The Scottish Butchers' Guide to Saving Energy

CARBON TRUST

Quality Meat Scotland (QMS)
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Contents

Why you should read this document

Gas and electricity costs in an average-sized butcher's are typically £12,000 per annum.

Gas and electricity are measured resources and controllable costs, but are inextricably tied to the prevailing oil price.

Current energy costs are higher than they have ever been and are likely to continue increasing as oil costs rise in response to global demand.

Savings of 6% (£720 per year) or more are possible where little has been done in the past to manage energy use without capital investment. This saving contributes directly to profit each year.

For context, an average butcher would have to increase sales by £7,200 each year to finance the additional energy cost (based on a margin of 10%).

A further 4% (£480) saving could be achieved by investment in low-cost measures.

So this is a business improvement opportunity which contributes directly to profit and reduces CO_2 emissions which makes for a greener business.

How do you achieve it?

This Guide tells you how...

Did you know?
For a typical butcher's 50% of electricity costs are for freezers and refrigerated storage.

Foreword

I am very pleased to write the Foreword for this Guide. It results from a joint project between Quality Meat Scotland and the Carbon Trust in Scotland, and provides practical and useful guidance for butchers to adopt measures to reduce energy costs which contribute directly to the bottom line. Not only does this represent sound business sense but also savings in CO_2 emissions.

This Guide has been produced after a number of site surveys were undertaken in 2012 to determine the scope for energy efficiency improvements across a broad selection of butchers in Scotland. The surveys identified practical and real opportunities which will result in cost and CO_2 savings.

We are grateful to the Carbon Trust for their support and expert advice in helping to produce this Guide, and we encourage you to implement a practical action plan to go green and drive down costs.

Every £ saved is an extra £ on the bottom line and a positive step for a more sustainable industry.

A. McGowan

Andy McGowan
Quality Meat Scotland

QMS

1. Introduction

1.1 Aim of this Guide

This Guide has been written to help retail butchers to save energy, reduce costs and cut CO_2 emissions.

A key step in managing energy is to appoint an Energy Champion, and it is important for this person to read this document as it will help equip them in their task.

The energy-saving opportunities in this Guide were identified from energy surveys of Scottish butchers funded by the Carbon Trust in Scotland.

1.2 Use of the Guide

This Guide assumes no previous knowledge of energy management. It describes simple but effective approaches for driving down costs and reducing carbon emissions.

The energy-saving opportunities fall into **three categories:**

- **No-cost Actions** which can be made immediately and bring immediate savings.
- **Low-cost Measures** which require small investments below £500.
- **Investment Measures** which require financial investment of over £500.

1.3 Benefits of Saving Energy

Energy is a large controllable cost, and savings go directly to bottom-line profitability.

In many butchers', simple **no-cost** actions can be made immediately to reduce bills by 6%. Typically, a further 4% savings can be made by **low-cost** measures.

For a typical butcher with annual energy costs of £12,000, this means £720 of savings per year are achievable by **no-cost actions** and an additional £480 of savings per year by **low-cost measures**.

Improved energy efficiency is one of the most effective means of reducing carbon emissions and driving down costs.

The benefits of saving energy are:

- **Reduced costs** contributing directly to bottom-line profitability. Every £ saved is a £ of extra profit. Also, making savings now protects against future rises in electricity and gas prices, and against price volatility in global energy markets.
- **Reduced maintenance costs** and equipment replacement costs because of improved operating efficiency.
- **Reputation** – a greener image showing customers and staff that the environment matters to your business.
- **Better working environment** – more comfort for staff and customers.
- **Reduced CO_2 emissions** and less impact on the environment.
- **Reduced use of a finite resource** where the energy is from a non renewable source, preserving resources for future generations.
- **Reduced risks** from legislation/regulation non-compliance.

1.4 Financial Support

The Carbon Trust

The Carbon Trust is a not-for-profit organisation funded by Scottish Government to assist businesses and public sector organisations to reduce their carbon emissions.The Carbon Trust's mission "is to accelerate the move to a low-carbon economy, by working with organisations to reduce carbon emissions now and develop commercial low-carbon technologies for the future".

The Carbon Trust offers a range of services to help organisations reduce their energy consumption and carbon emissions. It provides consultancy support and financial advice to small and medium-sized businesses.

For more information, call Carbon Trust Implementation Services on 0800 988 3718 or visit the website **www.energyefficiencyfinancing.co.uk**

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Enhanced Capital Allowance (ECA)

Enhanced Capital Allowance (ECA) is a simple way for a business to manage cash flow through tax breaks. The ECA scheme supports businesses that invest in energy-saving technology by offering 100% relief of first year tax on qualifying capital expenditure.

The website **www.eca.gov.uk** provides a list of technologies that qualify.

Energy Technology List
ECA SCHEME

For further details see Appendix 1.

2. Summary

2.1 Action Plan

In 2012, NIFES Consulting Group conducted energy surveys on behalf of Quality Meat Scotland and Carbon Trust in Scotland. The energy bills ranged from under £2,000 per year to £44,000.

The survey revealed that most butchers carry out Step 3 and read their meters regularly – the first action in Step 4. However, there is potential for all butchers to take action on all other steps.

The seven key steps are detailed in Section 3, but a summary is:

Step 1	**Appoint an Energy Champion.** Appoint an appropriate person to drive energy saving.
Step 2	**Develop an Energy Policy.** Produce a written energy policy which is signed and approved by the manager/proprietor and communicated to all employees.
Step 3	**Identify Meters and Invoices.** Identify location of all utility meters and gain regular access to all utility invoices.
Step 4	**Monitor and Target Energy Use.** Read meters regularly, plot consumption, check usage against targets, identify waste and take corrective action.
Step 5	**Conduct Regular Energy Walkabouts.** Conduct regular energy walkabouts identifying and recording energy waste, maintenance issues and opportunities for no-cost, low-cost and investment measures.
Step 6	**Implement Energy-Saving Measures.** Produce a clear written plan in each area with priorities for action against identified measures, with timescales, costs, savings and those responsible for action.
Step 7	**Engage Employees and Customers.** Regularly raise staff awareness, gain support/ideas, train key people and provide regular feedback on progress toward targets. Communicate objectives and successes to employees and customers.

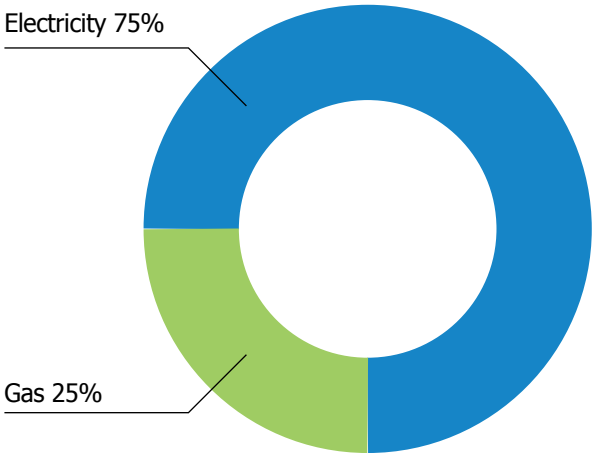
2.2 Typical Energy Use in a Butcher's

This table shows the average energy use across the 10 surveys of butchers' in Scotland. This data was accurate at the time of the surveys and is provided to give general guidance and representative data. The ratio of gas to electricity use varied considerably from site to site, as did the unit costs of electricity and gas.

