



Effective energy management for business



Preface

Reducing energy use makes perfect business sense; it saves money, enhances corporate reputation and helps everyone in the fight against climate change.

The Carbon Trust provides simple, effective advice to help businesses take action to reduce carbon emissions, and the simplest way to do this is to use energy more efficiently.

This overview for businesses introduces the main energy saving opportunities associated with effective energy management and demonstrates how simple actions can save energy and reduce energy bills.

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Introduction

A concise guide to energy management

Effective energy management is a key part of managing your business and can help you to cut energy waste and reduce cost. By metering and monitoring energy use you will be able to quantify the energy savings that you achieve over time and support energy efficiency investment projects with reliable data.

Inspire behaviour change in your organisation by creating an energy awareness scheme and encouraging staff to get involved.

Benchmarking energy consumption and tracking usage helps identify ways to improve performance and keep on top of maintenance issues which may not otherwise have been noticed.

Summary of top tips and actions

Actions	Top Tips
1. What gets measured gets managed	Start reading your energy meters on a regular basis and analyse your energy performance against your competitors and the energy intensity of your production.
2. Purchasing power	Diarise an action for when your energy contracts expire to obtain competitive quotations from several suppliers in advance of the termination notice period.
3. Switch on to switching off	Take the 'switch on to switching off' challenge (see page 9).
4. Employee engagement	Participate in the three stages of employee engagement: research and development, delivery and monitoring.
5. Invest to save	Check to see if the top three energy saving technologies can help your company; LED lighting, refrigeration and air compression.
6. Smart money	Write a procurement policy that uses 'life cycle costs' to ensure that the energy efficiency of equipment influences purchasing decisions.

This guide will be useful for all businesses looking to control their energy costs and is particularly aimed at small and medium sized enterprises (SMEs).



What gets measured gets managed

Manage energy as a controllable resource to prevent waste

Proactively managing energy as a controllable resource can deliver substantial energy cost savings. Regularly reading your energy meters to determine 'out-of-hours' usage and tracking energy performance indicators can offer additional savings.

Monthly meter readings are sufficient for most SMEs to track usage and serve as a useful accuracy check of utility bills. Significant changes in energy consumption over comparable periods should be investigated to understand what caused the change. In particular, where energy usage has increased due to non-adherence to procedures, corrective action should be taken e.g. refresher training for staff or displaying of staff awareness posters/stickers to remind them to turn-off lights and equipment when not required.

It is common to relate energy consumption to the floor area of the occupied building to derive an energy performance metric showing the kilowatt-hours of energy used per square metre of floor area, abbreviated to kWh/m². These should be calculated separately for electricity and gas usage. Calculating your business's energy intensity in this way allows you to [compare your energy performance](#) against that of over 330,000 SMEs in the UK, summarised in Figures 1 & 2.

You should bear in mind that these figures represent the average energy performance and that many businesses achieve much lower levels of energy intensity through good energy management and the use of energy efficient equipment.

For manufacturing businesses, we recommend that your energy consumption be related to your production in order to track the energy used to create a unit of output e.g. kWh/kg. Doing so will flag anomalies for investigation and correction, and allow you to track the effect of your energy management efforts and investments in more efficient equipment.



Building Type	Building Floor Area						
	0-50 m ²	50-100 m ²	100-250 m ²	250-500 m ²	500-1,000 m ²	1,000-5,000 m ²	5,000+m ²
Factories	27	26	33	38	41	52	120
Offices	130	76	68	71	83	120	216
Shops	192	162	130	116	125	134	235
Warehouses	37	19	31	34	33	29	30
Restaurants	317	259	212	273	-	-	-
Other	-	62	52	56	63	61	33

*Figure 1: Average electricity performance indicator - kWh/m²

Building Type	Building Floor Area						
	0-50 m ²	50-100 m ²	100-250 m ²	250-500 m ²	500-1,000 m ²	1,000-5,000 m ²	5,000+m ²
Factories	460	108	67	57	63	84	126
Offices	596	183	152	138	130	122	-
Shops	420	230	121	73	69	82	-
Warehouses	631	134	69	52	47	42	32
Restaurants	575	533	452	354	-	-	-
Other	-	229	160	139	131	111	-

*Figure 2: Average electricity performance indicator - kWh/m²

*Data source: UK Government, Non-domestic national energy efficiency data framework (NEED), energy statistics 2006-2012

Action

Start reading your energy meters on a regular basis. Analyse your energy performance compared to your competitors, and the energy intensity of your production. Monthly readings and analysis is usually appropriate for small energy users, however more frequent readings or Smart Metering will improve the quality and depth of the analysis and allow for a more timely response if corrective actions are needed.

