch officers tending to maintain relations of trust with their clients. In spite of its prominent position, SIDBI has not yet managed to issue the full amount of loans possible under the KfW's 'Financing for Energy Efficiency Investments of MSME in India' line of credit, which has been operational since 2010.

Why do MSME owners/managers not invest more in energy efficiency even though it makes business sense to do so? Why has the uptake of energy efficiency financing opportunities been comparatively low this far? These are the questions this report addresses by looking at the psychological factors that influence decision-making. Superficially, behaviour and finance are two different issues – the 'soft' and the 'hard' tools of development cooperation, or so it seems. However, no line of credit can be implemented successfully without human action (i.e. people interacting and taking decisions). Behavioural insights can help to optimise existing systems and programmes and provide support in all those instances where human decision-making can influence the implementation of financing schemes, both on the supply side of banks and on the demand side of loan applicants. Taking behavioural insights into account will not solve larger challenges such as pricing or financial system architecture. They can, however, provide alternative access to the 'human factor' in the equation.

The analysis of the KfW programme 'Financing for Energy Efficiency Investments of MSME in India' in cooperation with SIDBI is particularly interesting as a case study for the field of finance and behaviour because of the accompanying technical assistance components and the comparative aspect with a similar line of credit at SIDBI financed by the Japanese International Cooperation Agency (JICA).

The findings of this report are based on interviews with staff from both KfW and adelphi consult as well as on the KfW programme, grey literature, and secondary literature. SIDBI and MSMEs are influenced by different behavioural factors. For SIDBI, behavioural barriers consist of staff aversion to the unknown, unclear programmes (ambiguity aversion), the framing and communication of the KfW credit line, and a lack of commitment and positive incentives. For MSMEs, short-term thinking, difficulties in calculating payback periods (due to insufficient business skills), inefficient habits, and a preference for the current situation (status quo bias) all affect their decisions on energy efficiency investments. Behavioural drivers that could support decision-making are social comparisons, peer effects (e.g. learning from a similar enterprise in a cluster), and first-hand experience with energy efficient technology and energy management practices.

This report is structured as follows: the second section gives an overview of the overall political and economic context in which Indian MSMEs and SIDBI operate. An understanding of this framework is necessary to put the behavioural drivers and barriers into perspective. The third section briefly describes the KfW's approach to financing MSMEs' energy efficiency investments in India in collaboration with SIDBI, while the fourth section presents an in-depth analysis of behavioural drivers and barriers. The final section closes with a set of policy recommendations for the future roll-out of the programme.

Context: Energy, MSMEs and financial support in India

What characterises an MSME in India? The Indian government defines MSMEs according to the size of their initial investments in production plants and machinery, differentiating between the manufacturing sector and the service sector.

In the manufacturing sector (which comprises energy-intensive MSMEs) an enterprise with initial investments of up to US$50,000 is considered a microenterprise; US$50,000–1 million, a small enterprise; and US$1–2 million, a medium enterprise. Commercial banks in India use a slightly different scaling based on annual turnover, whereby an enterprise with an annual turnover of US$30,000–1 million is a microenterprise; US$1–4 million, a small enterprise; and US$4–40 million, a medium-sized enterprise.

To understand the context that frames the decision-making of MSMEs and its interactions with SIDBI, a brief overview of four areas is necessary. The first area covers the supply of power and energy costs, which are key to the production processes of MSMEs, often affecting the competitiveness of these businesses directly. The second area concerns the regulatory conditions and political support that shape the playing field by indicating both opportunities and constraints. The third area deals with the mapping of the existing financial support system for energy efficiency investments. The fourth area focuses on the correlation between behavioural factors and the general barriers that result from the socio-economic situation of Indian MSMEs.

POWER SUPPLY AND COSTS

In 2009 India's largest primary energy source was coal with a share of 42 per cent. Following a decrease over time, biomass now only makes up a quarter of the energy mix – as does oil. Nuclear, hydro, wind, and solar energy still only represent a small share of the overall energy mix (OECD/IEA 2012). In 2013 the majority of electricity produced in India derived from thermal, coal, and gas power plants (68 per cent), followed by hydropower (17 per cent), and other renewable energies (12 per cent). Nuclear power accounted for only 2 per cent of installed capacity (Ministry of Power 2013). Installed capacity and actual electricity production differ due to generation and transmission losses, though the relative shares of the sources remain the same. India also imports power, specifically hydroelectricity from Bhutan. In 2011 75.3 per cent of the Indian population had access to electricity, which is a relatively high share compared to other developing countries. Nevertheless, with around 280 million people lacking access to electricity, it is clear that much remains to be done. Power cuts and load shedding are regular occurrences throughout the country. The demand for power has increased at an average rate of 3.6 per cent in the past thirty years. In the last ten years demand has grown at a cumulative average of 11.6 per cent (FICCI 2012). Projections of energy-demand growth until 2035 vary between 4 and 8 per cent per annum. Therefore, there is significant pressure to sustain energy security while also improving access to and affordability of electricity, especially for India's poor.