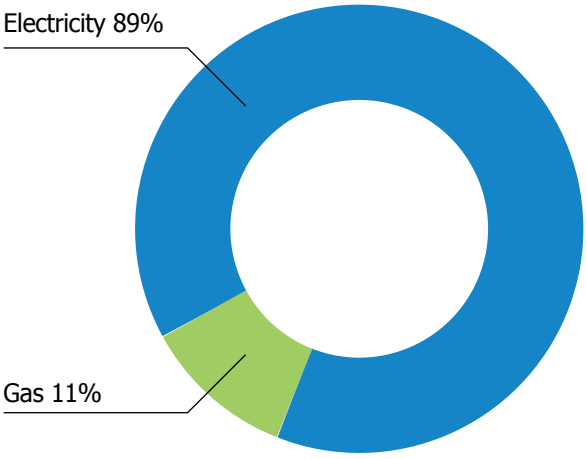
Utility	Annual Energy Consumption		Annual Energy Costs		Annual CO_2 Emissions	
	kWh	%	kWh	%	kWh	%
Electricity	100,358	74.9	10,700	88.9	52.6	89.5
Gas	33,661	25.1	1,300	11.1	6.2	10.5
Total	**134,019**	**100.0**	**12,000**	**100.0**	**58.8**	**100.0**

The amount of electricity used is measured at the meter in kilowatt-hours (kWh). This is the standard energy unit used in this Guide. The rate at which power is used is kilowatts (kW). So a fan rated at 2kW switched on for one hour uses 2kW x 1 hr = 2kWh. If left on for two hours, it would be 2kWh x 2 hrs = 4kWh. For advice on how to convert gas and oil consumption into kWh, see Appendix 3.

Electricity is 75% of total consumption...



...but 89% of total costs



The average unit cost of electricity across butchers' was 10.67p/kWh and for gas, 4.0p/kWh (including VAT and standing charges).

For the average butcher's, electricity is 75% of total consumption but, because of its higher unit cost compared to gas, is 89% of total cost.

As regards emissions, more CO_2 is emitted per kWh to produce and distribute electricity compared to gas, and electricity is 89.5% of total annual CO_2 emissions. For advice on how to calculate CO_2 emissions, see Appendix 4.

So the message is clear: for any butchers', the key first priority is to reduce electricity consumption. Electricity has the highest unit cost and the highest CO_2 emissions per kWh. Also, a large proportion of electricity use is within the control of end-users.

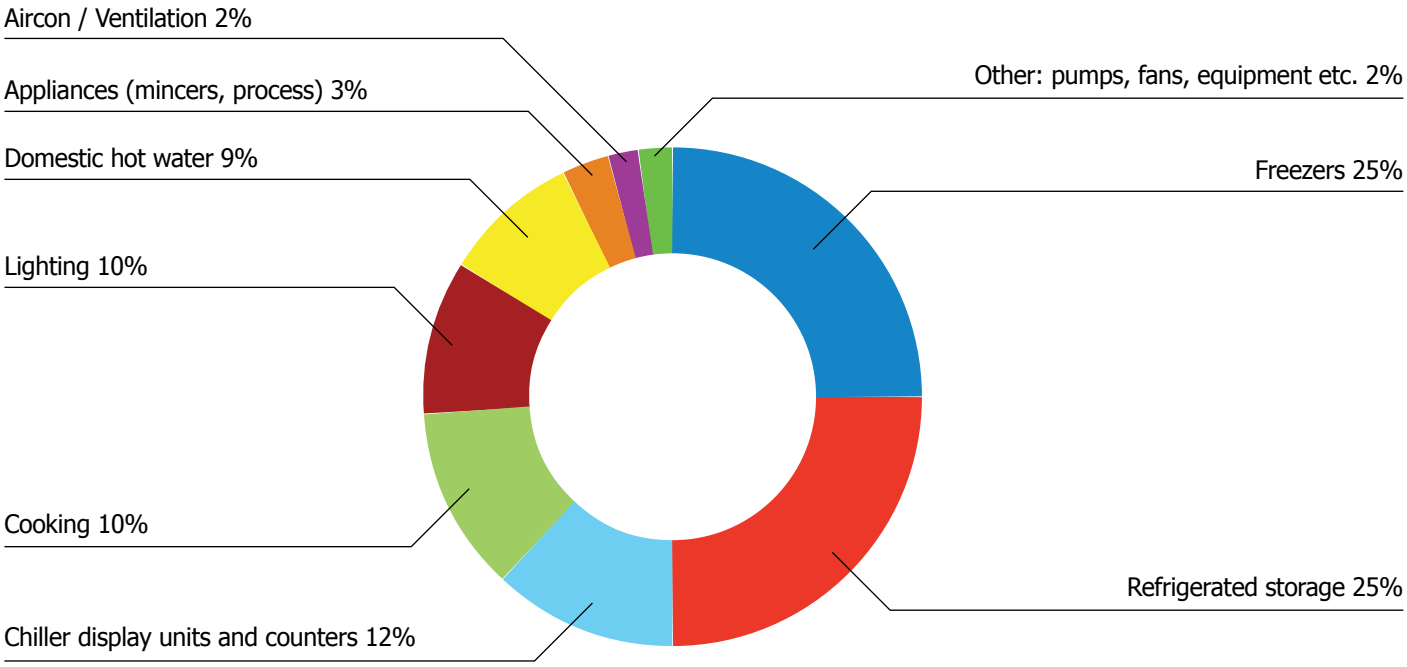
The two smallest sites surveyed had no gas supply and only used electricity as an energy source.

Where the energy is used will vary from one butcher to another, depending on equipment installed, building type, size, and hours of operation. There will be no sub-metering of electricity use on most sites, so an estimate needs to be made as to where electricity is used once it has come through the meter.

The average energy cost across the sites surveyed was approximately £12,000 per annum. The site shown below represents a typical butcher's operation where there is both electricity and mains natural gas (as against LPG) on site. The breakdown of energy use is also typical of the medium-sized sites surveyed.

Electricity User	Annual kWh	%	Annual Cost /£
Freezers	25,000	25	2,670
Refrigerated storage	25,000	25	2,670
Chiller display units and counters	12,000	12	1,285
Cooking	12,000	12	1,285
Lighting	10,000	10	1,075
Domestic hot water	9,000	9	965
Appliances (mincers, process)	3,000	3	320
Air conditioning/ventilation	2,000	2	215
Other: pumps, fans, equipment etc.	2,000	2	215
Total	**100,000**	**100**	**10,700**

Typical split of electricity use

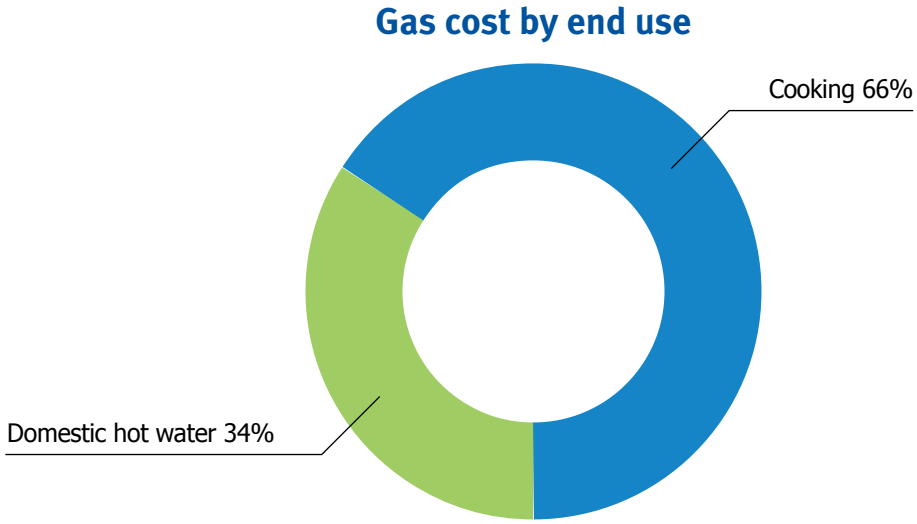


This breakdown shows that 50% of electrical consumption is due to refrigeration and hence this should be a priority.

