

Controlling energy use in buildings

This action-based resource pack complements other Best Practice Guides.

The Report and checklists will help you to:

- start controlling energy use
- review the progress of your campaign
- maintain control and boost your profits



ENERGY EFFICIENCY

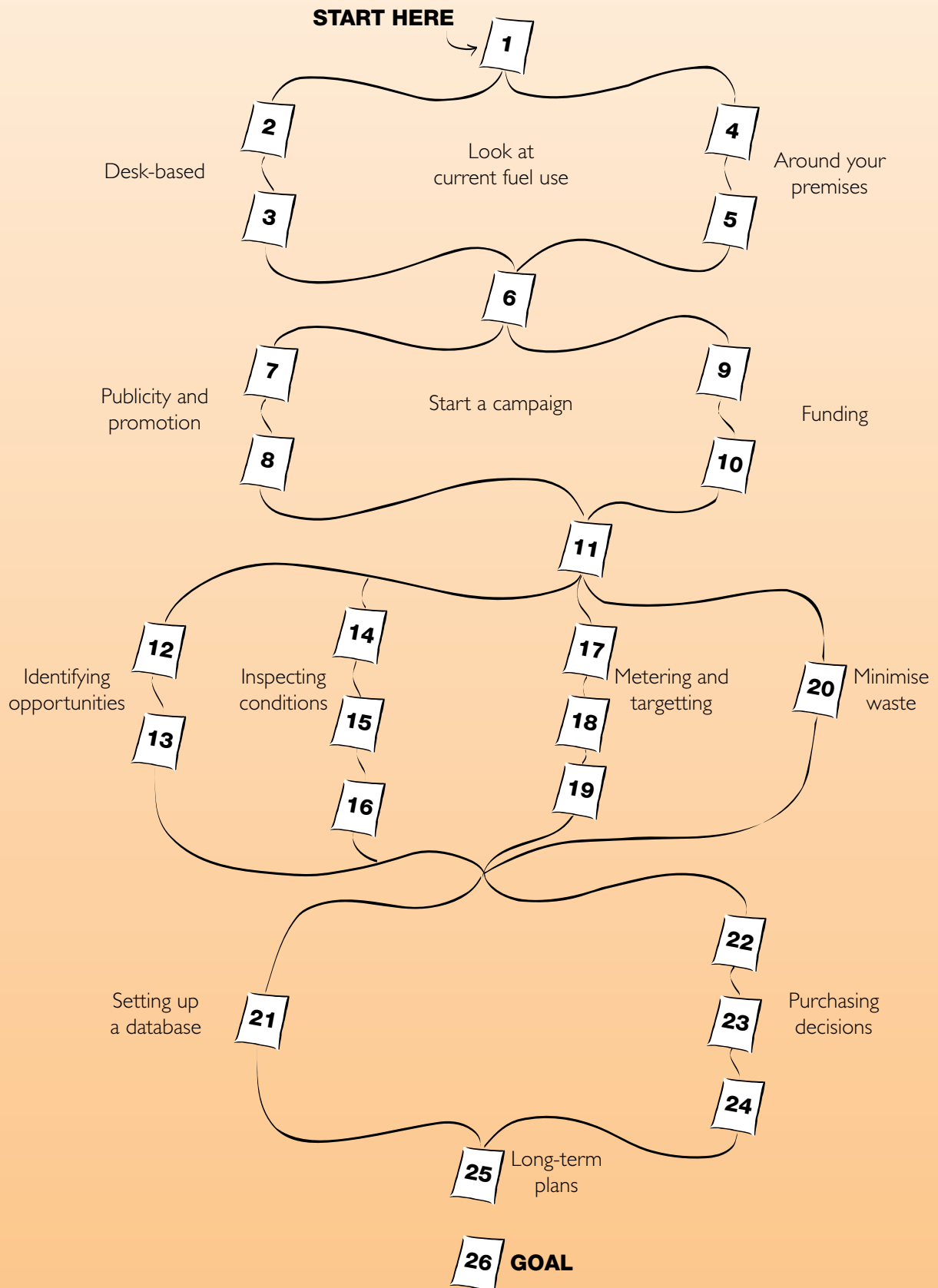
BEST PRACTICE PROGRAMME

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Controlling energy use – route map

There are many ways to gain and maintain control of your energy consumption. The route you choose depends on how well you are currently controlling energy use. The map below is one route to achieving your goal. Find out the best route for you and your organisation by completing the inserts.



Have you improved control over energy use?

INTRODUCTION

Introduction

Energy efficiency can improve profitability, and it benefits everyone by using the Earth's resources wisely. Using energy efficiently will:

- reduce your fuel bills and boost your profits
- improve staff comfort and morale
- benefit the environment and your environmental reputation.

Most organisations have the potential to achieve energy and water cost savings of 10-15% with little effort. Savings of 20% or more are possible. There is firm evidence that companies which achieve the best results in energy management do so because they have successfully integrated energy control into their general management processes.

With this in mind, the Department of the Environment's Energy Efficiency Best Practice programme has produced a range of documents to provide guidance on energy management in buildings (see page 16 for details). Good Practice Guide 200 'A strategic approach to energy and environmental management' (GPG 200) introduces a five-step approach to energy management, and covers the theory of energy management which will be familiar to many organisation where modern management practices have been adopted.

