

Chapter 8: Energy Efficiency in Non-Domestic Buildings and Processes

Summary

- There is a very large range of non-domestic buildings, from offices, retail and hospitality businesses to energy intensive industrial plant. The proportion of energy use covered by the building regulations compared to 'process' energy and energy used for equipment varies significantly. For some businesses, much greater energy saving potential lies in improving the efficiency of equipment and plant than their buildings. This variety means it is more difficult to calculate the opportunities for energy saving in this sector than in the domestic sector.
- Increasing energy costs are a significant business risk and affect both the direct energy costs for business and the cost of materials bought in. However, energy consumption is not on all management agendas.
- The Carbon Trust provides technical energy efficiency advice to larger and energy intensive businesses. It will undertake around 150 site surveys in 2009/10 for business sector clients, saving in the region of 100,000 lifetime tonnes of CO₂ and 20-25,000 tCO₂ annually.
- Many short payback energy efficiency opportunities have already been implemented by Scottish industry, but a range of highly cost-effective measures remain.
- The UK and international regulatory environment increasingly requires business to reduce its energy consumption and hence CO₂ emissions. The amount of regulation will increase as targets for CO₂ emissions reductions become more challenging. New policies will be accompanied by the need for business to measure and report on energy consumption and to put in place plans for energy reduction.
- The Scottish Government has issued draft planning guidance in relation to thermal power stations. This includes how applicants should consider the issue of waste heat usage.

Overview

8.1 The non-domestic sector uses energy in buildings and processes (covered here) and in transport (see Chapter 11). The scope of non-domestic buildings is very large, ranging from offices, retail and hospitality businesses to energy intensive industrial processes. Energy used as a result of the way buildings are built is regulated by the building standards. Energy used as a result of the processes that occur in those buildings is either subject to industry-specific regulation or is not regulated at all. To take the example of a supermarket, the energy used for heating, ventilation, hot water, lighting and auxiliary energy for pumps and fans is covered by building standards, but that required for refrigeration units, ovens, lighting, and electrical items such as tills is not currently regulated.

8.2 The proportion of energy use covered by the building regulations compared to process energy and energy used for equipment varies significantly. The proportion of energy consumption that cannot be influenced by building work (and hence dealt with through building standards) can be considerable. Indeed, for some businesses, much greater energy saving potential lies in improving the efficiency of equipment and plant than of the building. This variety means that it is more difficult to calculate what the opportunities for energy saving might be in this sector than in the domestic sector.

8.3 Estimates of energy use by the non-domestic sector (including the public sector) in Scotland range.¹²⁷ The lowest estimate is a total of 36% (15% by the service sector, 21% industry). The highest estimate is 46%.¹²⁸ The data available for energy use in non-domestic buildings (both the performance of buildings and the processes within them) is limited. As outlined in Chapter 4, the Scottish Government will work towards obtaining more detailed and accurate disaggregated data on Scottish energy consumption. In addition, Building Standards Division is undertaking a study to compile better data on non-domestic building stock (see paragraph 8.14).

8.4 Chapter 2 has already shown a number of significant trends in the non-domestic sector, for example the continued decline in growth in gross domestic product (GDP) in the manufacturing sector since 2000, and the high growth experienced in the services sector over the same period. This reflects energy consumption in the industrial sector across the whole of the UK, which observed a fall in energy consumption of over 50% between 1970 and 2008.

8.5 In Scotland, there is a small number of larger energy users. There are approximately 10,000 registered manufacturing companies in Scotland, and approximately 200 of these are classed as large enterprises, i.e. with over 250 employees. The main sectors are food (particularly distilling, malting, dairies and renderers), chemicals, engineering, and paper.

8.6 In addition, plastics and rubber, textiles and tanneries, primary aluminium, glass and ceramics, and mineral processing (including cement manufacture) are significant consumers of energy. Box 8.1 gives detail on specific sectors.¹²⁹

Box 8.1 Examples of opportunities in Scotland

The textile industry

The textile sector in Scotland has radically altered, with the number of companies and employees dramatically decreasing in line with overall UK manufacturing and a progression towards a more flexible, innovative and market driven industry. It remains an important contributor to Scotland's economy, with annual turnover of £967m and over 655 companies directly employing 10,200 people. It has been a regular contributor to government initiatives and consultations on energy and waste management, and has often piloted initiatives prior to national roll-outs. For example:

- In 2004, the industry was involved in a series of consultation discussions with SEPA prior to the introduction of the Water Framework Directive. This allowed industry to adopt new practices and led to a wider programme of regional Waste Mapping projects which had a significant impact on efficiencies within the sector.
- In 1998, the textile sector in Ayrshire collaborated to examine utilities usage. This led to the early cooperative procurement of utilities including power. The local initiative was then adopted by other regions and significant savings and significant reduction opportunities identified and bottom line savings made.
- At an operational level, leading textiles companies in the Borders, including Lochcarron of Scotland, have undertaken a series of business efficiency initiatives that specifically targeted issues relating to energy usage and waste management. The South of Scotland Business Efficiency Initiative (SSBEI) delivers environmental reviews covering waste, energy, resource management, and production processes. It identified potential savings to businesses of £380,000 a year if all recommendations were adopted. It also offered grants of up to 30% to a maximum of £10,000 for the acquisition of improved insulation, water recycling equipment, waste management equipment and software that manages equipment in a more efficient manner. Finally, it offered grant support to companies that wanted to analyse their business professionally and identify what would be required to develop a formal management system for waste and energy efficiency.