India has five different grids that operate in the northern, western, eastern, north-eastern, and southern regions of the country. Only four of them are connected in order to balance voltage and supply fluctuations. Since the southern grid is not connected to the other grids, the southern states were not affected by the major power blackout that affected many parts of the country in 2012. In India states are responsible for setting their own power tariffs. The costs for grid electricity vary between INR 5.18 (€0.06) and INR 8.48 (€0.10) per kWh (FICCI 2012). Delhi and Orissa have the lowest tariffs, while Maharsahtra, Jharkand, and West Bengal have the highest. Medium and large industries are more likely to have backup generators for power cuts than are micro and small enterprises. In its survey of 650 small, medium and large enterprises across India, the Federation of Indian Chambers of Commerce and Industries (FICCI, 2012) found that a third of the

companies owned backup generators – the majority of them medium-sized businesses. The study also revealed that some large companies also ran small private power plants (e.g. a small wind farm) to increase their independence from the grid. The costs of power from captive sources range between INR 12 and INR 16 (€0.14–0.19) per kWh between the different states (FICCI 2012). When power purchasing parities are taken into account, this is very expensive.

REGULATORY FRAMEWORK AND POLITICAL SUPPORT

With respect to MSMEs and energy efficiency, both the MSME regulatory framework and specific energy regulations are relevant. Compared to those in other developing countries, MSMEs enjoy strong political support in India. The Ministry of Micro, Small and Medium Enterprises is the nodal agency for all programmes and initiatives relating to MSMEs. The Micro, Small and Medium Enterprises Act of 2006 established the National Board for Micro, Small and Medium Enterprises and the Advisory Committee for Micro, Small and Medium Enterprises – both of which serve as institutional network facilitators and coordinating bodies. The MSME Act also laid the foundations for specific government initiatives such as the Micro & Small Enterprise Cluster Development Programme and the Credit Linked Capital Subsidy Scheme for Technological Upgrading. The latter seeks to provide upfront subsidies to small-scale industries for the modernisation of their equipment and techniques. The subsidy rate has been increased to 15 % in 2005. The maximum loan allowed is INR 10 million and the limit of the subsidy is INR 1,5 million or 15% of the investment in eligible machinery.

In addition to the financial support provided by SIDBI, there are an array of training courses and information campaigns offered to MSME owners by organisations such as the Small Industries Development Organization, small industries service institutes (SISIs), the National Small Industries Corporation, the National Institute of Small Industries Extension Training, the Small Industries Development Corporation, and the State Financial Corporation and District Industries centres. The Indian government has also sought to increase SME exports by including incentives for small-scale exporters in every economic growth policy (Singh et al. 2010).

India's current energy policy is focused on three goals: increased energy access, greater energy security, and climate change mitigation. The Integrated Energy Policy of 2008 and the National Action Plan on Climate Change (NAPCC) of 2008 are the most recent policy frameworks to impact businesses. The Integrated Energy Policy emphasises that transparent, targeted subsidies and adequate energy pricing is necessary as current rates and subsidies continue to favour certain consumer groups (e.g. farmers) at a very high cost the state. The NAPCC outlines the National Mission on Energy Efficiency as one of eight missions defining India's future climate policy. In 2010 the Ministry of Power and the Bureau of Energy Efficiency released an implementation plan for this mission.

With five federal ministries and a number of smaller institutions and committees involved in the country's energy policy, it would be accurate to say that India's energy sector is rather fragmented. At the national level the Ministry of Power is arguably the most relevant government entity for MSMEs as it oversees the Central Electricity Authority (which is responsible for the electricity grid) and the Bureau of Energy Efficiency (which has been running an energy-efficiency upgrading programme for MSMEs since 2008). At the state and regional levels additional bodies and committees exist. There sheer number of relevant actors makes it difficult for MSMEs to grasp the whole energy sector landscape.