However, not all organisations have well-defined management processes. This Report, and the inserts that accompany it, provides an action-based resource pack to complement information in other Guides. It is intended for those who are just starting out to gain control over energy use and have little expertise or experience, as well as those who have already taken the basic steps and now want to adopt a more sophisticated approach.

The inserts have been developed as a result of extensive experience gained with delegates in energy management workshops. Together, this Report and the inserts will provide you with the means to introduce energy efficient practices into your buildings. You may even find that the success of the management approach can be adopted for other aspects of your business.

Start controlling energy use

When you decide to investigate energy use in your organisation, there are two questions you need to ask:

- how much time should I spend
- what should I be doing first?

Before reading further, you should complete Insert 1.

Section A links expenditure with time required for energy management. This is based on guidelines from The Audit Commission, which estimates that for every £1 million of energy expenditure you will need at least one full-time member of staff to manage energy usage. In other words, you need to spend one hour per week per £25 000 spent on energy. Of course, there is nothing to stop you spending more time on energy management. (Although the times given are only guidelines, bear in mind that the cost of delaying an energy efficiency programme can be high.)

Section B helps you decide what to do first:

- If you answer 'No' to all the questions you will benefit from working through the whole document from page 6 including all the inserts.
- If you answer 'Yes' to all the questions you can skip to page 10, and Insert 12 where we begin to look at maintaining control and more advanced energy management issues.
- If you have a combination of 'Yes' and 'No' answers, you may still find it useful to read through this Report but you will need to complete only the inserts indicated by your 'No' answers in *section B*.

Some technical input will be needed to answer some of the questions on the inserts. If you are unable to complete an insert, seek advice from someone within your organisation who knows more about the particular subject.

Although this document is clearly divided into two parts - gaining control and maintaining control - you will see that some inserts are relevant to both sections. It may help to photocopy some inserts; and remember that you may wish to repeat an exercise, or use an insert again to review progress.

2 WHERE TO BEGIN

Part 1 Gaining control over energy use

The best place to start your energy management campaign is in your office, scrutinising your fuel and water bills. These contain three key pieces of information:

- a meter reading date
- the quantity of energy supplied
- its cost.

Armed with this information for a 12-month period or more you can begin to analyse the patterns and trends in your use of fossil fuel and electricity. This will help you to:

- gain a better understanding of the relationship between weather, occupancy and consumption
- assess whether your pattern of consumption is in line with what you would expect
- report trends to management with proposals for improvements
- identify (with the help of energy walk-rounds) where most energy is used and what opportunities there are to reduce waste
- calculate the amount you save from introducing good housekeeping.

Insert 2 will help you analyse your fuel use. If you do not have access to past bills, start today by keeping a monthly record of your consumption for each fuel and the costs involved. Better still read meters weekly – this enables better analysis to detect waste.

Benchmarking

At the start of your campaign it will be useful to have some idea of the potential for improvement. This can be achieved by benchmarking - comparing your consumption against established norms for your type of building.

Benchmarking will also help you to:

- identify which fuel(s) are likely to produce the greatest savings
- compare the performance of similar buildings across your estate of premises
- measure your progress in controlling energy use.

Insert 3 will guide you through the process, and provides 'good' and 'poor' performance data against which you can compare your consumption.

Even if your consumption is in the 'good' category there may still be opportunities for cost-effective improvement.

More information about comparing your consumption with industry norms, and correcting for exceptional weather and occupancy can be found in the 'Introduction to energy efficiency' series (see Further Information, page 16).

Energy walk-rounds

You cannot plan how you are going to control energy costs in your organisation unless you know how energy is being used. One simple and quick way to start gathering this information is to make a regular tour of inspection around your building - an energy walk-round.

A regular walk-round will help you:

- avoid expensive breakdowns and repair bills by keeping plant and equipment well maintained
- check that wasteful practices are gradually eliminated and do not recur
- demonstrate your commitment and the importance placed by your organisation on keeping energy costs under control
- identify ways to reduce the impact of your organisation's energy consumption on the environment.

Inviting staff to accompany you on an energy walk-round in their part of the premises gives you an opportunity to:

- raise their awareness of energy consumption
- agree good housekeeping measures appropriate for their accommodation.

You will need a maintenance checklist to conduct an effective walk-round (insert 4) and a good housekeeping checklist (insert 5).

WHERE TO BEGIN

Good housekeeping measures, such as turning off lights when rooms are unoccupied and keeping radiators free of obstructions, can achieve worthwhile energy savings of 10% or more and cost nothing to implement. The key is to change attitudes and lifelong habits by making staff aware of energy use and motivating them to cut out waste.

As well as lower energy costs and a better motivated workforce, the benefits include a cleaner environment. On average, every £75 of energy saved avoids the release of one tonne of carbon dioxide into the atmosphere.

Water usage

Water is a valuable natural resource which we should use efficiently. If you have a metered water supply you will, no doubt, check your bills. But even if your supply is not metered, you should remember that wasting water can have an effect on your fuel bills. For example, dripping hot water taps waste water **and** the energy taken to heat it. Look at the places where water is used when conducting your energy walk-round. Are you heating and storing too much water? Would local water heaters rather than central boilers be more appropriate for your needs? Have your water heaters been serviced regularly?