Paper production in Scotland

Between 2001 and 2008, 12 out of 16 paper mills closed in Scotland, partly driven by the high costs of energy and raw materials.¹³⁰ Of the four remaining mills, UPM Kymene and Tullis Russell are developing biomass CHP schemes to provide the heat and electricity needed from low carbon sources.¹³¹

¹²⁷ Unless referring to a specific non-domestic sub-sector, such as industry, this chapter includes reference to public sector buildings. The public sector is also covered in more detail in Chapter 9. For discussion of CHP see Chapter 10.

¹²⁸ See Chapter 2, paragraphs 2.7-2.10 for detail on different data sources.

¹²⁹ Case studies taken from Scottish Government, 'Scottish Energy Study, Volume 4: Issues, Opportunities and Barriers', October 2009, and information provided by Scottish Enterprise.

Engineering

With a number of medium-scale energy users, the engineering sector includes many sites that will be subject to the Carbon Reduction Commitment. The CRC will provide incentives for organisations to save money through energy efficiency. A range of process change opportunities can help engineering companies save energy costs. These include using pre-coated metal to eliminate the finishing process, and progressive and semi-solids forming, which will reduce energy use by at least 5%. In the longer term, when the carbon intensity of electricity is sufficiently low, electric heating for processes may offer a lower carbon alternative to fossil fuels

Chemical Industry

There are approximately 150 chemical companies in Scotland, accounting for 13% of the Scottish manufacturing sector. Scotland contributes more to the UK chemicals industry than its population ratio, and the sector is its second top export earner, responsible for £2.2bn of manufacturing exports.

Energy costs are a key factor for the sector's future competitiveness, and improving energy efficiency is a key objective of its strategy. There are many opportunities that could result in savings, including improved process control; process intensification (matching how the process is carried out to the requirements of the chemistry); fouling reduction (improving heat transfer, and process integration); making best use of heat; improvements to distillation and separation; new catalysts; and the sharing of heat or high pressure steam with other co-located industry users and/or with neighbouring domestic housing via a district heating scheme.

Food and Drink

Food and Drink is the largest manufacturing sector in Scotland and accounts for 18% of all Scottish exports. There are 1200 companies in the processing sector alone. They employ 46,000 people, contribute £3bn GVA, and generate £7.4bn in turnover. Taking the wider supply chain of agriculture and fishing into account, the sector employs 122,000 people across rural and urban Scotland. There is potential to develop low-carbon products, and further pressure is expected on the supply chain with respect to carbon footprinting.

Following successful trials, a number of Robert Wiseman vehicles now run on liquid natural gas (LNG). Initial results show that articulated vehicles running on a combination of LNG and diesel should reduce annual carbon emissions by around 11,500kgs per vehicle. Robert Wiseman Dairies is also the first dairy company in Britain to have all its facilities – including all dairies, distribution depots, vehicle maintenance garages and its head office – certified to the ISO 14001 standard. The company is continually striving to reduce its energy usage and this year used 2.32% less electricity to produce every litre of milk than last year.¹³²

Macswen, an Edinburgh haggis producer, is also committed to reducing its environmental impact. Among other initiatives, it has recovered heat for use in the offices, used timers on ventilation systems, and added proximity sensors to all lighting etc.¹³³

The Scotch Whisky Association has published its 'Environmental Strategy for the Whisky Industry in Scotland'. One of its commitments is 'to mitigate our greenhouse gas emissions to the atmosphere, and to increase our energy efficiency in the production process, through innovation and adoption of relevant technologies'.¹³⁴

Key Drivers determining direction of energy consumption**Increasing energy costs**

8.7 Increasing energy costs are a significant business risk and affect both the direct energy costs for business and the cost of materials bought in. Figure 8.1 shows how prices across (all) fuels, and in particular electricity, have climbed since 2004. For many companies, high energy costs alone can be a competitive disadvantage in today's high energy price environment, and improving energy efficiency can cut costs and thereby enhance profitability. However, whilst saving energy thus helps increase competitiveness, if the overall cost base of an operation in Scotland is higher than, for example, in China or Vietnam, a company's focus will not necessarily be on energy consumption, but on broader issues of industrial survival.

¹³⁰ http://news.paperindex.com/NewProjects_MillClosures/Scotlands_135_Year_Old_Curtis_Fine_Paper_Mill_Collapses_Lays_Off_180_Employees/.