FINANCIAL SUPPORT SYSTEM

The long-standing political support for MSMEs has translated into general mechanisms such as priority sector lending norms for commercial banks. These norms have already been operating for decades. MSME owners/managers in India also have recourse to several other financial support mechanisms for energy efficiency investments. For instance, the Technology Innovation Fund – set up by the government in 2011 and managed by SIDBI – supports the development, demonstration, and scaling up of innovative technologies and has a special focus on MSMEs. In addition, there is the Scheme for Technology and Quality Upgrading Support – founded in 2010 and operated under the National Manufacturing Competitiveness Programme – which offers MSMEs grants for capacity building, awareness campaigns, and the purchase of efficient machinery. Moreover, several commercial banks (i.e. the State Bank of India, Canara Bank, and Union Bank of India) also offer SMEs energy efficiency loans. SIDBI is the only public bank that focuses explicitly on SMEs.

In addition to the KfW credit line, several other donor-funded financing schemes exist. JICA, for example, cooperates with SIDBI in an energy-saving project for MSMEs. The main differences between the KfW and JICA are that JICA (i) finances investments for new MSMEs and not only for established MSMEs, (ii) has less strict criteria for loan eligibility, and (iii) does not use carbon emissions to determine eligibility or to monitor outcomes (see Section 3). The World Bank has been supporting the ICICI Bank's financing of industrial, commercial, and SME projects for a decade. Although the ICICI Bank recently ended a lending scheme specifically focused on energy efficiency, it continues to finance energy efficiency projects if they meet the general lending criteria (USAID/MinPower 2013: 25 f.). The World Bank and the Bureau of Energy Efficiency collaborated in a project called 'Financing Energy Efficiency at MSMEs' (2010–2014), which included awareness-raising and knowledge-management components as well as activities aimed at increasing actual investments. Meanwhile, UNIDO and the Global Environment Facility (GEF) support twelve clusters of energy-intensive SMEs as part of their programme 'Promoting Energy Efficiency and Renewable Energy in Selected Micro, Small and Medium Enterprises (MSME) Clusters in India'. In the past, other financing schemes for energy efficiency have been carried out by the World Bank/IREDA, the Asian Development Bank, and USAID (for an overview see USAID/MinPower 2013).

It is clear that MSMEs in India generally have possibilities to access financing for energy efficiency activities. However, two issues need to be kept in mind here: first, given that India is a very big country and the MSME sector is very diverse, the overall number of projects and programmes that finance energy efficiency is not that high. Second, all programmes have so far struggled to be sustainable and have an impact beyond the end of the project timeline. Financing energy efficiency has therefore not reached the stage of being 'business as usual' in the Indian banking and MSME support system.

GENERAL BARRIERS TO INVESTMENTS

The MSME sector is characterised by a number of challenges that are internal to the enterprise (e.g. education levels of owners/managers) or that come from the external business environment (e.g. structure of the market). These challenges not only act as constraints to the growth and upgrading of Indian MSMEs (Hampel/Loewe/Reeg 2013; Reeg 2013), they also shape the decision-making environment for energy efficiency investments. The most commonly cited barriers in the literature are inadequate market linkages, insufficient access to infrastructure, inadequate finance, a lack of business and management skills (e.g. poor bookkeeping), and the use of obsolete technology (e.g. Hampel/Loewe/Reeg 2013; IFC 2012; Ghosh/Roy 2011). The last factor mentioned and the resulting significant energy costs many MSMEs face should drive technology upgrading and energy efficiency investments, particularly for energy-intensive MSMEs. Many MSMEs are organised in clusters so that enterprises using the same production methods work closely to each other in the same area. If one or several MSMEs start using energy efficient innovations, this cluster system should generally support the spread of best business practices and knowledge about energy efficiency.

Since the MSME sector in India is composed of a very high number of non-registered businesses, access to formal financing options (e.g. bank loans and credit) often entails additional bureaucratic hurdles and raises fears of formalisation. Reeg (2013) found that the required collateral, the necessary documentation, and the formal registration of the firm as small-scale industry or an MSME are the major reasons why entrepreneurs do not want or do not get any external funding from banks. A lack of information about the financing options available, about the most efficient technology, and about where to get such technology are also widespread problems. Other barriers that have been identified, particularly regarding energy efficiency investments, include a lack of technical knowledge, extensive payback periods, high costs of energy efficient products, and high project and transaction costs (USAID/MinPower 2013; Ghosh/Roy 2011; Dasgupta 1999).

Generally, a lack of data on energy consumption, carbon emissions, and the savings of efficient technologies (benchmarks) make calculating the potential and achievements of energy efficiency investments difficult for MSMEs. And although the Indian government has begun to expand its work on standards and benchmarks, too little has been implemented so far to address these shortcomings.