3 STARTING A CAMPAIGN

Identifying opportunities and responsibilities

Overall, the main routes to achieving savings are:

- 1 good housekeeping
- 2 improving maintenance and operation
- 3 identifying opportunities for repairs, replacement and refurbishment.

If you assess the pattern of consumption in your premises and carry out an energy walk-round, you will be able to identify whether your energy costs are dominated by:

- providing space heating (including or excluding heating for hot water)
- running mechanical plant (such as ventilation, refrigeration, fans and pumps)
- running equipment (such as computers and copiers).

The end use which dominates energy costs in your building probably represents the area in which improvements are most likely to deliver significant energy and cost savings.

At the beginning of your energy efficiency campaign it is important to take actions that will achieve savings quickly. Early savings must be quantifiable and visible to ensure management confidence.

Based on the evidence you have gathered:

- choose an end use (such as lighting, heating or hot water) that can deliver immediate savings
- identify who is responsible for this energy use
- work with them to introduce improvements
- try to identify any savings that will arise.

It is best to proceed in this order, introducing no- and low-cost measures first. In addition, concentrate on electricity use before other fuels. Remember that savings from heating may accrue slowly and may be difficult to prove because of uncertainties about the impact of prevailing weather conditions.

Insert 6 will help you to identify where energy is used, which fuels are used and who has control.

Later, when you wish to make further reductions in avoidable waste, insert 6 can be photocopied and used to make a more rigorous assessment of where energy is used and which fuel each end use requires.

Raising staff awareness

Reducing energy consumption is not something you can achieve on your own. You will need to involve staff right across your organisation. One of the most effective ways of achieving this is through a publicity campaign to raise awareness and give advice on saving energy.

Staff need frequent motivation if good practices are to continue, so any campaign will need to be sustained by new posters, stickers, notices or newsletter articles. Keeping staff informed of progress will also maintain momentum and help them to see that improvements are being achieved.

Suggestion schemes or competitions to design a poster or logo may increase staff involvement in the campaign. Letting staff decide how some of the savings should be used will also act as an incentive. You may find it helpful to put yourself in their shoes and ask 'What's in it for me?'

People are motivated by a range of factors, not only rewards and incentives, but also challenges, loyalty to the organisation, the approval of work colleagues and personal satisfaction. Even so, if the organisation retains the benefit of all the savings you may leave staff with little or no incentive to save money for the organisation.

At this stage, you need only use the shaded areas of insert 7 to help you launch and sustain a staff awareness campaign. (Several Best Practice publications are available to assist your campaign. See Further Information, page 16, for details.)

STARTING A CAMPAIGN

Publicity and promotion

Publicity and promotional campaigns will help to keep up the momentum of your campaign.

- Change the location of posters and commission new ones to maintain variety.
- Rewards and incentive schemes - whether individual or group - may be appropriate in some organisations.

Working with staff to win their backing and commitment will involve communicating with people at all levels in your organisation. How you set about keeping them informed depends on who they are and what they need to know. The way you approach them therefore depends on their roles and responsibilities within the organisation. You must also take into account what you have to report to them and how they prefer to receive information.

Once you have begun to achieve savings, promoting them beyond the organisation itself - to your customers for example - may provide public relations opportunities.

At this stage you may find it helpful to use insert 8 to choose the specific mechanisms you need for delivering information to a particular group.

Funding

Gaining support and funding for energy efficient investment is essential, so once you have achieved energy savings you must report your actions and achievements to management and staff.

If you have fuel invoices or meter readings which illustrate the benefits, use these to support your

case. If not, estimate the cost savings by working out, for example, the reduced running hours of lights or equipment, and their hourly power consumption. Then ensure that you:

- report these to line and senior managers (if appropriate)
- persuade them that the savings have been achieved as a result of your measures
- let other staff know what has been achieved.

Demonstrating your achievements will give other people confidence in your abilities. A memo or letter from them confirming your results will be valuable when implementing your next step for gaining and maintaining control, particularly when you need to seek funds for investment in further improvement.

When senior managers consider investment proposals they need to be confident that past actions have delivered savings and that any proposed investments are worth funding. Drawing attention to your past achievements will boost trust in your capacity to deliver the expected benefits.

The Audit Commission recommends that you invest 10% of your annual energy bill on improving energy efficiency. Insert 9 can help you to calculate the potential contribution of efficiency to profitability.

Proposals for investment are most likely to be effective if they are written simply and are limited to one page or less. Insert 10 lists essential information to be included in a proposal. Other Best Practice Guides cover this topic in more detail (see Further Information, page 16, for details).

4 REVIEWING PROGRESS

Part 2 Maintaining control over energy use

Chapters 2 and 3 set the foundations for gaining control of energy use. Before reading further, you should complete insert 11.

■ **Section A** looks at how well you control energy use. It can also be used to assess the progress achieved by following chapters 2 and 3; and it will point you back to issues you may need to revisit.

■ **Section B** sets the scene for a more detailed approach to energy management, and will highlight areas you need to address if you wish to maintain control over energy use.

Maintaining control will involve many of the activities already used for gaining control - including analysing fuel bills, benchmarking and energy walk-rounds. It will also involve new activities such as setting targets (page 11) and calculating avoidable waste (page 12).