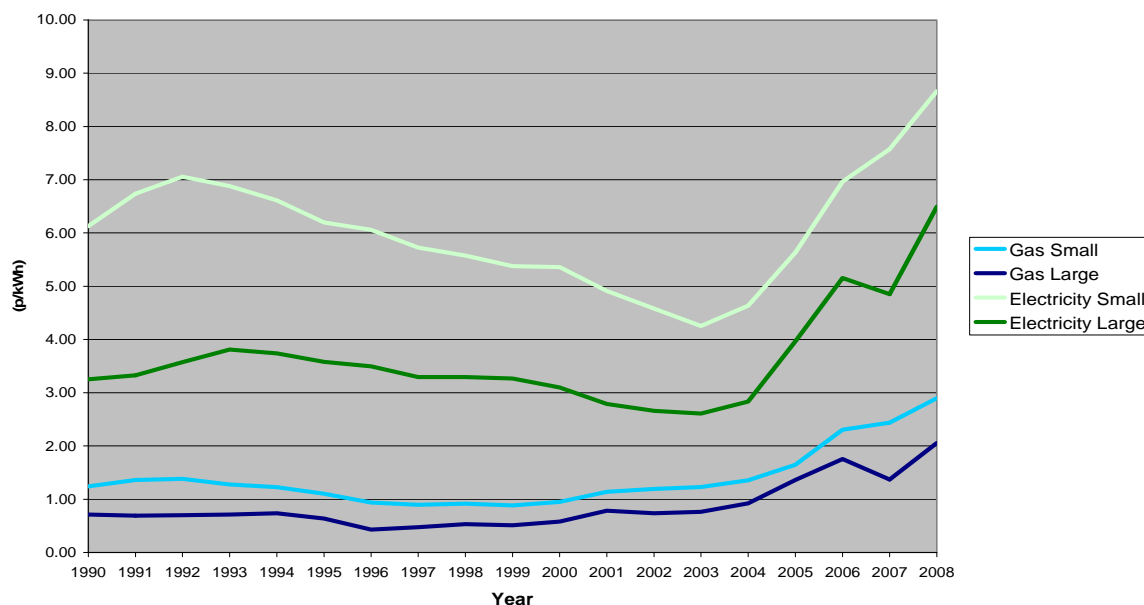
¹³¹ See www.newenergyfocus.com/do/ecco.py/view_item?listid=1&listcatid=32&listitemid=231.

¹³² See www.wiseman-dairies.co.uk/our-company/wiseman-and-the-environment/.

¹³³ See www.macswen.co.uk/templates/macswen/images/pages/about_us/macswen_environmental-report.pdf.

¹³⁴ See www.scotch-whisky.org.uk/swa/files/EnvironmentalStrategy09.pdf for other commitments relating to energy and transport. Case studies on energy efficiency in the Whisky Industry can be found at www.scotch-whisky.org.uk/swa/files/CSGasEmissions.pdf.

Figure 8.1 UK Prices Of Fuels Purchased By Industrial Consumers (Excluding Tax)



8.8 Energy consumption is not on all management agendas as the focus for managers is frequently cost, not consumption. Nevertheless, anecdotal evidence suggests that over 35% of companies that Scottish Enterprise is working with on this agenda state energy as their main sustainability issue. Technology solutions are viewed similarly to any other business investment, so the same rate of investment rules apply. However, this does not necessarily take into account future energy price rises, and so the full benefits of energy investment are not appreciated in company decision making.

Energy not a top priority

8.9 As indicated above, in many small and medium sized companies, the top priorities may not be decreasing energy consumption but turnover, production, profit levels or just staying in business. In general, energy use is not on the board agenda and does not necessarily get the attention it deserves. Too often the person responsible for energy management has numerous other responsibilities, many of which are more pressing. Previous research by the Carbon Trust and KPMG suggests that climate change, while increasing in importance, is a lower priority for businesses than a number of other issues, with one survey ranking it 9th out of 9 business issues.¹³⁵ In addition, energy as a share of the total costs of doing business tends to be much less than other costs, such as infrastructure or labour. However, it is possible that rising energy prices will change this.

Cost effective measures may have already been implemented

8.10 Prioritisation notwithstanding, many Scottish businesses have already reduced their energy use. Some of them have drawn on support and advice through the Carbon Trust and the Energy Saving Scotland business advice service provided by the Scottish Government (see paragraphs 8.27-8.33 below). Some businesses are increasingly aware of their own environmental reputation in response to rising public pressure, and many consumer-facing businesses are making the decisions and investments necessary to reduce their energy consumption. However, this tends to be less true for many industrial businesses, particularly if energy does not represent a large part of their cost base.

¹³⁵ KPMG LLP (UK)/ You Gov, 'Climate Change Business Leaders Survey: Summary of Results', April 2007, p. 3 (www.kpmg.com.au/Portals/0/climate%20change%20business%20leaders%20survey.pdf).

8.11 Many of the short-term payback energy efficiency opportunities may have already been implemented by Scottish industry. Nevertheless, while we do not have disaggregated cost abatement curves for Scotland, previous UK analysis would tend to suggest that a range of highly cost-effective measures remain.¹³⁶ One of the main barriers to implementing these is overcoming business capability and capacity constraints, for example, by providing support for skills development sector or site-specific advice. This suggests that there still may be a large cost-effective improvement opportunity that can be addressed with the right policy framework and on-the-ground support.

Economic downturn

8.12 In addition, we now have the added impetus of economic downturn. On the one hand, this means that many companies do not feel they have the spare cash to invest at the moment. On the other, one could argue that this is precisely the time to invest, i.e. when companies are already restructuring or when there is time to retain staff and reorganise systems so that businesses are in a better situation to seize the opportunities when they reappear.

Action by Scottish Government

8.13 The Scottish Government wants to encourage all businesses to take steps to reduce their use of energy in order to help reduce their costs and greenhouse gas emissions, increase competitiveness, and contribute to Scotland's sustainable economic growth. Some of the opportunities to make these changes are discussed along with broader opportunities for business in Chapter 12 (paragraphs 12.8-12.22). The following actions by Scottish Government have been split into those that deal with buildings only and those that deal with both buildings and process energy.