The KfW approach to financing energy efficiency investments in India

In 2008 the KfW Development Bank appraised a loan to SIDBI to establish a credit line for MSMEs looking to invest in energy efficiency. The credit line became operational in 2010. The broader goals of the programme 'Financing for Energy Efficiency Investments of MSME in India' are to increase Indian MSMEs' contribution to ecologically sustainable growth and climate mitigation and to broaden the range of financing products offered by SIDBI

The initiative primarily targets SME decision-makers, usually the owners or managers. The programme has a financial and a technical component: (i) a financial credit of €50 million with an interest subsidy of €8 million from the German Federal Ministry for Economic Cooperation and Development and (ii) a technical assistance grant of €500,000. The main purpose of this credit is to finance the replacement of inefficient, obsolete technology, though new energy efficiency projects – so-called green field investments – are also eligible under very specific circumstances. All financed investments are expected to result in significant reductions of greenhouse gas emissions: KfW expects carbon emission reductions of at least three tonnes of carbon per year for each INR 100,000 (€1,220) borrowed. The programme is scheduled to run till December 2015, with a possible extension to 2018.

The technical assistance module consists of eight elements:

- Joint development of financial products for energy efficiency
- Integration of the new processes into SIDBI management procedures
- Training of SIDBI staff on the new KfW line of credit
- Supporting information and marketing events
- Financial support to SMEs taking out loans that wish to have an energy audit
- Technical support to SMEs applying for a loan
- Development and implementation of a monitoring tool for the line of credit within SIDBI
- Support to banks taking out credit with SIDBI

The consultancy firm adelphi has been charged with supporting SIDBI in implementing these modules and is being assisted by SIDBI technical consultants and local energy auditors. Adelphi has provided SIDBI with a list of eligible energy efficiency measures, which consists primarily of specific technologies and machinery in different sectors and indicative suppliers. Moreover, a software-based assessment and monitoring tool has been developed to support SIDBI staff carry out their assessments of MSMEs. Since the KfW programme is ongoing, no final KfW evaluation has been completed yet – though adelphi provides KfW with regular reports. At the beginning of the programme, adelphi consultants conducted an assessment of needs and challenges based on visits to SIDBI's offices. They then visited several of SIDBI's regional and branch offices again in 2013. They found that SMEs struggled to provide the required data on energy consumption and that SIDBI staff found the comprehensive assessment and monitoring procedures too complex (see Section 4 in more detail). As a result of the insights gained, KfW decided to simplify the application and monitoring procedures for both SIDBI staff and MSMEs. Despite the challenges faced by both SIDBI and SME owners/ managers (e.g. lack of awareness, lack of data, time constraints, and a fear of making mistakes), the KfW line of credit has already led to some substantial investments in energy efficiency. Up to now, however, the credit opportunities have not been used to the fullest extent. An analysis of existing behavioural drivers and barriers may shed some light on the reasons for this.

Behavioural drivers and barriers investments

The behavioural drivers and barriers that currently impact the use of the KfW credit line for energy efficiency investments in India need to be divided into those that concern SIDBI staff and those that affect MSME owners'/managers' decision-making.

This report identifies ambiguity aversion, framing, and a lack of commitment and positive incentives as the main behavioural factors currently impeding SIDBI staff members use of the KfW line of credit. Possible interventions along these lines would, however, require more in-depth research. Concerning SMEs, the main behavioural barriers influencing decision-making on energy efficiency investments are short-term thinking, flawed calculations of investment payback periods, inefficient habits, and a preference for the status quo; drivers are social comparisons, peer effects, and hands-on experience with energy efficient technology.

AMONGST THE STAFF OF THE SMALL INDUSTRIES BANK OF INDIA

In line with other public sector firms in India, SIDBI operates with a strong hierarchical and bureaucratic structure. Traditionally, business management reflected social and cultural values of respect for paternalistic and hierarchic authority, which resulted in asymmetric, distant relations of power as well as a lack of information sharing and/or joint decision-making with employees (Amba-Rao et al. 2000). This began to change following the period of economic liberalisation in the 1990s, which saw global management practices enter Indian businesses. Performance appraisal practices, for example, are now more widespread, particularly in multinational and large Indian firms. Within the public sector, however, the bureaucratic and multilayered structure of businesses discourages the effective use of performance appraisals to some extent (Amba-Rao et al. 2000). Additionally, promotion in India is still typically based on seniority rather than merit or innovative capacity. SIDBI staff receive targets and quotas for the amount of loans and credits they have to give out, but the bank is also still very much embedded in traditional Indian business culture.In their day-to-day work, SIDBI staff based at branch offices therefore face a basic incentive structure that does not always favour new or seemingly more complex lines of credit.