You will need to use your time carefully. Setting priorities and avoiding functions more properly the province of others in your organisation will help to ensure your effectiveness.

Taking actions that achieve short-term results - picking off 'low hanging fruit' - will give you faith in **your own** ability and win you credibility to obtain authority for further actions.

Insert 12 will help you identify 'low hanging fruit' and what effect your improvements will have. Raising your profile as a competent energy manager will enable you to seek further funding to save yet more energy. In addition, publicising your results to staff will encourage them to keep the campaign going. This may be an appropriate time to review insert 7-10.

You may find that, as energy manager, you do not have all the necessary resources to deliver a competent service to your organisation. However, some of the capabilities you need may be available elsewhere in your organisation.

You will need to identify what can be done in-house with the available time, skills, equipment and funding. You may need to obtain help from other

departments or from outside your organisation. The process can be divided into three phases.

■ **Diagnosis.** Diagnostic skills are needed at the start to identify where best to invest your time and effort to achieve results. Picking off the 'low hanging fruit' will demand some technical skills - typically those of an informed householder.

■ **Active intervention.** You will need to identify a short-term works programme and to put forward a case seeking the funds to carry it out.

■ **Ongoing care and maintenance.** This will be essential to ensure you protect the investments you have made. Administrative skills will be required to operate the information system you put in place, enabling you to audit fuel use, identify exceptional consumptions and implement corrective actions as and when required.

Insert 13 will help you to identify whether you have the skills and equipment in-house for the energy management tasks involved in these three phases.

Inspecting conditions and services

Simple inspections and observations in your buildings can help you to identify ways of quickly cutting energy use without adversely affecting your staff and, in many cases, without capital cost.

Periodic inspections, which you can combine with your regular energy walk-rounds, will also allow you to assess the physical condition of your buildings and evaluate how well controlled the services within them are.

Inspect conditions and services in your buildings using inserts 14 and 15.

You should try to ensure that periodic inspections take note of seasonal variations in requirements. Much waste occurs when systems are not under full load. In spring and autumn internal temperatures are often maintained at unnecessarily high levels because services are set to respond to deep winter conditions rather than to the

REVIEWING PROGRESS

milder weather prevailing at each end of the heating season.

For lighting, avoidable waste occurs most frequently on overcast days, when lighting has been switched on early and left on. If water heating is by means of a central boiler plant, waste is greater in summer when the plant may be operating just to provide very small quantities of hot water for washing hands.

You may find it valuable to establish required service levels for illumination, temperature, humidity, and air change rate, and then ensure they are achieved using the minimum level of energy consumption and cost.

Maximise the benefits from your investments while minimising technical and operational risks by planning your energy management activities around the seasons using insert 16 - the 'energy year' programme.

- **Spring.** Nominally the heating season ends on 30 April, but you should try to turn heating off before then, especially on warm afternoons, if the weather is mild. Spring is often the time when financial budgets are being set, and bids for investment capital need to be made, complete with supporting information.
- **Summer.** The longer, brighter and warmer days of summer reduce the hours of operation of many building services. This is the time to check on your hot water consumption. Early summer is the time to plan energy saving improvements for the colder and darker days of the following winter.
- **Autumn/winter.** Traditionally, the heating season in many buildings begins on 1 October. In practice, it varies according to the external climate and, particularly in buildings such as offices with large heat gains from equipment or people, it may occur much later. Activate systems only as and when they are made necessary by weather conditions.

Metering and targets

It is often said that you cannot manage what you cannot measure. The principle behind regular metering is to provide reliable, timely and accurate data. Insert 17 provides a meter-reading checklist and advice on metering.

A routine of reading meters will help you to:

- check utility invoices and ensure you pay only for what you actually use
- set budgets, apportion bills and purchase energy at the cheapest price
- identify exceptional consumptions as soon as they occur so that you can rectify the causes
- provide operational information and ensure buildings are controlled within set limits
- motivate staff by reporting progress.

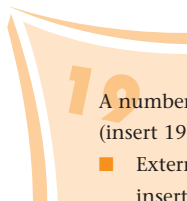
Data from meters can be entered manually into a computer spreadsheet, or you can set up a computer-based monitoring and targeting system using proprietary software. Insert 18 has been devised to help you compare the features and benefits of systems before you make a purchasing decision. If you have a large estate or site, a computer-based system will be essential for effective monitoring.

Once you have a reliable metering routine established and robust data available, you can set targets for reducing consumption.

It is important to set realistic targets which have a high probability of being just reached. Targets that are too easy to achieve may fail to motivate staff adequately, while targets that are too ambitious are likely to be dismissed as impossible to meet.

Arbitrary percentage reductions on last year's consumption, especially if there is no managerial, technical or financial support, may simply demotivate staff and have a negative impact on your energy efficiency campaign. Setting targets, therefore, should be based on easily understandable evidence that savings are possible, and should show how they are to be obtained. This will ensure that targets are challenging yet achievable.

REVIEWING PROGRESS



A number of methods are used to set targets (insert 19).