Buildings

Closing the gaps in knowledge of non-domestic stock

8.14 As with the majority of the UK, Scotland currently lacks structured data on the energy performance of the non-domestic building stock. The Scottish Government's Building Standards Division is undertaking a study to build a model of this stock. Existing datasets will be analysed first, then research will be proposed to fill remaining gaps in our overall picture. This should facilitate the targeting of measures by government, agencies and the private sector to improve the energy efficiency of the stock.

Building standards

8.15 The Sullivan Report, 'A Low Carbon Building Standards Strategy for Scotland', sets out recommendations for staged improvements towards zero carbon new buildings.¹³⁷ On 30 June 2009, the Scottish Government published a consultation on proposed changes to the energy standards in the building regulations that would come into effect in October 2010.¹³⁸ These include a 30% reduction in CO₂ emissions compared with current 2007 standards for new non-domestic buildings. The current energy standards and associated

¹³⁶ See Scottish Government, 'Energy Study, Volume 4: Issues, Opportunities and Barriers'.

¹³⁷ Scottish Building Standards Agency, The Sullivan Report, 'A Low Carbon Building Standards Strategy for Scotland', 2007 (www.sbsa.gov.uk/pdfs/Low_Carbon_Building_Standards_Strategy_For_Scotland.pdf).

¹³⁸ Scottish Building Standards, 'Proposed Amendment to the Building (Scotland) Regulations 2004 - A review of standards and guidance in the Technical Handbooks on Section 6', 30 June 2009 (www.sbsa.gov.uk/latestupdates/consul_energy09.htm). Dissemination events for the construction industry to advise of changes will be held in the spring of 2010.

guidance should reduce carbon emissions from new non-domestic buildings by 50-60% compared with 1990 energy standards, the benchmark year for emissions; the proposals should extend that to around 70%. For example, a two-storey office building, with a total floor area of 1,194 square metres constructed to 1990 standards, would emit 105 tonnes of CO₂ per year. Constructed to 2010 standards, it would emit 31.6 tonnes, a reduction of 70%.¹³⁹

8.16 Changes to the guidance on meeting the 30% reduction target include improvements to the building fabric that will reduce heat loss through measures such as more demanding levels of insulation and air tightness. Other revisions to guidance include improved efficiencies to equipment and controls used for space heating, hot water and lighting. Low-carbon equipment is likely to become increasingly important in achieving the reduction. However, the form of the standards and guidance allows flexibility to enable other solutions, such as district heating, to be considered for certain developments.

8.17 Whatever services are provided, the building regulations require that occupiers are provided with written information on the operation and maintenance of the building services and energy supply systems within their non-domestic building.

Box: 8.2 Improving existing building energy efficiency: Mabbett & Associates Ltd (M&A)

M&A Environmental Consultants and Engineers (part of the Mabbett Group, with UK offices in Glasgow and Dunfermline and US offices in Boston and Washington DC) purchased an 1850's Georgian townhouse in Glasgow City Centre that was in need of extensive modernisation and restoration. This gave the company's in-house energy engineers and architect the ideal opportunity to reduce dramatically the building's carbon footprint and future running costs. The total capital cost for the project, which aimed to provide a building fit for purpose as a modern office, was around £300,000. In most areas no additional outlay was required to incorporate low-carbon techniques. The only areas which needed additional investment were lighting, heating controls and insulation, costing £5,000. The projected annual saving is £2,700, meaning that the payback on additional low-energy and low-carbon investment will be around two years. By including low-carbon design, M&A has been able to reduce running costs while providing a modern, comfortable office with little additional capital investment. The savings have included a 40% reduction in building heat loss, a 50% reduction in heating and hot water costs, over 50% reduction in lighting electrical load, and emission savings of approximately 13 tonnes CO₂ per annum.

Research and promotion of good practice

8.18 Research has been undertaken to investigate the life cycle and capital cost impacts of changes to energy standards for new buildings in 2010, with consideration of reductions in both delivered energy and CO₂ emissions for school, office, and retail buildings.¹⁴⁰ Various levels of reductions have been studied. Initially, packages of energy efficiency measures were applied before adding low-carbon equipment. However, due to the high costs and practical difficulties of achieving Sullivan Report percentage reductions for office and retail buildings, the study was extended to customise improvements to respond to the particular energy demand profile of each building.¹⁴¹ These included lighting efficiencies and controls, passive chilled beams, reduced areas of glazing, rooflights, and plant efficiencies. Both the results of this study and the economic downturn influenced the proposed 30% reduction in emissions that was issued for consultation on 30 June.

8.19 Research is also addressing the practicalities and costs of measures to improve the energy performance of existing, non-domestic buildings. Case studies to date include office, retail, health care, and hotel buildings. Findings again illustrate the need to understand the different energy load profiles of each type of building in selecting appropriate improvement

¹³⁹ This equates to approximately 81 kgCO₂/m² in 1990 compared to 26 kgCO₂/m² in 2010.

¹⁴⁰ Davis Langdon, Faber Maunsell, 'Assessing the costs of proposed changes to non-domestic energy standards in 2010', (Scottish Building Standards, updated 2009, www.sbsa.gov.uk/research/summ_nd_energ_2010.htm).