Similarly, gas usage is estimated as:

Gas user	Annual Gas Consumption kWh	%	Annual Cost /£
Cooking	22,242	66	858
Domestic Hot Water (DHW)	11,458	34	442
Total	**33,700**	**100**	**1,300**

This assumes a natural gas supply at the premises. Butchers using LPG as their gas source generally use gas exclusively for cooking, and not domestic hot water (DHW).



Understanding how electricity and gas are used within the butcher's shops help to target, quantify and prioritise areas for action.

Note: For a small number of butchers using oil or LPG instead of natural gas, the fossil fuel kWh use has been assumed to be natural gas to simplify the above pie chart and analysis.

Did you know?
An open door costs about: £6 an hour for a chilled store, £12 an hour for frozen store.

2.3 No-cost Measures from Surveys

The table below shows typical examples of no-cost opportunities, some of which were identified in the energy surveys. The savings are calculated and based on actual site energy data. Individual savings opportunities range from £23 to over £500 per annum.

	Typical Annual Savings
Freezers	
Adjust operating temperature to -18˚C *	£72
Minimise door openings	£104
Keep evaporators free of ice	£96
Adjust latches for tight fit on door seal	£30
Rationalise frozen storage space	£527
Chillers	
Keep chiller doors closed	£125
Re-set chiller display temperature	£80
Do not overfill shelves	£58
Cover overnight display units	£37
Rationalise chilled storage space	£330
Lighting	
Switch off whenever area is unoccupied and overnight	£76
Switch off lighting in display cabinets overnight	£68
When lights need replacing, install T8 in place of T12	£58
Domestic hot water	
Reduce temperature at boiler to 60 – 65˚C	£105
Air conditioning	
Reset controls	£300
Extraction/ventilation	
Adjust latches for tight fit on door seal	£23
Implement M&T	
Read meters and note exceptional usage	£41

No-cost measures, by definition, require no capital investment and the savings are immediate. In energy management initiatives, it is a key priority to implement these measures first to control costs and then focus on low-cost measures and those requiring more investment. In some cases, the savings by no-cost actions can be used to invest in low-cost and investment opportunities.

*Refer to CTV013 Hospitality Sector Overview, page 19, for food storage temperatures.

2.4 Typical Investment Measures from Surveys

The following are typical low-cost and investment measures identified during the site surveys.

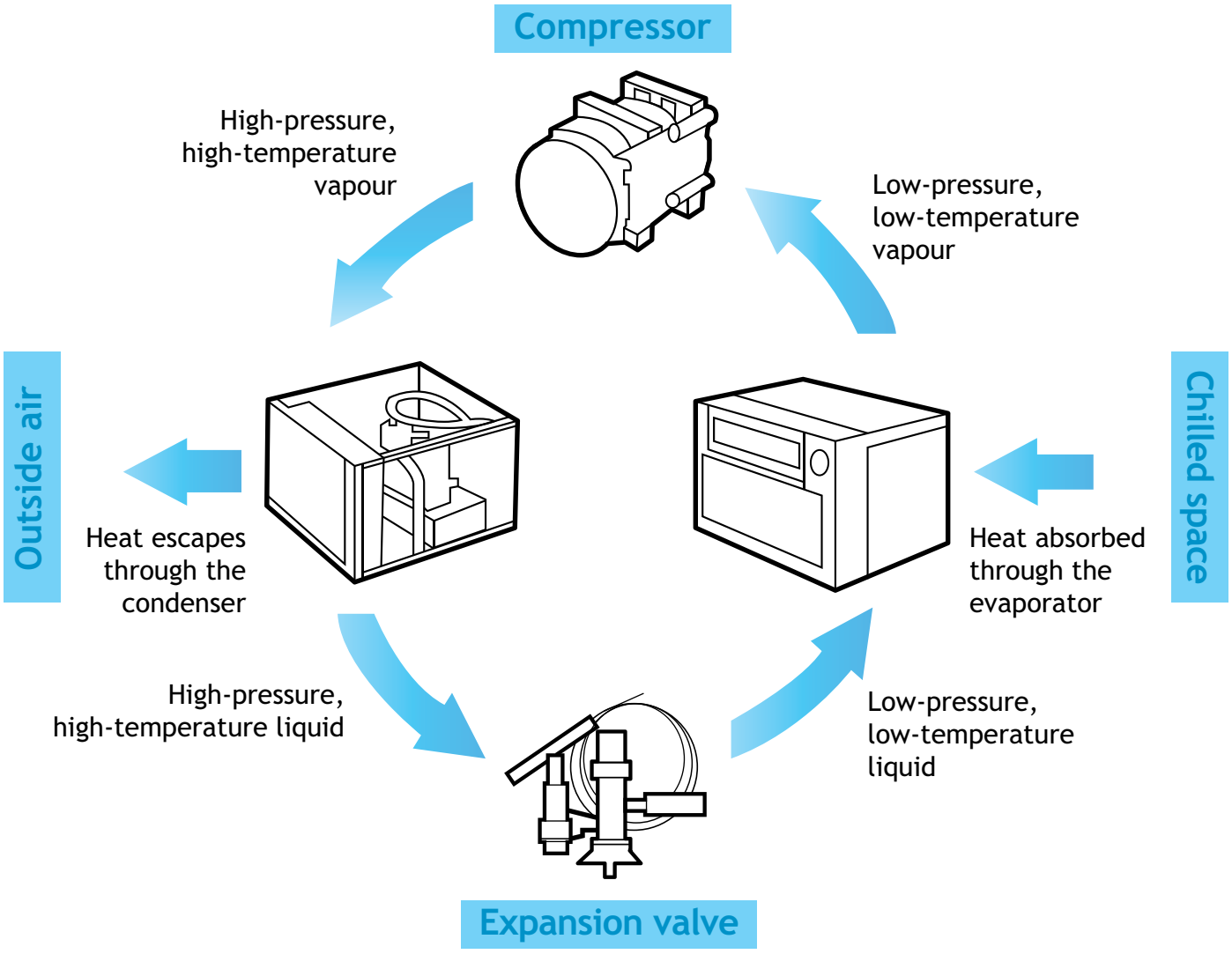
Opportunity	Typical energy cost savings per annum (£)	Typical implementation Cost (£)	Typical payback (years)
Freezers			
Minimise thermal load in freezers/cold rooms	£174	£300	1.7
Shading condensers on roof	£958	£5,500	5.7
Repair/replace poor door seals	£79	£50	0.6
Freezers			
Improve air flow around condensers	£184	£300	1.6
Minimise cool air mixing with ambient warm air (display counters/ shelves)	£37	£250	2.7
Repair/replace poor door seals	£79	£50	0.6
Re-arrange equipment to separate heating and cooling processes	£70	£100	1.4
Lighting			
Automated switch-off for lights in freezers and cold storage areas	£51	£280	5.5
Upgrade T12/T8 fluorescents to T5	£200	£1,300	6.5
Install lighting controls	£145	£560	3.9
Replace tungsten lamps with CFL	£140	£50	0.4
Upgrade T12/T8 to LED	£135	£1,045	7.7
Replace tungsten halogen lamps with LED equivalents	£247	£300	1.2
Heating/Hot water			
Fit timer to immersion heaters	£105	£50	0.5
Repair/replace poorly fitting jackets on hot water cylinders	£74	£150	2.0
Rationalise hot water use	£581	£500	0.9
Ventilation/Extraction			
Automate/interlock with cooking equipment	£120	£650	5.4
Ventilation/Extraction	£169	£200	1.2

3. Technology Overview

3.1 Refrigeration

Refrigeration accounts for up to 50% of the electricity bill in a typical butcher's, so it is vital to understand where the savings can be made in your plant - be this a large, cold storage room for the bulk storage of frozen goods, chilled storage or stand-alone display cabinets. Good savings can be made from basic maintenance and housekeeping measures.