Purchasing power

Manage your energy supply contracts

Good energy management starts with ensuring that your business is buying energy at the best possible price. You should ensure that you always seek competitive quotations ahead of contract renewal dates and never allow contracts to 'roll-over' or default to a 'standard variable tariff'.

Also:

- If you're on a multi-rate tariff, make sure you schedule processes and operations to make best use of the cheaper electricity rates e.g. by charging forklift truck batteries at night and, if on a seasonal time of day tariff, avoid - as far as possible - using electricity during high charging periods e.g. 16:00-19:00 hours, Monday-Friday;
- If you're on a maximum demand tariff or charged according to your supply capacity, check your bills to ensure your contracted availability isn't greatly in excess of your maximum demand. Also check your Power Factor; if it's significantly below 0.95, there may be a business case to update or install new power factor equipment.

Of course, using fossil-fuel based energy has a negative impact on the environment and an increasing number of companies are committing to purchasing green energy as a way of reducing their carbon emissions. Many electricity suppliers offer contracts for guaranteed 100% renewable energy which is one way for businesses to demonstrate they are taking action to reduce their carbon emissions.

Action

Diarise an action for when your energy contracts expire to obtain competitive quotations from several suppliers in advance of the termination notice period.

Request quotations for 100% renewable electricity and ask the suppliers to detail how they can guarantee this.



Switch on to switching off

Implement simple 'start-up' and 'shut-down' procedures

Carbon Trust has analysed in detail the energy consumption of thousands of UK businesses. We routinely observe unnecessary and wasteful energy usage by systems and equipment outside of operational hours, the vast majority of which is avoidable with the implementation of simple 'opening/start-up' and 'closing/shut-down' procedures.

A time investment of just a few hours to write-up and establish start-up and shut-down procedures has saved many business thousands of pounds annually. Beyond direct energy savings, following operating procedures can also prolong the economic life of equipment and reduce maintenance costs.

Figure 3 shows typical changes in the energy consumption profile over a day before and after implementing effective operating procedures and energy efficiency improvements, with reductions in the out-of-hours (baseload) and peak energy demands.