¹⁴¹ An energy demand profile will normally show the fluctuation in how much and what type of energy (heat, cooling or electricity) is needed over time (a day, a week and a year).

measures.¹⁴² The results of these and further studies will influence the guidance that Building Standards Division gives on improving the carbon and energy performance of existing non-domestic buildings.

Energy Performance of Buildings Directive

8.20 Transposition of the Directive was completed on 4 January 2009, with all building owners being required to provide prospective buyers and tenants with an Energy Performance Certificate (EPC).¹⁴³ Owners of public buildings over 1,000 m² were required to have an EPC on display from the same date.¹⁴⁴

8.21 In addition to the provision of EPCs, the Directive also requires air-conditioning inspections which include assessment of the efficiency and the sizing of the system compared to the cooling requirements of the building and promotes the improvement of the energy performance of buildings. For existing buildings, inspections are being phased in:

- from 4 January 2009 for all systems with an effective rated output of more than 250 kW, with first inspections completed by 4 January 2011;
- from 4 January 2011 for all other systems with an effective rated output of more than 12 kW with first inspections completed by 4 January 2013.

8.22 The EU is considering potential revisions to the Directive, which should be notified to all member states in late 2009.

Assessment and improvement of energy performance and emissions

8.23 The Sullivan Report set out recommendations for improving existing non-domestic buildings and energy performance certificates. Enabling powers included in Section 63 of the Climate Change (Scotland) Act require Scottish Ministers to make regulations for the assessment of:

- (i) the energy performance of non-domestic buildings, and
- (ii) emissions of greenhouse gases produced or associated with such buildings or with activities carried out in such buildings.

8.24 As well as an assessment, regulations will require owners of such buildings to take steps to improve energy performance and to reduce emissions.

8.25 Implementation of Section 63: Energy Performance of Non-Domestic Buildings is at an early stage, and the next step will be to develop regulations for implementation. This will require detailed work, supported by research and public consultation, and will then be subject to Parliamentary approval.

8.26 All of the above considers buildings, rather than any processes within them. The following actions tackle all energy use that occurs within non-domestic building stock, whether this is as a result of the processes within the building or not.

Buildings and Process energy

Energy efficiency advice and audits

8.27 The Scottish Government funds the Carbon Trust to provide technical energy efficiency advice to larger and energy intensive businesses. The principle activity is the provision of direct on-site consultancy advice. This can range from a holistic carbon management review for larger companies, through highly bespoke technical support such as

¹⁴² Scottish Building Standards, see www.sbsa.gov.uk/research/summ_impr_ep_existbuild.htm.

¹⁴³ Energy Performance of Buildings Directive (EPBD), EU Directive 2002/91/EC.

¹⁴⁴ For definition of public, refer to 9(2) of The Energy Performance of Buildings (Scotland) Regulations 2008 (www.opsi.gov.uk/legislation/scotland/ssi2008/ssi_20080309_en_1).

feasibility studies, to a one-day site survey for smaller businesses with an annual energy spend in excess of £50,000. It is estimated that in 2009/10 the Carbon Trust will provide support and advice to over 300 businesses in Scotland and that, during the year, Scottish clients in the sector will consequently implement measures that will reduce their annual emissions by 85,000 tCO₂ and provide lifetime savings of 375,000 tCO₂.

8.28 In many medium-scale industrial sectors, the majority of energy use is in complex, sector-specific processes. There are significant untapped opportunities for energy savings in these processes. The Carbon Trust Industrial Energy Efficiency Accelerator approach focuses on identifying, and then addressing, the specific barriers to implementation of opportunities for emissions reduction in sector-specific industrial processes. Since 2008, the Carbon Trust has been working with the animal feed, asphalt and plastic blow-moulding sectors to identify such opportunities and support sector-wide implementation. The average annual emissions savings identified in each sector were 28%. Following success with these three pilot sectors, the Carbon Trust is planning to significantly upscale this activity by working with up to a further 15 sectors.

8.29 Carbon Management provides companies with a holistic approach that delivers a strategic view of the impact of their energy use and carbon emissions. It also provides operational guidance on reducing these. The Carbon Management Energy Efficiency offering is aimed at larger clients who require a more bespoke technical service. The sort of measures implemented vary depending on the type of business, but cover zero-cost, low-cost and high-cost energy efficiency measures, plus options for renewables and changing fuel type. Around 25 private sector clients are expected to go through one of the Carbon Management programmes in 2009/10. This is expected to save over 170,000 lifetime tonnes of CO₂ (35,000 tCO₂ annually) as a result of the action these businesses will subsequently take.

8.30 Advice from the Carbon Trust suggests that business are most likely to have implemented the measures that are both simple to implement and very cost-effective. Energy efficiency measures that are more complicated to implement or with longer payback periods need to be considered and encouraged. Some of the wider UK and EU drivers which will help to do this are set out below.

8.31 The Scottish Government also invests in the Energy Saving Scotland advice network, which provides advice on a range of sustainability issues to SMEs with an energy spend of under £50,000 a year, including guidance on reducing energy consumption (see Chapter 5). This is carried out by a dedicated team of business advisers, who undertook over 600 energy audits in 2008/09, saving over 36,670 lifetime tCO₂ (5,867 tCO₂ annually) as a result of the energy saving measures subsequently implemented.