Ambiguity Aversion

Ambiguity aversion means that an individual avoids choices that entail too many unknown factors. A lot of bank staff perceive the KfW line of credit to be more complicated than the JICA line of credit due to the greater amount of time and effort needed to fulfil the assessment and monitoring requirements. Even though a checklist and an assessment and monitoring tool make dealing with these requirements much easier, bank staff prefer the JICA line of credit. This is perfectly rational behaviour given that bank staff strive to fulfil their targets and quotas in the quickest and easiest way possible. However, it could be that ambiguity aversion plays an additional role here. Ambiguity aversion describes the phenomenon whereby people avoid choices and situations that are not clear to them or where possible consequences and outcomes are unknown (Fox/Tversky 1995; Ellsberg 1961). In the case of the choice between offering a client JICA or KfW credit, bank staff often preferred to offer the JICA line of credit because they were more familiar with it and its procedures because it had been in existence longer– in that respect, outcomes were already known. Psychologically, the avoidance of ambiguity derives from an individual's expectation that his or her choice will be evaluated by others (Curley et al. 1986). Unlike in a situation of risk aversion, where the probabilities of each possible outcome of a choice can be assigned, in a situation of ambiguity aversion the probabilities of different outcomes are unknown.

Framing

The framing of information can have a strong influence on decision-making. Too much information (choice overload) or outdated and unclear information can prevent an individual from taking a decision. In this respect, the salience of information is important (Wilson/Dowlatabadi 2007; Iyengar/Lepper 2000). Apart from during the initial training provided at the

beginning of the KfW programme, SIDBI employees have usually received information on new lines of credit and how to administer them only via email newsletters. Although specific data about the framing and reception of this information was unfortunately not available, it is likely that the KfW programme came across as 'just another line of credit'. Since SIDBI staff generally still have a low awareness of and familiarity with energy efficiency, it may be helpful to frame information in a manner that is concise and instigates curiosity rather than ambiguity aversion. Given the high turnover of staff within SIDBI and the resulting loss of knowledge about the KfW line of credit, the framing of updates and information becomes even more important.

Another issue is that SIDBI clients do not know whether they have received JICA or KfW credit. Often, they are not even aware that they have received a specific energy efficiency credit and assume it is a general technological-upgrading or modernisation credit (see below). This lack of framing and communication on the part of SIDBI impedes any positive association the MSMEs may develop between energy efficiency and the receipt of the credit.

Lack of commitment and positive incentives

Within SIDBI the attitude to energy efficiency lines of credit and green financing more generally varies between upper management, the regional offices, and branch office staff. Although no systematic data is available on commitment levels amongst different bank offices or different levels of staff, adelphi consultants found a mismatch between SIDBI's general move towards offering green products and the actual extent of knowledge and interest on the regional and branch levels. Those branch officers who have understood what energy efficiency credits could mean for their customers show a higher interest in the JICA and KfW lines of credit than mid-level staff. There are no specific or positive incentives for SIDBI employees to advise clients to invest in energy efficiency or to take out a KfW investment loan. Non-financial rewards and the positive recognition of employees' achievements have traditionally been absent from Indian management practices, though an increasing number of large firms such as Wipro, NTPC, and Mahindra Intertrade successfully use these management tools (Limaye at al. 2012; Björkman/Budhwar 2007). Even though SIDBI, as a public bank, works according to different structures, positive incentives and recognition could improve its engagement with the KfW credit line and the topic of energy efficiency more generally. Such incentives, however, would need to be carefully adapted to SIDBI's institutional culture.

Psychologically, the instigation of commitment and the voicing of implementation intentions create strong mental links between a situation and a behavioural response, which helps people to stick to their goals (Holland et al. 2006; Gollwitzer 1999). It is easier to convince an individual to take a next step towards changing his or her behaviour if he or she already committed to something small and easily achieved – taking home a one-page leaflet about energy efficiency credit options, for instance. Specifying where, when, and how goals will be pursued and then publicly voicing or writing such information down increases the likelihood of attaining these goals while also helping to break energy inefficient habits – for example, starting to recycle used materials at the workplace (Holland et al. 2006).

AMONGST THE MSMES

Despite various awareness-raising campaigns, MSMEs in India still have low levels of awareness regarding energy efficiency.[8] Many businesses invest in modernisation and technological upgrading but not specifically in energy efficiency. MSME owners and managers often have other priorities (e.g. securing access to raw materials), even if they know that energy costs make up a significant share of their business expenses. From a behavioural perspective, several reasons explain this reluctance to invest in energy efficiency.