The most common means of providing the refrigeration effect is the vapour-compression cycle, shown below.



How does a refrigeration system work?

The vapour-compression cycle is a closed-loop system wherein a refrigerant (or coolant) is used to extract heat from a product, thus cooling it. The extracted heat is then discharged to another area. Heat is absorbed from the chilled space into a liquid (the refrigerant) by the evaporator. This heat turns the refrigerant into a low-pressure gas that flows away from the evaporator to the compressor, where it is pressurised.

In the condenser, the gas gives up its stored heat (releasing it to the outside air) and condenses back to a liquid. It then flows through an expansion valve, where pressure is released cooling the liquid and the sequence then begins all over again. The compressor also pumps liquid and gas around the system. Usually the condenser, expansion valve and compressor are outside the refrigerated space. In small refrigeration applications such as stand-alone chilled display cabinets, fridges and freezers, all the components are commonly integrated into the housing of the unit. In larger systems, these components are often located in a central plant room or enclosure remote from the evaporator and cooled space.

Cold storerooms

For cold storerooms, the compressors and condensers are often located outside the building in plant rooms or enclosures. Adequate ventilation is necessary to enable heat to dissipate.

Stand-alone units

In stand-alone fridges, freezers or display cabinets, the compressor and condenser are located at the rear of the cabinet. The condenser is usually a large panel (possibly finned) with a small pipe coiled back and forth across its area. This provides a large surface area for heat rejection to ambient air. The evaporator is usually located inside the cooled volume, or just under the internal walls. It may not be visible without dismantling the cabinet.

Maintenance

Regular maintenance saves energy by ensuring that refrigeration plant operates efficiently. It also reduces the risk of business interruption through breakdowns.

- Keep condenser grilles free of debris or blockages.
- Check there is no dirt, fouling or corrosion on the heat exchanger itself.
- Remove any obstructions around the condenser.
- Consider shading condensers from direct sunlight.
- Make sure compressor is in a well ventilated environment where cool air can enter and warm air can be removed.
- Look out for scaling and ice build-up on the evaporator fins. Use a stiff brush to remove light ice build-up. Heavy ice needs removing by following the manufacturer's guidelines for defrosting the equipment.
- Check evaporators and condensers for broken vent fins.
- Ensure that bleed/drip pipes are not iced up. On metal pipes gentle heat can be applied to defrost. Check that any integral defrosting element is working correctly.
- Have compressor units serviced and lubricated regularly.
- Choose a high-calibre contractor and make sure that the contract selected provides appropriate cover.

3.2 Lighting

After refrigeration, lighting is the next biggest energy-saving opportunity. While there are many types of lamps, for most display lighting purposes a combination of T5 fluorescent tubes, Compact Fluorescent Lamps (CFL) and LEDs should provide the appropriate visual effect. Avoid the traditional tungsten halogens that are inefficient in terms of energy consumption and short lamp life.

Tubular fluorescent lamps

Tubular fluorescent lamps are referred to by their diameter in eighths of an inch, i.e. the oldest ones in use are T12 type. These are 1.5" diameter (12/8ths of an inch).

Newer lamps are either T8 - 26mm (1") diameter or T5 - 16mm diameter. T12 tubes with switch-start fittings can be replaced directly with T8 lamps and will save 8% of the energy previously used. (Switch-start fittings often flicker briefly when switched on).

For even greater savings replace T12 with T5. However, T5 tubes are a different length from T12s, and also require high-frequency (electronic) ballast. Retrofit systems are now available to allow direct replacement.

Light emitting diodes (LEDs)

A light emitting diode (LED) is a semiconductor diode that emits narrow-spectrum light. Traditionally LEDs have been low power consumption light sources with low light output. However, with recent increases in efficiency, LEDs are increasingly used for display lighting. LEDs offer potentially long life (over 50,000 hours) and low maintenance if they are designed and controlled appropriately.

4. Detail of Action Plan

Step 1 Appoint an Energy Champion

To achieve ongoing energy savings in butchers, someone needs to be appointed as an Energy Champion. To have influence, this person should have a degree of responsibility and the full support of the manager/proprietor. The Champion needs to want to take on the challenge and ideally have some interest in energy/environmental issues and the desire to drive down costs. For a smaller butcher, the manager/proprietor may decide to take on the role.

The responsibilities of the Energy Champion would include:

- Locate and read meters regularly.
- Develop an Energy Policy and communicate to all employees.
- Gain regular access to energy invoices and half-hourly electricity data.
- Monitor consumption and look for waste.
- Conduct regular walkabouts – some out-of-hours
- Identify and list energy saving measures.
- Identify low-cost/investment measures.
- Train key staff.
- Raise employee awareness and provide feedback.
- Integrate energy management into standard procedures.
- Communicate the Energy Policy and progress to staff and customers.

Step 2 Develop an Energy Policy

It is important to have a clear and concise energy policy to explain the business's approach to using energy and reducing environmental impact.

The Energy Champion should draft a policy. An example is shown in Appendix 5. The Policy should be discussed with staff to gain support, and their comments incorporated.

Once approved, the policy should be signed by the manager/proprietor and communicated to all employees, with copies displayed in the shop and on the website. At staff meetings the policy should be distributed and discussed, along with the plan to implement the policy.

The policy should be reviewed at least every two years, with amendments being made as required.

Step 3 Identify Meters and Invoices

If you cannot measure energy, you cannot manage it. But energy is a measured resource and, therefore, can be managed. Two key sources of information are meters and energy invoices.

Meters

It is vital for the Energy Champion to locate the electricity and gas meters. Sites not on mains gas are likely to burn oil and/or LPG with their own metering. To convert oil, gas and LPG into kWh units, see conversion factors in Appendix 4.

Some meters will be easy to access but others less so: water meters are sometimes under a manhole cover outside the building. Photograph these meters and file in a log book with an explanation of how they can be accessed. The benefits of reading the meters are:

- It focuses attention on energy use.
- It helps future budget planning by having up-to-date accurate data.
- It avoids invoices based on estimated readings by the utility company.
- It provides the basis for an energy monitoring and targeting system (Step 4).

Meter Reading

The utility meters should be read on a weekly or monthly basis. This enables anomalies to be quickly identified and remedial action taken. Establish a routine so that meters are read on the same day of the week, and where possible, at approximately the same time. Make up and photocopy a log sheet for each meter, with a box for each reading to be taken with a space for date, time and each digit on the meter window. Here is an example for an electricity meter sheet for recording consumption.

Meter Sheet

Meter No: 324579651

Location: Cupboard adjacent to Cold Room

Function: Total electrical supply to site

Units: kWh

Date	Time	Reading (kWh)	Consumption (kWh)
30/3/12	0920	496241	-
27/4/12	1042	497794	1,553
25/5/12	1101	499387	1,593
22/6/12	0942	500867	1,480
20/7/12	0950	502554	1,687
17/8/12	1009	504057	1,503

Different meters will have different configurations; make up a log sheet to suit each one.

This allows the current reading to be quickly compared with the previous reading, reducing errors. This data can also be put on a spreadsheet. Also ensure that more than one person knows where the meters are and how to read them, to allow for holidays and sickness. For more detail on how to read meters, see Appendix 4.