- External norms, such as benchmarks (see insert 3) may be used.
- In an estate containing a number of premises of similar type, function and occupancy, targets can be based on the better performers in the stock.
- Computer models, of varying levels of complexity and sophistication, can be used to predict fuel consumption, although experience and expertise is needed to interpret the results.
- Major improvements in efficiency, such as replacement boilers or lighting control systems, allow calculations of projected savings which provide new targets.

When comparing present consumption with that of previous years, or external norms, it is important to take into account changes such as the weather, occupancy levels and production rates, as well as extensions or refurbishments, and new plant, controls or services.

In an estate of buildings it is essential to notify those who manage energy locally as soon as targets are missed or unexpected consumptions occur. This will help them to diagnose the causes and to make a rapid response. In this way you will ensure that corrective actions are taken whenever targets are missed.

Minimising avoidable waste

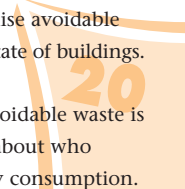
It is possible to determine the minimum amount of energy your organisation needs to meet its objectives. This is the base energy budget. Any energy over and above this base requirement may be thought of as an avoidable waste. In many organisations it may amount to a quarter, but can

be a third or even more, of total consumption. Estimating avoidable waste and taking steps to reduce it should be high on your list of priorities.

Some level of waste is almost inevitable in buildings. It arises through a combination of imperfections in systems and their controls, and the relatively low priority which most people give to energy when undertaking their core organisational activities. So identifying and then eliminating avoidable waste completely, while a worthy goal, is unlikely to be achieved.

However, avoidable waste is a valuable concept: it is instantly recognisable as something that should be reduced or eliminated. There are simple ways to determine the level of avoidable waste by monitoring consumption at particular times. For example, when fuel is being used for a single purpose you can compare it with calculated requirements. Comparisons across similar buildings will enable you to identify the least efficient, and the size of their avoidable waste. Insert 20 lists actions that will help you to minimise avoidable waste in single buildings, or in an estate of buildings.

One of the strengths of assessing avoidable waste is that it allows you to ask questions about who 'owns' the problem of excess energy consumption. How much is being wasted and who is responsible for it? Questions such as these can create awareness that opportunities exist to save money for the organisation. They can also help you to promote the need for improvements. Reduction of avoidable waste should be treated as a management function, with clear targets, responsibilities and reporting procedures.



5 OTHER MANAGEMENT ISSUES

Setting up a property database

Establishing and maintaining a property database will provide you with background information that will help you manage your buildings better. For example, it will help you to:

- check invoices
- answer queries about the buildings
- diagnose the likely causes of faults and errors
- keep track of changes to your building stock.

As you systematically gather more information, you can increase the sophistication of the database (see insert 21).

Much of the data that needs to be used for energy management will probably be 'owned' already by others in your organisation (and should therefore not be paid for by energy management). If it is not available, you may be able to ask others to obtain it and provide it to you as part of their routine operations. However, you may need to check that the information is up-to-date and accurate enough for your requirements.

Energy efficient purchasing

Almost every buildings-related purchasing contract has energy implications - from buying a light bulb to acquiring new premises. Therefore an awareness of the energy and environmental implications is beneficial when making purchasing decisions.

Use the matrix on insert 22 to diagnose how well developed your current contract procedures are for identifying and promoting energy efficiency.

Try to ensure that energy efficiency requirements are included in your organisation's purchasing policy. Periodic checking of your suppliers' compliance, together with the identification of remedial actions, may be required.

Certain types of purchases - such as office cleaning - may need only a simple contract clause and occasional compliance checking to ensure that lighting and water use is minimised.

Other contracts - such as minimising fuel purchase costs through tariff selection - may require a higher level of expertise and preparation.

Concentrating on particular goods and services where you can have most impact will help to make the best use of your time. A list of services which could be candidates for your attention is provided on insert 23. This also indicates the savings available in each area from energy efficient purchasing and specification.

Insert 24 contains a checklist to help you minimise your fuel purchase costs, and review the energy implications of other purchases.

6 WHAT NEXT?

Long-term plans

Much can be done to improve energy efficiency by management actions such as good housekeeping and checking control settings. These help to ensure that you use your equipment as efficiently as possible. Maintenance and repair may be required to keep your installations operating at or near their optimum potential efficiency. Beyond this, replacement and refurbishment are needed to reduce consumption still further.

Drawing up a long-term programme of improvement works, setting out the costs and benefits of the various options, will ensure that your efforts are coordinated. For example, if you plan to replace the heating system and also improve the insulation, you should insulate first so that the heating system is sized to suit the reduced demand.

Having a ready-costed programme of works which you can pull off the shelf may also be useful if your organisation unexpectedly finds funds available and is seeking investment opportunities.

Three key principles should be remembered when planning energy-related works.

- Keep it simple. Complex systems can be difficult to manage and may fall into disuse, leading to inefficiencies in practice.
- Make sure you include energy efficiency in the brief. It is unlikely to be incorporated otherwise.
- Identify your intention to audit achieved results.

Start devising your works programme with the help of insert 25.



25

Conclusions

Having read through this Report and worked through all the relevant inserts, now is the time to review your progress. Insert 26 will enable you to assess how well you are controlling your energy use. It also refers you back to inserts that you may need to review in order to improve control.