Short-term thinking

Short-term thinking describes an individual's propensity to focus on the present and to not care enough about his or her future self (Laibson 1997). It can result in procrastination or the inability to commit to long-term goals such as saving. Short-term thinking becomes more likely when some of the costs or benefits of a decision lie in the near future, whereas long-term planning is easier if all costs and benefits are in the medium term or far future (Camerer/Loewenstein 2004). The focus on immediate profits and the attitude that a minimal level of profitability is sufficient are evidence of short-term thinking amongst Indian MSMEs. Ghosh and Roy (2011) argue that this myopic vision prevents MSMEs from recognising the long-term competitive advantages that the adoption of energy efficient

8 According to interviewed KfW and adelphi staff. Awareness levels and pressure to invest in energy efficiency are likely to vary between business sectors. No representative data is available that systematically analyses differences and similarities across India.

technologies would bring. The inability to plan ahead till the end of the year or even month is a symptom of both short-term thinking and a lack of business skills. Even though Indian companies are often lauded for their entrepreneurial spirit, MSMEs in India often lack the competence to maintain an accurate bookkeeping system or develop an effective business plan (e.g. IFC 2012). It is possible that liquidity constraints are fortified by a perceived lack of finances, which actually derives from insufficient management skills.

Flawed payback period calculations

Calculating investment payback periods is standard business practice. However, given the lack of data on energy consumption, benchmarks, and technology savings, accurately calculating payback periods of energy efficient technology investments may be difficult in practice. Whereas energy auditors and SIDBI staff generally know how to correctly work out amortisation due to their training, MSME owners/managers may overestimate or underestimate discount rates. Moreover, due to MSME owners'/managers' short-term thinking and risk aversion, their perception of an acceptable payback period may be much shorter than the actual payback period of a larger investment or what a bank could offer. Previous KfW projects in India have shown that most SMEs find a payback period of up to three years acceptable, while the KfW credits actually run for five to seven years. Some micro and small enterprises in India even require a maximum payback period of six months to ensure they stay in business, which constrains the range of efficient technology they could invest in.

In line with behavioural economics theory, a behavioural barrier would only be present here if the MSME owner were to estimate irrationally high discount rates and still refrain from investing despite it actually being rational to do so. Here, a more in-depth analysis would be necessary to disentangle the roles of discount rates and acceptable lengths of payback periods. In any case, it could be useful to support MSME owners with these calculations – for instance, through a service provided by an energy auditor or consultant (see Section 5).

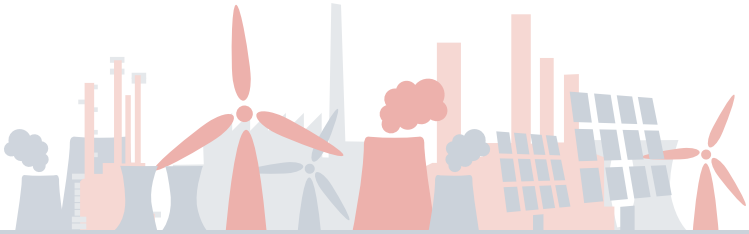
Habits and status quo bias

A habit is an action that is repeated automatically in the same situation or context. Many MSME owners/managers in India use habitual practices in the running of their businesses (e.g. how they maintain machinery or how they prioritise investments), reflecting a 'business as usual' way of thinking. A lack of energy management practices may exist here. The purchase of equipment from the same vendor or taking out a loan from the same bank can also be habits which reflect trust in a specific individual or institution. Changing habits may require several measures at the same time. For instance, information and educational measures that aim at changing an individual's intention to do something may work well for weaker habits (e.g. explaining the costs and benefits of energy saving on the radio). Stronger habits, however, in addition to information and education, may require measures that modify their triggering environment (Verplanken/Wood 2006).

Habits often exist in parallel to a certain resistance to change. Behavioural scientists call this status quo bias, which describes a cognitive preference for the current situation (Samuelson/Zeckhauser 1988). Any change from the current state of affairs is perceived as a loss. People tend to prefer the status quo particularly if they are uncertain or unconvinced of the benefits of changing. In a study analysing the reasons for MSME's adoption and non-adoption of energy efficiency, Ghosh and Roy (2011) found that one group of SMEs surveyed shied away from the high initial costs of investing because they perceived energy efficiency investments to be more costly than other investments, whereas another group refused to invest because they thought energy efficiency was unprofitable, did not want to change their products, and were generally reluctant to change. Amongst those MSME owners/managers who are highly risk averse, status quo bias may be even stronger.