Half Hourly Data

For larger sites with half-hourly (HH) electricity (and some gas), readings are sent to the utility company by a modem or radio link. However, a typical smaller butcher's will not be of sufficient size to have HH metering.

Consider Switching Energy Supplier

There are two ways to reduce energy costs:

- Purchase energy as cheaply as possible
- Maximise efficiency of use

The surveys showed that similar-sized butchers' shop were paying up to 50% more for their electricity unit rate, so if you purchase directly from gas and electricity suppliers it is worth going online to check if you are getting a good deal, and if not, switch supplier. There are a number of comparison websites which deal with small businesses. A good place to start is the energy watchdog, Consumer Focus. Have your energy data to hand in annual kWh or costs, name of current supplier and payment method.
See www.consumerfocus.org.uk/Scotland

If you are part of a larger group, this option is may not be open to you as utilities are likely to be purchased in a group contract.

Step 4 Monitor and Trend Energy Use

Using a simple form of Monitoring and Targeting (M&T), retail butchers can detect anomalies in energy and water consumption and resolve them. A basic monitoring approach will highlight the changes in consumption. The four main elements are:

1. Data collection
Take meter readings. If historical data is not available, use invoice data but watch for estimates.

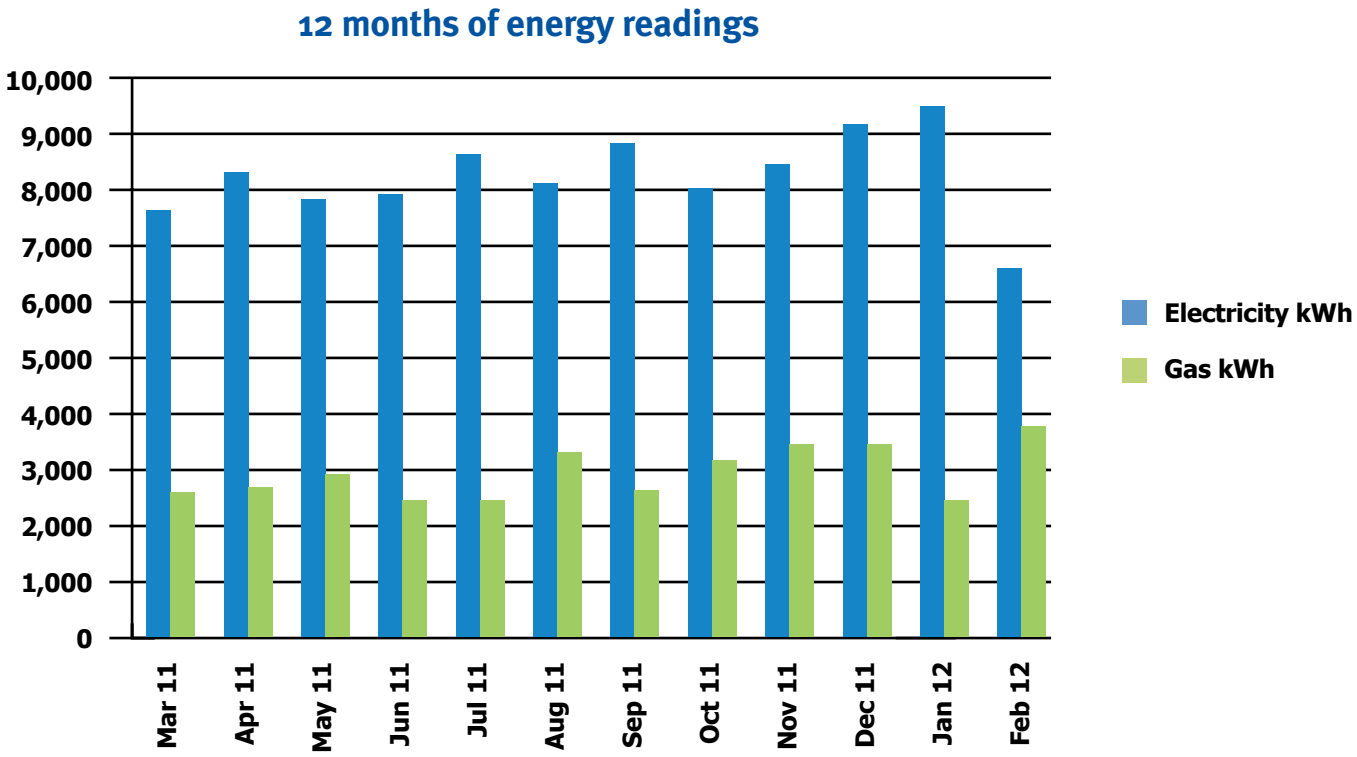
2. Analysis
Plot the meter readings for each month using a simple spreadsheet. Compare months year on year to see the actual-vs-expected consumption.