8.32 Both the Energy Saving Trust and Carbon Trust also offer advice through their respective websites, publications and advice helplines. In addition, the Carbon Trust provides a business incubator service and technology accelerator projects to accelerate the commercialisation of future low-carbon technologies (see Chapter 12, Enterprise and Skills, for detail).

8.33 Despite the provision of free energy efficiency audits and advice, the SME sector is well known as a sector that is hard to influence. It is generally recognised that more needs to be done to increase this sector's investment in energy efficiency. There has been some debate about extending the UK Government's Carbon Emissions Reduction Target (CERT), which currently provides the main source of market incentives for the up-take of energy efficiency measures in the domestic sector, to the SME sector. The Scottish Government would be interested to understand what else it could do to address this gap.

Box 8.3 Carbon Trust Case Study

Carron Phoenix has been producing kitchen sinks at its factory in Falkirk in central Scotland since 1962. It is now the UK's largest dedicated sink producer, manufacturing both stainless steel and acrylic composite sinks for the domestic and export markets.

The Carbon Trust assisted in identifying that the company's existing air compressors were old and inefficient. In addition, as fixed speed units, they were not suited to the varying compressed air load at the site, resulting in energy wastage and high running costs. Maintenance costs for the compressors were also high, and breakdowns and repairs could interfere with production.

Recognising that the cost of energy consumed by air compressors over their lifetime far outweighs the initial capital cost, Carron Phoenix invested in new energy efficient air compressors. As well as significantly reducing energy costs, the new variable speed compressors are much more reliable, cutting down on business interruptions due to breakdowns and reducing maintenance costs. The projected savings include:

- Annual electricity savings of 1.6 GWh (ie 1.6 million kWh).
- Energy cost savings of £103,000 per year (at 2007 prices).
- Maintenance cost savings of almost £9,000 per year.
- Emissions savings of 683 tCO₂ per year.

Small business loans

8.34 The Scottish Government also helps small businesses to reduce their energy use through the Energy Saving Scotland small business loans scheme. Administered by the Energy Saving Trust, the interest-free loans scheme (formerly known as Loan Action Scotland) was re-launched in December 2008. It now includes renewables as well as energy efficiency measures, with around £2 million invested in the scheme last year specifically for microgeneration measures (i.e. using small-scale low- and zero-carbon technologies). This took total funding in the scheme to around £5 million.

8.35 Despite a changing economic climate, 57 loans totalling over £1.1 million were paid out in 2008/09, with estimated annual savings of 2,639 tCO₂ and lifetime savings of 21,100 tCO₂. The scheme supports a wide range of energy saving measures, with the most common being improvements in insulation, lighting, space heating and changing fuel type. Other measures include double glazing, compressors and processors.

Box: 8.4 Small business Loans: H&F Drilling drill down their energy costs.

H&F Drilling Supplies Ltd were keenly aware of rising energy prices and therefore sought to reduce energy consumption through increasing the efficiency of their oil fired heating system, which had a poor efficiency rating of around 60%. By replacing the equipment with a more efficient version, it was calculated that H&F Drilling could save £2,800 per annum. The installation of more energy efficient equipment was calculated to cost £9,020 and would therefore pay for itself within five years. As well as tangible financial savings, there were measurable environmental benefits as the company would use 17,000 fewer litres of oil per annum, equating to a reduction in the release of some 45.4 tonnes of CO₂.

The capital required was eligible for an interest-free loan through the Scottish Government. After successfully installing the new system and realising the identified savings, H&F Drilling Supplies Ltd continue to benefit financially and commercially from increased efficiency associated with a greater environmental awareness.

Enforcement of Pollution, Prevention and Control regulations

8.36 Since 2000, SEPA has issued permits to operators of activities that are subject to regulation under the Pollution Prevention and Control Regulations (Scotland) 2000 (as amended) which implement the Integrated Pollution Prevention and Control (IPPC) Directive. These cover a range of pollutants. Large scale (Part A) installations must be operated so that energy is used efficiently. There are approximately 500 plants that fall into Part A in Scotland. Examples include larger industrial installations such as refineries, power stations and some intensive agricultural sites.

8.37 Scotland has hitherto remained consistent with the UK approach to regulating energy efficiency requirements in order to simplify enforcement and compliance for industry. Part A installations must meet basic energy efficiency requirements. Many of the Part A installations are part of a Climate Change Agreement or are subject to the EU Emissions

Trading System (ETS) (see 8.41 below). If they meet their obligations under these regimes they are considered to meet the energy efficiency requirements of the IPPC Directive. Installations that fall outwith CCAs and EU ETS may have to comply with further permit-specific requirements. In Autumn 2009, the Scottish Government will lay regulations in Parliament to ensure SEPA has full powers both to implement and enforce these duties. In future, SEPA is considering carrying out more detailed assessments relating to energy efficiency, particularly taking into account both the European BREF notes on energy efficiency¹⁴⁵ and sector-specific guidance.

Other relevant action

8.38 Envirowise is a Scottish Government funded programme that provides advice to businesses on resource efficiency, waste prevention and the sustainable use of water.¹⁴⁶ It provides very basic advice on energy efficiency and refers anything more complex to the Carbon Trust. Generally, work on waste prevention and resource efficiency will have energy efficiency benefits, for example because fewer raw materials are required. In 2009/10, Envirowise aims to save 50,000 MWh of energy and 140,000 tonnes of CO₂. Since April 2005, it has worked with companies of all sizes across Scotland, saving them £26 million.