Social comparisons and peer effects

Since many MSMEs are organised in clusters, comparing one's own business to that of a neighbour or competitor is a natural thing to do – especially if the neighbour's business is faring better. According to adelphi, Indian MSME owners react quite strongly to pilot projects and demonstration plants in their areas as well as to what they see their neighbours doing. Provding MSME owners with specific feedback on how much energy their business consumes and



saves compared to a similar business or the whole cluster would also indicate whether their current energy management practices are effective or not. Such comparison-based feedback on electricity use has been shown to reduce electricity consumption, albeit by a rather small percentage (0.3–6.3 per cent reduction in the electricity bill) (Allcott 2011). In the Netherlands, the combination of feedback with tailored information – thus avoiding choice and information overload – and goal setting has proven useful given that households react differently to different incentives (Abrahamse et al. 2007).

Peer effects can be conducive to SME owners' decisions to invest in energy efficiency and apply for a loan or credit. For example, people tend to imitate that which others have already done successfully. Peer learning – on an individual level and on a collective level (e.g. in a cluster or group) – generally works well with Indian MSME owners and is therefore important to enterprise growth and upgrading (Reeg 2013). Inter-firm networks support the development of best practices and the exchange of tacit knowledge – although the latter is constrained by competition between enterprises. Utilising and placing greater emphasis on this behavioural driver would therefore be useful to technical assistance modules that accompany financial support mechanisms (see Section 5).

Hands-on experience

Indian MSME owners and employees tend to better understand what energy efficient technology is and how it saves both energy and money if they directly experience it themselves or actually see it at work in a business similar to theirs (e.g. a neighbouring business in a cluster). Given that showing pictures and examples of energy efficient technologies at the information and marketing events organised by SIDBI and adelphi did not lead to any investment loan applications, providing even more first-hand experience with equipment and best practices may be a better approach. After all, uncertainty has been shown to decrease and trust has been found to increase through such direct experiences, which indicates that learning has switched from passive to active learning (Hamilton/Thompson 2007; Hoch/Deighton 1989). On a cognitive level, the human brain processes 'real' and close objects in a more concrete way than 'distant' information obtained through pictures (Trope/Liberman 2010). Additionally, more first-hand experience can counter the existing misconceptions of what energy saving and energy efficiency are.

Policy recommendations and conclusion

The integration of behavioural insights into financial support programmes is not the silver bullet for all the implementation challenges these interventions face.

Behavioural insights can neither change the financial structure or banks' standard interest rates in a country nor change energy and technology prices. They can, however, optimise technical assistance modules; improve awareness-raising and marketing campaigns; support interaction between banks, energy consultants, and clients; and influence the decision-making processes of loan applicants. Perhaps most importantly, behavioural insights shed fresh light on known long-standing challenges. The preceding analysis of behavioural drivers and barriers leads to five sets of recommendations for the KfW 'Financing of Energy Efficiency' line of credit in India.

A. CONCISE, SALIENT INFORMATION AND COMMUNICATION

The transmission of information and communication both within SIDBI and to MSME owners needs to be concise and salient. Long brochures and manuals or complicated tools work less effectively than direct oral communication that allows for questions or posters that visually explain procedures. Therefore, revising the assessment and monitoring procedure was a necessary step. It is also advisable for technical consultants to continue visits and maintain phone contact with branch offices until a deeper understanding of the line of credit and the use of energy efficiency to MSMEs has

been reached. SIDBI could benefit from appointing an energy efficiency or 'green' knowledge manager in each branch office to answer staff questions and contact the technical consultants directly. In their communication with MSME owners, both energy auditors/consultants and bank staff could stress how much money MSMEs are losing by not investing in energy efficiency rather than how much they would save in the long run (after paying back the loan). Additionally, it may be useful to support MSME owners in the calculation of payback periods.

B. FOSTERING COMMITMENT

Reducing SIDBI employees' fear and establishing positive incentives that instigate commitment to energy efficiency financing lines are important. This will increase the quality of advice to clients and support the long-term establishment of a green portfolio within SIDBI. While adelphi suggests rewarding SIDBI staff with study tours, comparative performance appraisals that incorporate both recognition and a social element may work just as effectively. Since SIDBI is a hierarchically organised bank that values the principle of seniority, these would have to be introduced carefully. Such appraisals might include a 'green employee of the month' award. A social event under the theme of energy efficiency presents another option. This may produce a 'warm glow' amongst employees that psychologically derives from contributing to a public good or helping others. Fostering commitment through small, voluntary contributions that raise awareness and help employees identify with the green portfolio could also prove valuable – for instance, asking employees to put up an 'energy saver' poster in their office. Together with simplified guidelines on how to assess and manage the KfW line of credit, a greater commitment to SIDBI's green portfolio will be likely to result. These mechanisms that set positive incentives may seem irrelevant in the overall scheme of things, but they are likely to reduce fear and aversion to seemingly complicated energy efficiency lines of credit. If bank employees do not have a positive attitude towards energy efficiency in general and the KfW line of credit in particular, they will not support their clients' applications.