3. Report
Reporting needs to be clear and appropriate for those taking the remedial action.

4. Action
Action based on the reports leads to actual savings. Without action no savings will be made.

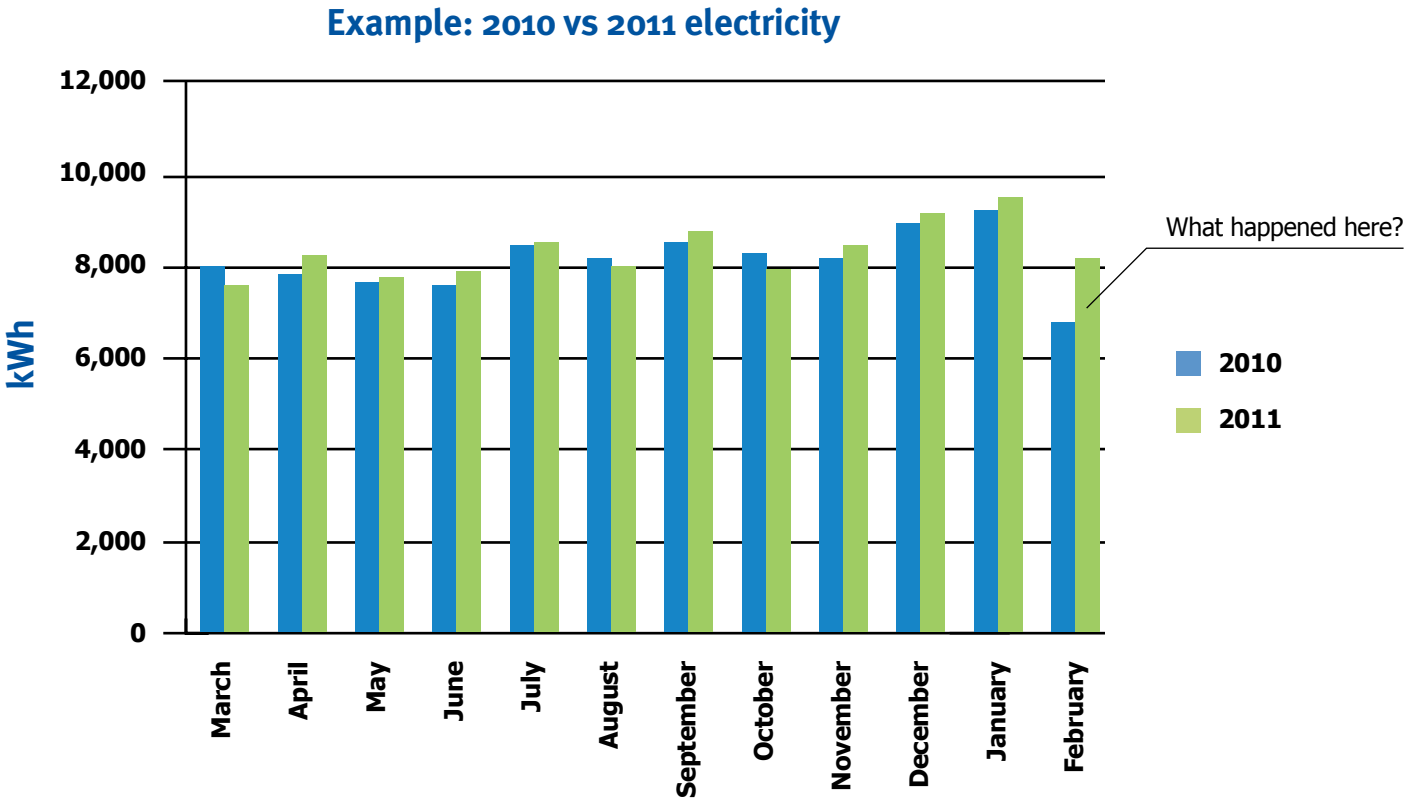
Monitoring Consumption

In Step 3 of the Action Plan, the importance of reading meters on a weekly or monthly basis was stressed. Some butchers do read meters, but very few analyse the data to see if energy use is changing. This is easily done by plotting weekly or monthly consumption on a graph. An example for a Scottish butcher is shown below for monthly electricity and gas. This data is from monthly readings taken at the premises.



Analysing data

For a retail butcher, a useful comparison to make is between the same months of different years, e.g. comparing the current month with the same month last year, especially for electricity which accounts for 90% of the overall energy bill. Another is to compare electricity consumption before and after refrigeration equipment is serviced, to check for any anomalies.



Where there is a marked difference, determine what changes there may have been in the business. As well as energy data, keep a record of the key drivers influencing energy use, so that changes can be correlated:

- Servicing of equipment – dates
- Installation of additional equipment – dates
- Rationalisation and removal of energy using areas dates
- Sales / stock levels
- Proportion of cooked goods (if cooking is carried out at the premises)

Ideally, read the meters on a weekly basis to identify changes and take action promptly.

Gradually increasing energy consumption can point to deterioration of equipment, and should be investigated. If there is no cooking on the premises, then the gas consumption will largely be driven by the weather.

Step 5 Conduct Regular Energy Walkabouts

The Energy Champion should conduct regular energy walkabouts in every area of the premises. The Champion can do this on his/her own or with another colleague. The idea is to walk from area to area, identifying and recording opportunities to save energy including maintenance issues and possible areas for investment.

The walkabouts should be at least monthly, with the findings recorded. If the walkabouts take place in normal working hours, it provides an opportunity for the Energy Champion to discuss energy issues with colleagues. This interaction can provide valuable insights into issues and opportunities.

Bad practice

Poor control of doors and of defrosting in a cold store – a dangerous combination. This evaporator is completely iced up, meaning that it will be providing a fraction of the necessary cooling, but with increased energy consumption.

Good practice

A freezer room with a nicely defrosted evaporator and a well insulated drain – as well as low-power fans. No evidence of ice.

Conducting energy walkabouts out-of-hours provides visible evidence of energy waste when the premises are unoccupied.

After a few walkabouts, the Energy Champion will be able to draw up an action list for each area and consult with colleagues. These lists will act as the basis for future walkabouts.

The walkabouts will also provide the basis for producing a list of low-cost and investment measures which can then be put in priority order for action.

Step 6 Implement Energy Saving Measures

By conducting walkabouts (Step 5), you can develop lists of possible opportunities. These opportunities will fall into three main categories:

- No-cost Actions.
- Low-cost Measures (up to £500).
- Investment measures (over £500.)

Most investment measures will pay for themselves in reduced energy costs. Some paybacks will be in days, and others could be six to eight years.

Below are typical opportunities in these categories for butchers.

Front of house

No-cost

- On failure, replace older T12 with T8 fluorescents.
- Only switch on air conditioning when really needed.
- Reduce lighting level in display area if sufficient natural light.
- Avoid overfilling display shelves as cold air spills out.
- Do not overstock cabinets.
- Use insulating blinds at night on display cabinets.
- Clean condenser coils regularly.
- Reduce lighting for stocking/cleaning outside trading hours.
- Ensure any spot lamps are directed at products not the floor.
- Make selective use of the most efficient lamps for night security.
- Switch off all display lighting after trading.
- If you have an open door policy, keep external doors open only during busy periods.
- Control use of over-door warm air curtains.

Low-cost (below £500)

- Upgrade T12/T8 fluorescents to T5.
- Replace tungsten lamps with CFL or LEDs.
- Replace tungsten halogens with LEDs.
- Clean lamps and fittings regularly.
- Fit 7-day timers to vending machines.
- Fit blinds to chilled display counters and use overnight.

Investment (above £500)

- Replace discharge lamps with lower wattage lamps and new control gear.
- When replacing lighting or equipment, select energy efficient options.
- Upgrade roof insulation.

Did you know?

For every 1°C the air conditioning is set below 24°C, electricity consumption and costs increase by 11%.

Freezers and Refrigerated Storage

No-cost

- Switch off lights in freezers and refrigerated rooms upon leaving.
- Minimise the number of times freezer doors are opened.
- Do NOT allow walk-in freezers or chillers to become a pedestrian short cut for staff.
- Operate freezers at -18˚C rather than any colder.
- Check cold rooms are at correct temperature.
- Rationalise cold storage space – whether chilled or frozen – to reduce the volume of space that needs cooling.
- Ensure evaporators are ice-free to work efficiently.
- Check that evaporator fins are not bent or dirty.
- Do not store product within 0.3m of the evaporator.
- Where condenser coils are accessible, clean regularly.
- Check filter dryer for blockages.
- Check whether evaporator fans run unnecessarily.
- Ensure good air flow within the cooled space – do not place product directly on the floor.

Low-cost (below £500)

- Repair door seals, and adjust latches to ensure a good seal.
- Fit blinds to chilled display counters to use overnight.
- Fit /repair strip curtains to reduce ingress of warm air when store door is opened.
- Replace damaged insulation on lines between evaporator and compressor.
- If evaporators are sited in a cold air stream then fit PVC air strips as a partial barrier.

Investment (above £500)

- Invest in electronic expansion valves.
- Consider purchasing 'defrost-on-demand' models when plant is due for replacement.

Back of house

No-cost

- Switch off lights in all unoccupied spaces.
- On failure, replace older T12 with T8 fluorescents.
- Only switch on cooking equipment when needed.
- Reduce domestic hot water temperature to between 60°C and 65°C.
- Discourage use of supplementary fan heaters.
- Switch off extraction fan once cooking processes finish.
- Only switch on cooking equipment when needed and switch off after use.
- Check immersion heater jackets fit properly, with no gaps.
- Check all time switches and controls are correctly set, including GMT/BST changeovers.
- Switch off computers/office equipment when not in use, particularly at closing time.
- Switch off toilet extraction fans when not in use.
- Close loading bay doors to reduce heat loss.
- Don't leave electrical appliances on standby at night.
- Label light switches to encourage staff to switch off.

Low-cost (below £500)

- Fit draught proofing on doors/windows.
- Seal any sources of draughts in the building fabric.
- Improve pipework, flange, valve insulation.
- Fit presence detectors to lights, in intermittently used areas with no natural light.
- Repair leaking or dripping taps.

Investment (above £500)

- Replace older boiler with new condensing boiler.
- Replace tungsten halogens with LEDs.
- Re-design layout so that cooking appliances and cooling appliances are not adjacent.
- Fit double glazing.
- Upgrade roof insulation.

Did you know?
Changing from T12 to T8 gives a 9% energy saving for the same light output. Also, T8 tubes are cheaper to buy and last longer.