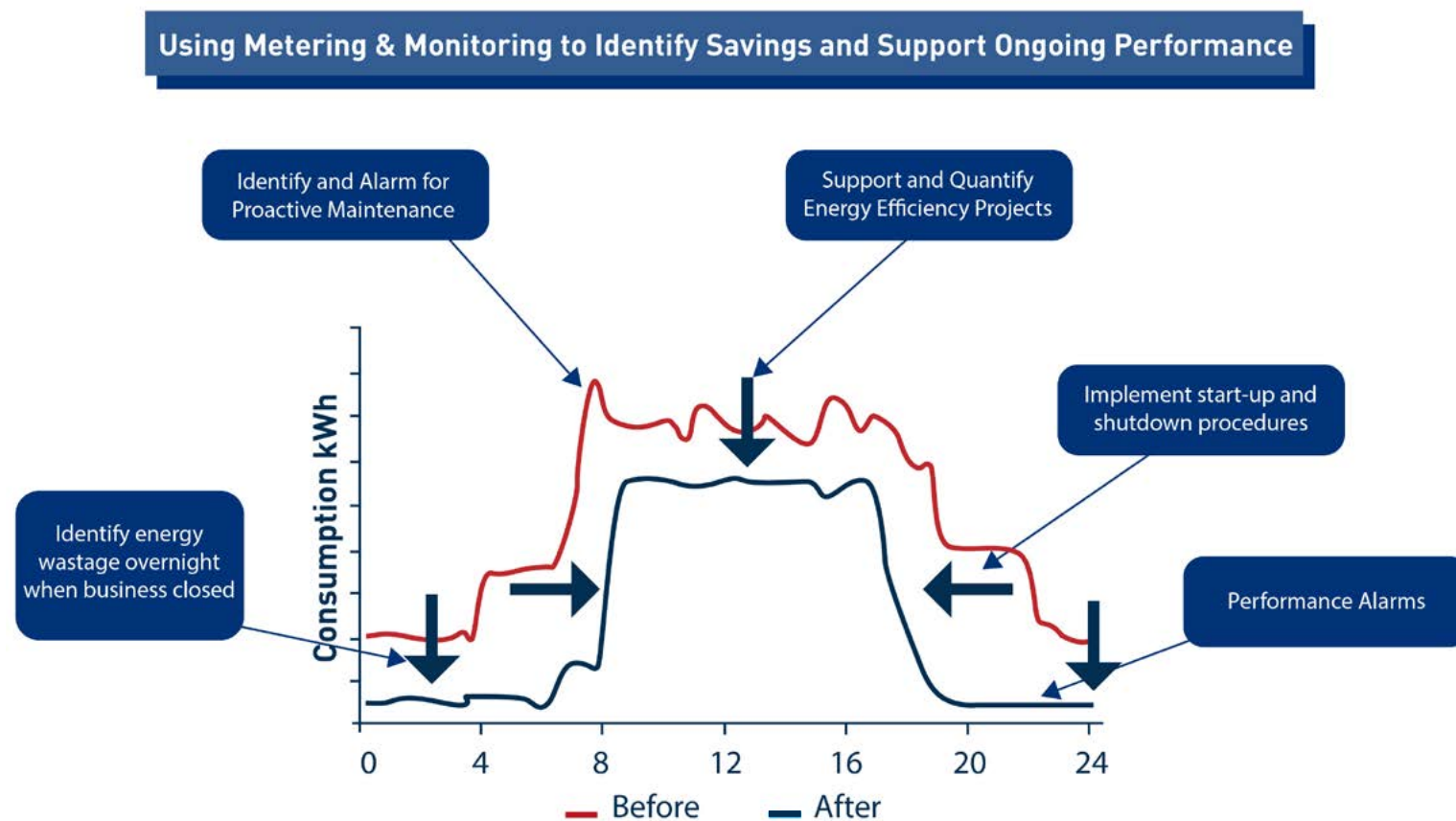


Figure 3: Typical electricity consumption profile before and after energy management procedures

Bottom-line annual energy cost savings can often be achieved with no capital expenditure. So, if you don't already have procedures in place, systematically review your systems and energy using equipment to:

- 1) Record the location of the ON/OFF switch/controller on a floor plan and label the equipment/system it controls.
- 2) Colour code each switch/controller using a 'traffic light' system to show (for example):
 - GREEN: SWITCH-OFF at closing time or at end of a production run
 - AMBER: Check with before switching-off
 - RED: Leave switched ON; critical equipment
- 3) Ensure that critical systems that need to be left on are correctly identified. Agree what equipment may be switched-off depending on production requirements.
- 4) Write an easy-to-follow 'opening/start-up' checklist itemising the systems and equipment to be switched on. This could include photographs and instructions, a single site procedure or separate procedures for different buildings or functions as appropriate for your site.
- 5) Do the same for 'closing/shut down' at the end of production times.
- 6) Brief staff on the procedures and include in the induction for new staff. Carry out spot-checks to ensure compliance and provide refresher training as necessary.

Action

Estimate how much energy your business is using when its closed or 'out-of-hours' by:

1. Recording the meter reading(s) at the close of the day, ideally before a weekend or public holiday;
2. Recording the meter reading(s) again at the opening of the next working day
3. Subtract the two readings and apply any conversion or scaling factors to determine the number of energy units consumed out of hours (kWh).
4. Multiply by the unit cost of energy (£/kWh) and extrapolate to estimate the annual cost the out-of-hours energy.

Action

Take the 'switch on to switching off' challenge:

- Week 1 – Record opening/closing meter readings
- Week 2 – Write-up and implement 'standard operating procedures' for opening & closing
- Week 3 – Record opening/closing meter readings and calculate the energy and cost savings



Employee engagement

Engaging employees on energy use can contribute to a more profitable company, a happier workforce and a better brand.

Engaging employees on energy use in your organisation can bring multiple benefits:

- 1. Energy savings:** A well-designed and implemented behaviour change programme can lead to energy savings of approximately 3-5%. Saving energy saves money and reduces an organisation's carbon footprint.
- 2. Employee satisfaction:** Participation in employee engagement schemes can make employees feel valued. Knowing that their organisation cares about sustainability can improve employee satisfaction and help retain staff.
- 3. Reputation:** Taking action on sustainability shows that an organisation cares about the environment. This can improve your brand and help attract potential employees and customers.

There are three key stages to successful employee engagement:

- 1. Research & planning:** It is essential to do your research and create a plan of action before launching your engagement activities. Every organisation is different, so

you need to understand your company's needs and abilities in order to engage your employees accordingly.

- 2. Delivery:** This is the main stage where the engagement will take place. Throughout this stage you will need to refer back to your plan, but you can update this as you learn what works well and what doesn't.

In practice: You will need to use the right communications channels and target your messages.

- 3. Monitoring:** Review awareness following any activity, and always allow room for feedback. Don't forget to close the feedback loop for staff and let them know the impact of any changes they've made.

In practice: After the campaign period has passed, you should communicate the results to employees and request feedback.