You may find it helpful to make several copies of insert 26 and use them during periodic inspections (see 'energy year', page 11, and insert 16); or as part of your annual audit process.

If you want to see whether further improvements in energy efficiency can be made, it may be worthwhile commissioning a detailed energy survey of your premises, as recommended by the Chartered Institution of Building Services Engineers.



26

FURTHER INFORMATION

'Making a Corporate Commitment' campaign

The MACC campaign seeks board level commitment to energy efficiency. It encourages directors to sign a Declaration of commitment to responsible energy management, prepare a business plan for energy efficiency and ensure that it becomes an item which is considered regularly by the main board. Further information is available from the Department of the Environment, telephone 0171 276 4613.

MACC publications

- Chairman's Checklist
- Executive Action Plan
- Energy, Environment and Profits – six case studies on corporate commitment to energy efficiency

DOE ENERGY EFFICIENCY BEST PRACTICE PROGRAMME DOCUMENTS

The Energy Efficiency Best Practice programme (EEBBp) publications listed below focus on energy management techniques. The Guides are available from BRECSU and ETSU (details below).

Good Practice Guides

- 69 Investment appraisal for industrial energy efficiency
- 85 Energy Management Training
- 119 Organising energy management – a corporate approach
- 136 Is your energy use under control? – A practical guide to assessment and action
- 165 Financial aspects of energy management
- 172 Marketing energy efficiency – raising staff awareness
- 186 Developing an effective energy policy

- 200 A strategic approach to energy and environmental management
- Pocket Business Guide to energy costs in buildings

ENERGY MANAGEMENT IN INDUSTRY**Good Practice Guides**

- 31 Computer-aided monitoring and targeting for industry

Good Practice Case Studies

- 214 Energy saved by raising employees' awareness
- 265 Energy savings in a small company through management commitment and staff involvement
- 289 Team building and energy saving
- 328 Effective energy efficiency through Total Quality Management
- 331 Energy management within a strategic framework

ENERGY MANAGEMENT IN PUBLIC AND COMMERCIAL SECTORS**Good Practice Case Studies**

- 264 A corporate approach to energy and the environment
- 324 Energy management – staff awareness. British Telecommunications plc
- 325 Energy management – training and motivation. HM Customs and Excise.
- 327 Energy management – staff awareness and motivation. The Sears Group
- 341 Energy management – awareness and motivation. Digital Equipment Company Limited

INTRODUCTION TO ENERGY EFFICIENCY

These Guides, for new energy managers, focus on particular building sectors. Contact BRECSU or ETSU for details.

The Government's Energy Efficiency Best Practice programme provides impartial, authoritative information on energy efficiency techniques and technologies in industry and buildings. This information is disseminated through publications, videos and software, together with seminars, workshops and other events. Publications within the Best Practice programme are shown opposite.

Visit the website at www.energy-efficiency.gov.uk
Call the Environment and Energy Helpline on **0800 585794**

For further specific information on:

Buildings-related projects contact:
Enquiries Bureau

BRECSU

BRE
Garston, Watford WD25 9XX
Tel 01923 664258
Fax 01923 664787
E-mail brecsuenq@bre.co.uk

Industrial projects contact:
Energy Efficiency Enquiries Bureau

ETSU

Harwell, Oxfordshire
OX11 0RA
Tel 01235 436747
Fax 01235 433066
E-mail etsuenq@aeat.co.uk

Energy Consumption Guides: compare energy use in specific processes, operations, plant and building types.

Good Practice: promotes proven energy-efficient techniques through Guides and Case Studies.

New Practice: monitors first commercial applications of new energy efficiency measures.

Future Practice: reports on joint R&D ventures into new energy efficiency measures.

General Information: describes concepts and approaches yet to be fully established as good practice.

Fuel Efficiency Booklets: give detailed information on specific technologies and techniques.

Introduction to Energy Efficiency: helps new energy managers understand the use and costs of heating, lighting, etc.



How well are you controlling your energy use?

Look down the left column of *section A* until you find the expenditure figure closest to your own annual fuel bill. Then read across to the figure on the right. This indicates the amount of time normally required to manage a fuel bill of this size.

Of course, the figures in the chart are only a rough guide. They are based on The Audit Commission's formula of one full-time member of staff for every £1 million of energy expenditure, and probably represent the minimum amount of time you need to invest to manage your energy consumption effectively.

Once you have identified the time required, move on to *section B*. This will help you to decide what you need to do to get your consumption under control. Simply tick the 'Yes' box for any activities you already undertake. Where your answer is 'No', turn to the relevant insert or page in the Report.

Insert 1

Section A

How much do you spend on energy per year?

£25 000 or less

£50 000

£200 000

£500 000

£1 million or more

Tick



How much time you should spend on controlling energy use

1 hour/week

2 hours/week

1 day/week

Half-time

Full-time

Tick

Section B

Do you allocate at least one hour per week to controlling your energy use for every £25 000 you spend on energy a year?

Do you keep a running total of your energy consumption or costs?

Do you compare your monthly and running totals with previous years?

Do you investigate the reasons for changes in costs/consumption?

Do you compare the performance of similar buildings in your portfolio?

Have you benchmarked your consumption/cost against industry norms?

Do you conduct regular energy 'walk-rounds' of your premises?

Do you promote good housekeeping measures?