External areas

No-cost

- The condensers should be located in as cool a place as possible and maintained properly.
- Improve air flow around condensers – remove any obstructions.
- Provide shading to enhance heat loss from condensers.
- Clean air cooled condensers and check for corrosion.
- Check signage and external lights are switched off when not required.
- Switch off exterior lighting during daylight hours.

Low-cost (below £500)

- Replace / re-design any enclosures that restrict air flow or do not provide shade.
- Fit photocell/timer control to signage and external lighting.
- Consult your supplier/service personnel on energy-efficient improvements.

Step 7 Engage employees and customers

Employee engagement

It is important for the Energy Champion to raise staff awareness of energy consumption and costs, and the opportunities for savings by no-cost measures.

Step 1 covered energy policy, which needs to be communicated to all employees clearly in meetings, on notice boards and on the intranet.

Employees can also make suggestions for saving energy, and this should be encouraged with ideas recorded and acknowledged.

Communication methods can include:

- Briefings at existing meetings.
- Discussions e.g. during energy walkabouts.
- Feedback from energy monitoring and targeting on progress.
- Notice boards and website.
- Posters, stickers, e-messages.
- Advice on home energy savings.
- Posting photographs of energy waste and good practice examples.
- Case studies on how other retailers have achieved savings.

Seven-Step action plan checklist

	Action	Yes / No	Comments
Step 1	**Appoint an Energy Champion** • Has a Energy Champion been appointed? • Does he/she have management support?		
Step 2	**Develop an Energy Policy** • Has an Energy Policy been drafted? • Is it signed by a manager/proprietor? • Has it been communicated to all employees? • Is it available to the public?		
Step 3	**Identify Meters and Invoices** • Have all utility meters been located? • Are the locations/access known to several staff? • Are meters read regularly? • Are utility invoices available? • Are invoices accessible on an ongoing basis? • Is switching supplier an option?		
Step 4	**Monitor and Target Energy Use** • Is meter reading data recorded on a spreadsheet? • Is an analysis made of consumption? • Are targets set for each week or month? • Are unexplained increases in consumption investigated? • Is corrective action taken?		
Step 5	**Conduct Regular Energy Walkabouts** • Do regular energy walkabouts take place? • Are the findings recorded? • Have walkabouts taken place in normal operating hours? • Have walkabouts taken place out-of-hours? • Has an action lists been drawn up?		
Step 6	**Implement Energy Saving Measures** Have a list of opportunities drawn up and invest (when appropriate) in the following areas: • Front of house. • Freezer/cold rooms. • Food processing/electrical equipment. • Hot water/fabric. • External areas.		
Step 7	**Engage Employees and Customers** • Has the Energy Policy been communicated to all employees? • Have employees been briefed on energy saving? • Are employees' suggestions sought on saving energy? • Are the energy bills and graphs shared with employees? • Is use made of normal communication channels to raise employee awareness? • Is the Energy Policy and progress on energy issues made available to the public?		

Appendix 1

Support for investment

CARBON TRUST ENERGY EFFICIENCY FINANCING

www.energyefficiencyfinancing.co.uk

Or call Carbon Trust Implementation Services on 0800 988 3718

ENERGY SAVING TRUST

www.energysavingtrust.org.uk/scotland

Services for business include small business loans

ENHANCED CAPITAL ALLOWANCE SCHEME (ECA)

The ECA scheme is designed to encourage business to invest in energy-saving equipment (plant and machinery only).

It provides 100% first-year capital allowances on investment in energy saving equipment against taxable profits of the period of investment.

The Energy Technology Criteria List (ETCL) is reviewed each year. Lighting, boilers and refrigeration equipment are included on the list.

For further details, see http:etl.decc.gov.uk

Appendix 2

Further sources of information

The following publications are available to download from the Carbon Trust website: **www.carbontrust.com** under tools, guides and resources section

CTG046 Refrigeration Systems

CTG808 Energy Savings in Retail Refrigeration

CTG055 Energy Surveys – a practical guide

CTG008 Monitoring and targeting

CTG056 Creating an awareness campaign

CTV001 Retail sector overview

CTV013 Hospitality sector overview

CTV045 An introduction to energy management

CTV049 Lighting overview

CTL063 How to implement draught-proofing

CTL064 How to implement roof insulation

CTL161 How to implement lighting controls

CTL163 How to implement lighting refurbishments

CTL164 How to implement LED lighting

CTL165 How to implement T5 lighting retrofits

PFL306 Employee awareness poster - Lighting

PFL308 Employee awareness poster – Refrigeration

PFL311 Employee awareness poster - Air conditioning

Other publications can be requested from the archive by emailing Carbon Trust: **info@customercentre.carbontrust.co.uk**

CTV002 Refrigeration – Introducing energy-saving opportunities for business

CTG 010 – Display lighting

CTL 028 How to implement T5 retrofit conversion kits

CTL 040 How to implement thermostatic radiator valves

CTL 041 How to implement compact fluorescent or LED spot lighting

CTL 044 Walk around checklist – Retail and distribution

PFL 313 Employee awareness sticker sheet – Assorted sizes

PFL 338 Employee awareness sticker sheet – Small stickers

This list is subject to change.

Institute of Refrigeration

www.ior.org.uk

British Refrigeration Association

www.feta.co.uk/bra

Food Storage & Distribution Federation FSDF
(formerly Cold Storage & Distribution Federation)

www.fsdf.org.uk/organisation.php

Appendix 3

Metering overview

Electricity meters

There are many different types of electricity meter, most of which are quite easy to read. However, some of the modern electronic meters require a little knowledge to obtain the readings. Typical of these meters is the Siemens Elster A1700 Code 5 Meter.

On the front panel is a button (yellow or blue). This button is for cycling of the register display, which can be viewed at any time. Each time the button is pressed, the display will show for 30 seconds and then revert back to the active register for that time of day.

There are many parameters available on such meters. For meter reading purposes, keep pressing the button until Rate 1 kWh is shown and record the display. If you have a dual rate tariff, such as Economy 7 or even a three rate tariff, then press the button again until Rate 2 kWh and Rate 3 kWh are shown. If in any doubt, contact your utility supply company.

Gas meters

Gas meters are easier to read as they generally will only have one register.

Record the index reading up to any decimal point, but include any clock face dials. The meter to the left reads

1 0 5 5 8 8 4 0

Make a note of the meter units, in this case cubic feet, newer meters are calibrated in cubic metres (m^3). This information is necessary for converting the reading into kWh. See Appendix 4 for conversion factors.

For meters reading in cubic metres (m^3), the consumption is multiplied by 11.0 to convert to kWh.

Water meters

There is usually one meter to read. On the example shown, only the digits in black need to be recorded. The red dials can be ignored. This meter measures in cubic metres (m^3), as stated on the face of the meter.

Energy invoices

Most butchers will receive paper or electronic invoices. They should be kept and filed for easy retrieval. If the butcher is part of a group, the invoices may well be sent to HQ. It is important for the Energy Champion to locate invoices for the last 12 months.

It is important to check that:

- the meter number on the invoice corresponds with that on the meter. Otherwise you may be paying for someone else's energy or vice versa.
- meter readings are actual, not estimates (E). Phone/email actual readings so that invoices are accurate.

Electricity invoices are useful in determining contract or tariff arrangements and may provide useful information on the ratio of the day to night units and other information. Night units are usually charged at a lower rate for seven hours overnight (start times vary with supplier). To benefit, you need to use 40% of your electricity during these hours.

Appendix 4

Conversion factors (energy)

Electricity is measured at the meter in kilowatt hours (kWh) and is billed in kWh.