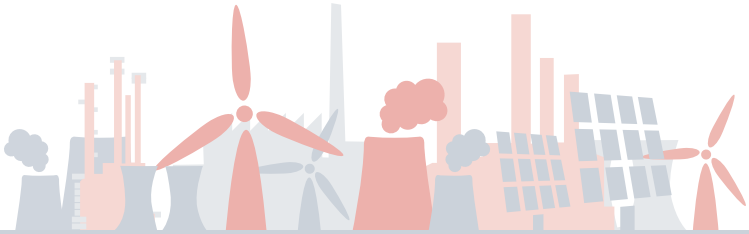
C. MAKE IT EASY: DIRECT CONTACT WITH CLIENTS AND 'HANDS-ON' EXPERIENCE

To receive information on the possibilities for technology upgrading and energy efficiency loans, MSME owners currently have to physically visit a SIDBI branch. Sending SIDBI staff or the growing number of energy auditors and energy consultants in India directly to MSMEs could make things much easier for potential clients. Energy advisors could engage in some of the marketing activities, help to reduce uncertainty on the part of MSME owners/managers, and assist with the loan application procedure. The reduction of bureaucratic hurdles and data requirements to the maximum extent possible is likely to increase the chances that the owners of MSMEs operating in the informal sector will decide to apply for energy efficiency loans. To counter potential mistrust, SIDBI branch officers who have good relationships with their MSME clients could recommend trusted energy auditors or consultants to visit and advise the MSMEs.

Generally, facilitating more first-hand experience with energy efficiency practices and technology and greater knowledge of how energy efficiency affects a business's energy costs and productivity could prove very helpful. This could be achieved by setting up more demonstration plants in clusters or by letting trusted energy auditors go into neighbourhoods to show examples of energy efficient technology to MSME owners. Another approach to help foster hands-on experience would be to let MSME owners/managers try out energy efficient equipment during training workshops and/or in their own businesses for a few days. For the latter, a partnership with energy efficient technology producers could be an option.

D. MAKE IT SOCIAL: FEEDBACK, BENCHMARKING, AND PEER LEARNING

To raise awareness and support MSME decision-making, the establishment of feedback and benchmarking systems that show MSME owners how their businesses fare compared to others could be a powerful tool. These social comparisons could be combined with simple tips on how to optimise energy saving practices (e.g. a note on the electricity bill to contact an energy auditor for specific advice, contact SIDBI for



a loan, or buy energy efficient equipment). Although comparative feedback on electricity bills and the communication of best practices (concerning both specific technologies and energy management practices) may not always lead to instant investments in energy efficiency, these measures will capture the attention of the person paying the bill. While implementing feedback or benchmarking systems is not something that KfW can carry out on its own, the establishment of cooperation relations with energy consultants, local business associations, and utility companies could at least be initiated in the realm of the KfW–SIDBI partnership. For future training workshops that are part of technical assistance modules, more social elements that target peer learning and make use of existing social relationships between businesses are likely to enhance participation and collective learning.

E. LONG-TERM IMPACT AND CHANGING HABITS

Changing habits of MSME owners and achieving sustainable energy efficiency programmes is not an easy task. To help overcome short-term thinking and make use of implementation intentions, medium-term reminder campaigns (e.g. repeated text messages, radio adverts, and regular meetings with SIDBI staff or energy consultants) can play an important role. Moreover, the establishment of more comprehensive energy management systems and the explanations of the benefits thereof could be supported long term by SIDBI, particularly with regard to firmly established SMEs, which are likely to be more capable of maintaining these systems. To achieve long-term change, a comprehensive set of mechanisms and training courses are necessary. These would need to focus on energy management as well as underlying challenges such as inadequate business management skills, the scarcity of information on energy efficient technology, and the lack of technology available at an affordable price. This goes beyond the scope of a financing programme.

It is possible that some MSME owners do not take out energy efficiency loans because they perceive the interest rates to be too high or the modes of repayment to be too strict. While more research is needed to confirm this, a general option for micro and small enterprises could be to offer delayed repayment schedules that do not start until two to three months after the loan has been issued. This would provide owners with immediate benefits and the time to build more working capital.

Since there is a dearth of research on energy efficiency and very few behavioural insights into developing countries, there is no guarantee that the implementation of these recommendations will lead to immediate substantial improvements. Therefore, it is essential to carefully design and carry out a test of measure by comparing 'treated' groups and control groups.

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Notes


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