Stage of Engagement	Top tips
Research and planning	Energy policy and goal setting An energy policy states the business' ambition and commitment to energy management. It is important to set achievable targets to generate a positive message about energy saving and create further support for future activities.
	Senior support This is particularly important in smaller organisations, where the individuals in charge can really set the tone, culture and influence working practices.
	Available resources Think carefully about how much time your engagement will take and the resources needed to achieve a positive impact.
Delivery	Timing
	Target audience Make sure you are targeting the people whose behaviour you actually want to influence most. For example, focus on employees carrying out the
	Messages Try to make your messages clear and closely aligned with existing goals and staff motivations. The most effective messaging is values-led and tailored to environmental or financial values for example.
Monitoring	Feedback
	Maintaining momentum One of the most important factors in securing long-term commitment from staff is to provide effective feedback on the outcomes and achievements. Communicate not just that the engagement campaign has happened, but what the impact on behaviour and energy use has been.

Invest to save

Investing in new, modern, energy efficient equipment and systems can be highly cost effective and many thousands of businesses are doing just that.

These are the top three energy saving technologies as supported by the Carbon Trust's Green Business Fund Capital Contribution scheme.

1. LED lighting: By a very large margin, upgrading to LED lighting is the top energy saving measure SMEs are investing in and for good reason. The business case for LED lighting is compelling, with the average simple payback period of under 2.5 years across over 1,000 LED projects supported by the Carbon Trust. LED lighting offers many advantages over other types of lighting including: power and energy savings (typically leading to a > 65% reduction in energy consumption), automatic controls and reduced maintenance costs.

2. Refrigeration: Commercial refrigeration accounts for a high percentage of energy consumption within a wide range of businesses including supermarkets, convenience stores, restaurants, hotels, retail food outlets, pubs and clubs. Modern, energy efficient refrigeration display cabinets outperform ageing equipment. Look to incorporate the following technologies: more efficient compressors, evaporative condensers, doors for open-fronted cabinets, LED

lighting and EC fans. The average simple payback period across 50 SMEs supported by the Carbon Trust to upgrade their refrigeration equipment is 4.5 years based on energy cost savings alone, without taking maintenance and refrigerant cost savings into account.

3. Compressed air: Compressed air is very versatile and almost all industrial businesses use it – in fact, over 10% of electricity supplied to industry is used to compress air. However, it is a very expensive source of energy typically requiring 10 kWh of electricity to produce just 1 kWh of useable compressed air meaning that it commonly costs over £1.00/kWh! So, if you use compressed air you should:

- a. Check to see if there are suitable, more cost-effective alternatives such as use of electric or battery powered hand-tools and the use of a vacuum generator for 'pick and place' applications;
- b. Routinely test for air losses and leakage from the system and repair all identified leaks. The leak rate on an unmanaged compressed air system can be as much as 40-50% of the generated output;

- c. Switch compressors 'off' when possible, as idling compressors can consume 20-70% of their full load power;
- d. Review the compressor air intake and where possible use a generously sized ducting to introduce clean, dry outside air into the compressor. Also, regularly check the condition of the air filters as dirty or obstructed filters increase energy usage.

Action

If you haven't already upgraded to LED lighting, contact two or more of the suppliers listed on the Carbon Trust's [Green Business Directory](#) for a competitive quotation to upgrade your lighting to LED with appropriate automatic controls or search for other energy efficient equipment suppliers.

Smart money

Make step change improvements by investing in energy efficient equipment based on whole-life costings.

The previous section illustrates how investing in new, modern, energy efficient equipment can deliver significant bottom-line savings. However, new equipment is often purchased as a result of failure or breakdown which can lead to a rushed purchase of a more costly, higher energy using replacement. Therefore, every business should have a procurement policy to ensure that purchasing decisions consider the most suitable energy efficient equipment available.

The policy should contain a commitment to procure key assets on the basis of a 'life cycle cost assessment' that takes energy usage and cost into account over the expected lifetime of the product or system. This helps to ensure that purchases are made on a 'best value' basis and not automatically on the lowest initial capital cost which can often turn out to be a more expensive option over the life time of the asset.

As part of the procurement policy, include a register which identifies your business' key energy using assets (e.g. heating boilers, compressors, motors and drives), their date of purchase/installation and their anticipated year of replacement. Identify the required specifications for their

replacement (e.g. a new compressor should be a variable-speed machine incorporating an IE4 motor) as well as up-to-date contact details of vendors capable of providing high-quality, low-energy equipment at competitive prices. Use this register to plan ahead to invest in energy efficient assets and achieve step change improvements.