8.39 The Scottish Government consultation on draft planning guidance in relation to thermal power stations, which includes considerations on how applicants should consider the issue of waste heat usage, closed earlier this year.¹⁴⁷ The final guidance is expected to be available over the coming months following the outcome of the UK consultation, 'A Framework for the Development of Clean Coal', which closed on 9 September 2009. Further measures targeting power stations are discussed in Box 8.5, and further planning issues are discussed in Chapter 10.

Box 8.5 The fossil fuel energy generation and transmission sector in Scotland

The value of energy efficiency and greenhouse gas abatement is particularly significant in the power generation and transmission sectors. The bulk of opportunities are in power generation and refining.

Scotland's three large fossil fuel power stations – Scottish Power's coal-burning Cockerzie in East Lothian (1,152MW) and Longannet in Fife (2,304MW), and SSE's gas-fired Peterhead station (1,540MW) – produce around 10 million tonnes of CO₂ per annum – more than half of the emissions produced onshore in Scotland covered by the EU Emissions Trading System.

Retrofits of existing plants that embed higher energy efficiency can create energy savings by allowing these plants to operate at higher temperatures and pressures. Whilst the SSE gas-fired station at Peterhead uses modern, efficient combined cycle gas turbines (CCGT) to produce power, the two Scottish Power coal-burning stations are much older and consequently relatively inefficient.¹⁴⁸

Cockerzie is opted-out of the EU Large Combustion Plants Directive (LCPD), and must close by December 2015 or sooner, dependent on the number of operating hours. Scottish Power recently announced a consultation on a proposal to replace it with a modern, efficient gas-fired CCGT station which would be built alongside the old station. This would greatly increase the efficiency of the station, producing less CO₂ per unit of electricity generated.

Longannet is by far the largest generating plant in Scotland. Scottish Power is at present running a small trial to demonstrate the capture of CO₂ from flue gas. It has lodged entries in the UK Carbon Capture and Storage demonstrator competition and has applied for EU funding under the Economic Recovery Programme. Longannet will require further upgrading by 2016 to meet significantly tighter EU LCPD emissions limits. This should extend the station's life to 2030. Other options being considered could involve upgrading the plant capacity by retrofitting higher efficiency burners and boilers to the plant, and by adding carbon capture. Alternatively, a new station could be built alongside the old station.

¹⁴⁵ See European Joint Research Centre, Institute for Prospective Technological Studies (<http://eippcb.jrc.es/reference/>).

¹⁴⁶ See www.envirowise.gov.uk/scotland/Envirowise-in-Scotland.html.

¹⁴⁷ www.scotland.gov.uk/Topics/Business-Industry/Energy/Infrastructure/Energy-Consents/Thermal-Guidance

¹⁴⁸ Typically CCGT stations operate at around 52% efficiency, whilst the coal stations operate around 36%. Modern coal technologies can achieve around 45%.

It is important to note that whilst some of these steps increase plant efficiency, this will be offset to a great extent by the power required to run the carbon dioxide capture plant if this is fitted. By how much will not be known until the trials, further development and optimisation of the new technology are completed. At Hunterston, Ayrshire Power is currently developing proposals for a multi-fuelled power station. This will have a target thermal efficiency of 47% and will be built carbon-capture-ready. Its main fuel will be coal, but it will also burn some biomass.

Building new plant also provides a good time to consider and take any opportunities to develop heat networks to utilise waste industrial heat from such plants, particularly where they are situated relatively close to other heat demands such as other industrial uses, hospitals, leisure centres or housing. (See Chapter 10 for more detail.)

Increasing UK and EU regulation

8.40 The regulatory environment in the UK and internationally increasingly requires business to reduce its energy consumption and hence greenhouse gas emissions. The amount and strictness of regulation is likely to increase as the targets for greenhouse gas emissions reductions become more challenging. New policies will be accompanied by the need for business to measure and report on energy consumption, and to put in place plans for energy reduction targets.

8.41 Current regulatory schemes that require or encourage energy savings include:

- Climate Change Levy (CCL), introduced 2001: applies to all businesses, increasing the cost of energy and hence providing a stimulus to reduce costs.
- Climate Change Agreement (CCA), introduced 2001: applies to large energy intensive industry players who can obtain a CCL discount if they meet bi-annual energy saving targets. The scheme comprises 52 industrial sectors across the UK and about 10,000 facilities, grouped into around 5,000 target units. Targets are set at the sector level through a process of negotiation between DECC and sector associations.
- EU Emissions Trading System (EU ETS), phase 2, commenced January 2008 and will run to December 2012 (see box 4.1 for detail). This uses a cap and trade approach to address emissions in power sector and large industrial sites. There have been phases prior to this (UK ETS which ran from 2002-2006, and the EU ETS phase 1 which ran from 2005-2008). Phase 2 includes additional sectors, such as flaring offshore installations.
- EU ETS Phase 3, post 2012: may reduce the number of free allowances and include CO₂ emissions from: petrochemical production, ammonia, aluminium production (both primary and secondary).¹⁴⁹
- The Carbon Reduction Commitment (CRC): From April 2010, the CRC will apply mandatory emissions trading to cut carbon emissions from medium to large organisations not already included in CCA or EU Emissions Trading System. It will thereby provide incentives for these organisations to save money through energy efficiency. It will apply to organisations whose use of half hourly metered electricity is more than 6,000 MWh per year, expected to be around 5,000 organisations in the UK. This scheme will include, for example, supermarket chains, hotel chains, office-based corporations, government departments and large local authorities. 2010 will be a footprint year, when data on energy sources will be collected and a footprint report submitted. This will be followed by an introductory period when allowances will be sold at a fixed price. From 2013, the CRC will operate as a cap and trade scheme. Revenues will be recycled to participants, in proportion to the emissions reduction made by them.