Natural gas is measured at the meter by volume, usually cubic metres (m^3) but sometimes, on older meters, in cubic feet (ft^3). The utility bill explains how to convert from volume to kWh precisely, but a figure of 11kWh/m^3 is generally used for m^3.

It is usual to convert all types of energy to kWh which is the standard unit of energy used to compare all fuels. The following conversion factors are used:

Liquid fuel	kWh / litre
Gas oil	10.7
Fuel oil	11.7
Liquefied Petroleum Gas (LPG)	7.4

Gaseous fuel	kWh / m^3
Natural gas	11.0

If gas is measured at the meter in ft^3 then a conversion factor is needed to calculate m^3 and, from there, to kWh. For example if a premises uses 96,643 ft^3 of natural gas per annum, to calculate the kWh first convert to m^3.

96,643 x 0.0283 = 2,735m^3

Then convert to kWh:

2,735 x 11 = 30,085 kWh

Conversion factors (CO_2)

Carbon dioxide emissions

Burning hydrocarbon fuels of any type produces carbon dioxide emissions. Each fuel produces a different amount of CO_2 depending on its carbon content and, in the case of electricity, its method of generation. To calculate the emissions, multiply the energy usage in kWh by the appropriate factor from the table below, to give the CO_2 emissions in kg.

Energy type	CO_2 emission by fuel type for the UK	
	kg CO_2/kWh	kg CO_2/litre
Electricity	0.52462	-
Natural gas	0.1836	-
Fuel oil	0.2674	2.674
Gas oil	0.2786	-
LPG	0.2147	1.495
Diesel	0.2517	-
Petrol	0.2407	-

Due to the substantial contribution of carbon dioxide to the threat of global warming and the fact that most of the man-made emissions come from burning fossil fuels, an energy -saving programme is a necessary part of any reduction in greenhouse gas emissions.

Electricity is by far the highest in terms of kg of CO_2 per kWh. This is because electricity is mostly generated from burning fossil fuels and losses occur in the distribution system, making the overall process only about 35-40% efficient. Thus, when trying to reduce a site's environmental impact, reducing electricity use should always be a priority.

So in the Table in Section 2.2, the CO_2 figures are derived as follows:

Electricity 100,000 kWh x 0.52462 kgCO_2/kWh
= 52,462kg CO_2 (52.65 tonnes CO_2)

Natural Gas 33,700kWh x 0.1836 kgCO_2/kWh
= 6,187 kg CO_2 (6.18 tonnes CO_2)

Appendix 5

Energy Policy template

Energy Policy

ABC Butchers

Statement

- ABC Butchers is committed to using energy and water efficiently. By doing so, it aims to minimise expenditure and environmental impact, whilst maintaining food quality and hygiene standards
- ABC Butchers understand that there is a need to improve the way they use energy, to become more energy efficient and to reduce its carbon dioxide emissions.

Objectives

We will undertake the following:

- Commit resources to implementing this policy, by allocating responsibility for implementing this policy to our Energy Champion.
- Encourage all members of staff to ensure lights/equipment are turned off if not in use.
- Identify cost-effective energy efficiency measures and develop an action plan to implement them.
- Provide regular reports on our consumption and associated cost.
- Raise awareness of energy-related environmental issues.
- Provide training to employees on the efficient operation of heating, cooling, lighting, and electrical equipment.
- Set up an in-house energy monitoring and reporting system.
- Review this policy every two years to maintain our commitment to continual improvement.

Scope

The scope of this policy covers ABC Butchers' premises at Blandyke, Moss End and Forbury.

Date effective

This policy is effective from 1 June 2012.

This policy is due to be reviewed and updated every two years. It is available to the public.

Signed: Paul Duffy **Position:** Manager **Date:** 1 June 2013

Appendix 6

Terms & abbreviations

Air curtain	A steady stream of air (generated by a fan) that acts as a barrier to separate environments at different temperatures, without blocking the movement of people or objects. Air curtains are used in open-fronted refrigerated display cabinets to retain chilled air within the cabinet's volume while still allowing ready access to the stored products.
Ambient temperature	The temperature of the outside air.
Ancillary load	Load created by secondary equipment. In the case of refrigeration, this may be the additional heat created by lighting or evaporator fan motors in refrigerated space.
Automated leak detection	System that continually monitors for the presence of air-borne refrigerant gases and generates an alarm when excessive levels are detected, indicating leakage of refrigerants from the refrigeration system.
Compressor	A machine which raises the pressure of a gas, such as a refrigerant vapour. This will usually raise the temperature and energy level of the gas.
Condenser	A heat exchanger in which a gas, such as a refrigerant vapour cools and then condenses to liquid form.
Defrost-on-demand control	A control system that automatically initiates a defrost sequence when an appropriate amount of ice has built up on the evaporator surface.
Discharge	The high-pressure exit from a compressor.
Evaporator	A heat exchanger in which a liquid refrigerant absorbs energy from its surroundings and vaporises, producing a cooling effect.
Expansion valve	A valve through which liquid refrigerant passes and reduces in pressure and temperature.
Heat exchanger	A device for transferring heat between two physically separate streams.
Receiver	A vessel used to store a fluid (liquid or gas) usually at pressure. In a refrigeration system, the most common are high-pressure receivers, located after the condenser. Some systems also utilise a low-pressure receiver located before the compressor suction.
Refrigerant	The working fluid of the refrigeration system which absorbs heat in the evaporator and rejects it in the condenser.
Refrigerant leakage	Most types of refrigeration system are prone to some degree of refrigerant leakage. This can cause a loss of cooling performance, excessive energy consumption and damage to the environment.
Suction	The entry point for vapour into a compressor.
Superheat	A thermodynamic term referring to a vapour at a temperature above the boiling point at the prevailing pressure.
Vapour compression refrigeration cycle	A type of refrigeration cycle using a compressor to remove low-pressure vapour from an evaporator, where it has absorbed heat, and deliver it to a condenser at a higher pressure, where it rejects heat.
Water cooled condenser	A heat exchanger used to condense refrigerant vapour using cooling water.

List of abbreviations

Electricity meters

AC	Air Conditioning
AHU	Air Handling Unit
AMR	Automatic Meter Reading
CFL	Compact Fluorescent Lamp (low energy)
CO_2	Carbon Dioxide
DD	Degree Days
ECA	Enhanced Capital Allowance
HF	High Frequency
HVAC	Heating, Ventilation and Air Conditioning
kW	kilowatt, unit of power, rate at which energy is used in thousands of Watts
kWh	kilowatt hour, unit of energy, the amount of energy used in thousands of Watt hours
kWh/m²	Energy consumption in kilowatt hours/square metre of floor area
LED	Light Emitting Diode
LPG	Liquid Petroleum Gas - such as butane or propane
M&T	Monitoring and Targeting
SME	Small to Medium-sized Enterprise
TRV	Thermostatic Radiator Valve
T12	Tubular Fluorescent Lamp 12/8" (i.e. 1.5 inches) diameter running on conventional ballast
T8	Tubular Fluorescent Lamp 8/8" (i.e. 1.0 inch) diameter running on either conventional or HF ballast
T5	Tubular Fluorescent Lamp 5/8" diameter running on HF ballast
tCO2	tonne (1000kg) of CO^2
W	Watts, unit of power (1W = 1 Joule per second)
Wh	Watt hours, unit of energy consumption

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  - D G Lindsay & Son – Perth
  - David Faulds & Son Ltd – Kilmarnock
  - HM Sheridan Ltd – Ballater
  - S Collins & Son – Muirhead
  - Scott Brothers – Dundee
  - T & R Skinner – Stirling
  - Thornhill Stores – Dumfries

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