Action

Write a procurement policy that uses 'life cycle costs' to ensure that the energy efficiency of equipment influences purchasing decisions. Make sure you specify and purchase equipment that is [Energy Technology Product List](#) compliant and when installed claim your [Enhanced Capital Allowances](#).

Heating, ventilation and air conditioning (HVAC) can account for a large proportion of money spent by an organisation on energy. When refurbishing or putting in a new HVAC system, it pays to specify the most efficient system possible. Remember that day-to-day running costs may soon outweigh the capital costs of installation and so the more efficient the system, the less expensive it will be to run. Take time to understand your heating and cooling needs and select the most appropriate HVAC system for your requirements. Even small adjustments to the system and controls can significantly improve the working environment and prevent energy wastage.

See our [HVAC guide](#) for more information.

Further information

There are several technology and sector guides on the Carbon Trust's website to help businesses identify energy efficiency investment opportunities.

Other Carbon Trust guides for further information - Click below

- [Better business guide to energy saving](#)
- [Lighting](#)
- [Refrigeration](#)
- [Compressed air](#)
- [Monitoring and targeting](#)
- [Making the business case for a carbon reduction project](#)
- [Employee awareness and office energy efficiency](#)
- [Heating, ventilation and air conditioning](#)

Glossary of terms used

Maximum demand: The highest level of electrical demand monitored in a particular period usually for a month period. Usually measured as kVA or kW.

Multi-rate tariff: Energy contracts structured to provide differing electricity unit costs for different periods of the day.

Power Factor: The ratio of the real power to the apparent power in the circuit. A load with a low power factor draws more current than a load with a high power factor for the same amount of useful power transferred. Utilities usually charge a higher cost to industrial or commercial customers where there is a low power factor.

Standard variable tariff: A supply contract with an indefinite length that does not have a fixed-term applying to the terms and conditions. It's an energy supplier's basic offer and data from OFGEM shows that standard variable tariffs are usually more expensive than other deals available in the market.

Your next steps

There are many easy low and no-cost options to help save money and improve the operation of your site

Step 1: Understand your energy use

Look at your site and identify the major areas of energy consumption. Check the condition and operation of equipment and monitor the power consumption over say, one week to obtain a base figure against which energy efficiency improvements can be measured.

Step 2: Identify your opportunities

Compile an energy checklist. Walk round your building and complete the checklist at different times of day (including after hours) to identify where energy savings can be made.

Step 3: Prioritise your actions

Draw up an action plan detailing a schedule of improvements that need to be made and when, along with who will be responsible for them.

Step 4: Seek specialist help

It may be possible to implement some energy saving measures in-house but others may require specialist assistance. Discuss the more complex or expensive options with a qualified technician.

Step 5: Make the changes and measure the savings

Implement your energy saving actions and measure against original consumption figures. This will assist future management decisions regarding your energy priorities.

Step 6: Continue to manage your office's energy use

Enforce policies, systems and procedures to ensure that your business operates efficiently and that savings are maintained in the future.

Go online for more information

The Carbon Trust provides a range of tools, services and information to help you implement energy and carbon saving measures, no matter what your level of experience.

Website – Visit us at www.carbontrust.com for our full range of advice and services.

➤ www.carbontrust.com

Tools, guides and reports – We have a library of publications detailing energy saving techniques for a range of sectors and technologies.

➤ www.carbontrust.com/resources

Events and workshops – We offer a variety of events, workshops and webinars ranging from a high level introductions to our services through, to technical energy efficiency training.

➤ www.carbontrust.com/events

Small Business Support – We have collated all of our small business support in one place on our website.

➤ www.carbontrust.com/small-to-medium-enterprises/

Our client case studies – Our case studies show that it's often easier and less expensive than you might think to bring about real change.

➤ www.carbontrust.com/our-clients

The Carbon Trust Green Business Fund – is an energy efficiency support service for small and medium-sized companies in England, Wales and Scotland. It provides direct funded support through energy assessments, training workshops, and equipment procurement support.

➤ www.carbontrust.com/greenbusinessfund

SME Network - Join a community of over 2000 small and medium-sized businesses to discuss your strategy and challenges to reducing carbon emissions and improving resource efficiency. Sign up for free to share knowledge, exchange useful resources and find out about the support and funding available in your area, including the details of your local energy efficiency workshops.

➤ www.carbontrust.com/resources/tools/sme-carbon-network

The Carbon Trust is an independent company with a mission to accelerate the move to a sustainable, low-carbon economy. The Carbon Trust:

- advises businesses, governments and the public sector on opportunities in a sustainable, low-carbon world;
- measures and certifies the environmental footprint of organisations, products and services;
- helps develop and deploy low-carbon technologies and solutions, from energy efficiency to renewable power

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