Reporting to the CRC will mean organisations will more accurately measure their energy use over a year and this will be collected on a UK-wide basis. For organisations which are solely based in Scotland, this will provide us with a greater indication of energy used by these organisations.

¹⁴⁹ This also includes N₂O emissions from production of nitric, adipic and glyoxal and glyoxylic acid.

- Energy-using Products (EuP) Directive: the EuP Directive 2005/32/EC establishes a framework for the setting of eco-design requirements for energy-using products. It aims to improve the environmental performance of products throughout their life-cycle, by systematically integrating environmental aspects at a very early stage in the product design.¹⁵⁰

8.42 The UK Government also has fiscal policies to encourage energy efficiency. Enhanced Capital Allowances, for example, enable businesses to claim 100% first-year capital allowances on their spending on qualifying plant and machinery. Businesses can write off the whole of the capital cost of their investment in these technologies against their taxable profits.

The case for further regulation?

8.43 Industrial experience over the past 30 years with health and safety, environmental and now CO₂ reduction legislation would point towards tougher legislation as a key means of meeting Scotland's emission reduction targets.

8.44 The Carbon Trust offers to industry many support methods such as standard surveys, feasibility surveys and carbon management. It found that 76% of respondents to its 2006 census confirmed that they would not have implemented the same level of carbon savings without the Carbon Trust. Nevertheless, organisations could still achieve much greater reductions in carbon dioxide emissions, as less than 40% of the carbon savings identified by the Carbon Trust between 2003 and 2006 have so far been realised – the census found that 60% of organisations had only implemented up to five recommendations, compared to an average of 11 recommendations made to a typical client. This shows that about half of all energy efficiency opportunities are not being implemented.

Q 30: Given this information, is there a case for Government to introduce legislation to require business compliance? For example, should there be a minimum criteria required for energy efficiency based on a sub-sector approach to drive a greater up-take of energy efficiency measures?

Q 31: Consideration is being given to the potential role for operational ratings. Should sub-metering be considered for existing non-domestic buildings which are part of a large campus? Or will financial drivers such as the introduction of the Carbon Reduction Commitment (see paragraph 8.41) be sufficient?

What are the potential savings for the business sector in Scotland?

8.45 The UK Committee on Climate Change estimated the overall potential UK savings from energy use and CO₂ emissions in industry to be 11 Mt CO₂ (compared to projected emissions in 2020 of 145 Mt CO₂). However, the Scottish Energy Study Volume 4 has found marked differences between the composition of Scotland's industry sector and that of the UK as a whole.¹⁵¹ Specific examples include a greater contribution in Scotland from the food, drink and chemicals sectors, and a much lower contribution from the steel sector. This study found that these differences mean that the UK results cannot be assumed to apply to Scotland.

8.46 In addition, Volume 4 of the Energy Study has found that the potential to reduce emissions at a low cost is much smaller relative to the size of the sector than for the services and domestic sectors. The 7Mt CO₂ available at negative cost represents just 4% of

¹⁵⁰ See www.berr.gov.uk/whatwedo/sectors/sustainability/eup/page38894.html.

¹⁵¹ Energy Study, Volume 4, 'Issues, Opportunities and Barriers'. This work updated Defra's ENUSIM model abatement curve.

industrial sector emissions, whereas for the services and domestic sectors the equivalent figures are 18% and 27% respectively. This may reflect good existing energy management practices and the motivation and skills available in industry to reduce energy costs. In addition, the study could not identify separately the results for each technology. This reflects the fact that the opportunities in industry lie in many relatively small process improvements such as:

- improvements in efficiency in the use of electricity through multiple enhancements to electrical machinery; and
- improvements in efficiency of heat generation, insulation and heat recovery.

These improvements can be achieved either within existing plants via incremental improvement or as part of investment in new plant.

8.47 In conclusion, the Scottish Government has a track record of action in supporting businesses to invest in energy efficiency. However, we know that there is still more that could be done. We also recognise that we need to have more accurate data on Scotland's industrial energy end-consumption in order to understand better and therefore assist Scottish businesses in becoming more energy efficient. With increasing pressure on the business sector to reduce greenhouse gas emissions, together with impacts of rising energy costs, further action needs to be taken. This consultation presents an opportunity to canvass what new policies and programmes could be put in place by the Scottish Government to drive investment in energy efficiency further.

Q 32: How could the Scottish Government improve its understanding of industrial energy end-use consumption in Scotland?

Q 33: What is the role for Scottish Government in regulating the industrial sector to drive a greater up-take of energy efficiency?

Q 34: What more could the Scottish Government, its agencies and the wider public sector be doing to drive a greater up-take of energy efficiency in the SME sector and in non-domestic buildings and processes?

Q 35: What steps could be taken by the Scottish Government to encourage the use of waste industrial heat?