Do you identify opportunities for initial energy saving measures?

Do you organise staff awareness campaigns?

Do you invest 10% of your annual energy spend on energy saving measures?

Yes

No

Guide page

Insert

5

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6

2/4

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2/4

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2/4

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9*,10*

*These inserts may be disregarded until after you have gained control of energy use.

If you have answered yes to all the questions, move straight to page 10 and complete insert 11, *Section B*.

You may photocopy this page

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Identifying patterns and trends in fuel use

If you have a number of buildings, concentrate initially on those with the largest annual energy costs. For most buildings, weekly meter readings rather than monthly fuel bills should be used as the basis of analysis. In properties which use more than £50 000 worth of energy annually, inspecting daily profiles from automated half-hourly metering is recommended.

A spreadsheet should be used for recording dates, readings, consumptions and costs, as it can do all the calculations and produce graphs. It can also be extended later as new bills are received. Keep electricity and fossil fuels separate. A bar graph of monthly consumptions will give you an immediate visual picture of how fuel use varies with the seasons.

If you have consumption information for more than 12 months, a moving average can be calculated. Calculate the average consumption for the 12 months ending last month. Then take the 12 months ending the previous month, and again calculate the average for that yearly period. Repeat the process to calculate the moving average for two or three years into the past. Because seasonal fluctuations mostly balance out, this reveals long-term trends.

Begin by locating invoices for the past 12 months (further back if possible). Using your spreadsheet:

Enter reading date, kWh consumed, and cost

Calculate the average cost per kWh for electricity

Calculate the average cost per kWh for fossil fuels

(For greater accuracy, divide the monthly consumption by the number of days between readings to correct for different time periods)

Prepare a bar graph of monthly electricity consumption

Prepare a bar graph of monthly fossil fuel consumption

Does electricity usage conform to the regular seasonal pattern you would expect?

Does fossil fuel usage conform to the regular seasonal pattern you would expect?

Are there examples of unexpected step changes in consumption for either fuel? (If possible, compare a particular month this year with the same month last year)

Are there unexpected changes between this year and the same month last year?

Prepare a monthly moving average of electricity consumption

Is the long-term trend for consumption to increase, stay the same or decrease?

Prepare a monthly moving average of fossil fuel consumption

Is the long-term trend for consumption to increase, stay the same or decrease?

Building:

Date:

Actions required

- 1 Acquire fuel invoices and enter fuel-consumption figures into spreadsheet
- 2 Prepare bar graphs and compare the pattern of consumption with expected use
- 3 Use patterns and trends to help identify where energy is used and the opportunities for savings

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Benchmarking consumption

Benchmarking is a way of comparing your consumption with established norms for your type of building. Typically, norms are expressed in annual energy consumption divided by the floor area - that is, kWh/m² per year. Electricity consumption is kept separate from fossil fuel consumption because of its different cost and environmental impact.

Annual energy consumption is most conveniently obtained from past utility company bills. Take care that these represent a full year; and are not estimates. It may be helpful to look at more than one year's bills. The figures you require at this stage are the energy units consumed, not the cost.

If your consumption is much higher than the norms there may be exceptional reasons to do with the building. For example, it may have full air-conditioning which raises consumption substantially. Or there may be reasons related to the weather - it may have been an exceptionally cold winter. These and similar factors, including the level of building occupancy, can affect levels of consumption. It is best, therefore, to treat the results as a broad indication of performance, rather than an absolute assessment.

Energy consumption benchmarks for both good and poor performance are provided overleaf.

Calculating your performance index

Decide which performance norm you will use. If it is kWh/m² of floor area per year follow the steps in this table.

Obtain electricity and gas or oil invoices for whole year

Add together total electricity consumption in kWh for whole year (take care if any invoices show estimated readings)

kWh/year

Add together total fossil fuel consumption in kWh for whole year (again, take care if any invoices show estimated readings)

kWh/year

Obtain the floor area of the premises, and assess the 'treated floor area' (the area which you heat and light). Sources of information about floor area are leased or cleaned areas - these are often within 10% of treated area. Remember to exclude car parks, unheated stores, etc. Ensure that any figures relate to your current use of the building(s)

m²

Divide annual electricity consumption by treated floor area to obtain index in kWh/m² per year

kWh/m²/yr

Divide annual fossil fuel consumption by treated floor area to obtain index in kWh/m² per year

kWh/m²/yr

Compare electricity index with the benchmark for your type of building (overleaf) - are you in the good, medium or poor category?

category

Compare fossil fuel index with the benchmark for your type of building (overleaf) - are you in the good, medium or poor category?

category

Assess whether there are good reasons for the differences between your premises' performance and norms, to avoid false diagnoses

Use your comparisons to assess the potential for improving performance

If you have more than one building, prepare a ranked list of your buildings by their electricity consumption index

If you have more than one building, prepare a ranked list of your buildings by their fossil fuel consumption index

Use the ranked lists to determine which premises to pay close attention to

Building:

Date:

Actions required

- 1 Obtain all fuel bills for past year (or more)
- 2 Compare fuel use with industry norms
- 3 Assess potential improvements in performance

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Benchmarks

BUILDING TYPE	Good performance for fuel stated less than:		Poor performance for fuel stated more than:	
	Electricity kWh/m ² /yr	Fossil fuel kWh/m ² /yr	Electricity kWh/m ² /yr	Fossil fuel kWh/m ² /yr
Offices				
Small office	36	95	48	200
Naturally ventilated – open plan	61	95	85	200
Air-conditioned – open plan	132	100	202	222
Air-conditioned – headquarters	261	132	361	273
Schools				
Primary or middle school, no pool	20	137	27	189
Secondary school, no pool	22	151	31	204
Secondary school, with pool	26	172	33	221
Universities and colleges				
University – residential building	85	240	100	290
University – academic building	75	185	85	220
College of further education	35	145	50	215
Hotels				
Small hotel or guest house	80	240	120	360
Business or holiday hotel	80	260	140	400
Luxury hotel	90	300	150	460
Industrial buildings				
General manufacturing	65	225	85	325
Factory/office	72	150	100	225
Light manufacturing	43	175	70	300
Storage and distribution	29	135	43	185
High street agencies				
Post office	45	140	70	210
Post office (electrically heated)	80	–	140	–
Bank or building society	70	70	100	100
Bank or building society (electrically heated)	100	–	140	–
High street agency	55	150	75	230
High street agency (electrically heated)	90	–	160	–
Retail shops and stores				
DIY store	130	150	160	195
Non-food shop	200	80	260	130
Non-food shop (electrically heated)	230	–	300	–
Department store	240	150	290	220
Department store (electrically heated)	290	–	370	–
Small food store	400	80	500	100
Small food store (electrically heated)	440	–	550	–
Supermarket	670	160	920	290
Supermarket (electrically heated)	750	–	1050	–
Catering establishments				
Restaurant with bar	1100	650	1250	730
Fast food restaurant	820	480	890	670
Pub restaurant (in kWh/place setting)	1300	2700	1500	3500
Public house (in kWh/m ² /£1000 turnover)	0.8	1.5	1.8	3.5
Sports centres				
Dry sports centres	75	215	85	325
Sports and recreation centre with pool	150	360	205	540
Swimming pool only	165	775	235	1120
Other building types not listed above				
Prison	120	430	150	540
Police station	45	295	60	410
Fire station	55	385	80	540
Ambulance station	50	350	70	460
Crown and county court	100	165	135	220
Church	10	80	20	150
Library	50	150	70	210
Museum and art gallery	90	130	125	185

Data as at December 1996

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Insert 4

Conducting an energy walk-round

Walk round your premises and, using the checklist below, make a systematic visual inspection of each room and circulation area in turn, noting down where:

- repair or maintenance work is needed (to reduce energy costs)
- there is a need for capital investment (to improve energy efficiency)
- energy is being wasted (because good housekeeping practices are not being followed, see insert 5).

Remember to look both inside and outside your building(s). Put each set of items in priority order. If your organisation has a rolling programme of maintenance or refurbishment work, compare your 'wish' list with the one drawn up for the accommodation you occupy.

After the walk-round, use these lists to identify opportunities for investing in measures that will reduce your consumption of energy. Divide these opportunities into 'no', 'low' and 'high' cost measures. Decide which measures in the first two categories you can fund out of any savings you make from good housekeeping, see insert 5.

Lighting

- Check lamps, light fittings and reflectors are clean to maximise light output
- Ensure that shades and diffusers are translucent or clear to maximise light output
- Check that walls and ceilings are light coloured to maximise reflected light
- Replace 38 mm fluorescent tubes with higher efficiency 26 mm tubes if possible
- Replace tungsten bulbs with more efficient compact fluorescent lamps
- Check both sides of windows and roof lights are clean to maximise available daylight
- Check that there are enough switches to avoid lighting up large areas for individual members of staff
- Fit task lighting and reduce overall lighting levels
- Match lighting levels to requirements – avoid excessive lighting in circulation areas
- Check operation of automatic controls, such as timers and daylight sensors
- Install occupancy sensors in areas of intermittent use
- Ensure external lighting uses high-efficiency light sources

Hot water

- Test tap water temperature
- Check hot water storage tanks and pipework are fully insulated
- Check whether localised hot water generators are installed, to avoid long pipe runs
- Check water storage temperature is correct

Space heating

- Check settings and operation of room thermostats and humidistats
- Check settings and operation of thermostatic radiator valves
- Ensure air filters in fan convector heaters are clean
- Check time and temperature settings of electric panel and storage heaters
- Make sure air flow is unobstructed from heat exchanger surfaces, grilles, and vents
- Check that plant operation and controls deliver heating only where and when required
- Ensure all motorised valves and dampers open and close without sticking
- Find out when heating controls were last calibrated
- Find out when boiler combustion efficiency and flue gas temperatures were last checked

Air-conditioning

- Check that refrigeration is not operating at the same time as the heating
- Find out whether fans run only when needed

Building fabric

- Check that roof voids are insulated to reduce heat loss
- Inspect state of repair of draughtstripping around doors and windows
- Ensure self-closers to external doors function properly
- Consider replacing excessive glazing with insulated panels

Building:	Date:
------------------	--------------

Actions required	
1 Conduct energy walk-round	<input type="checkbox"/>
2 Complete checklist of repairs and maintenance	<input type="checkbox"/>
3 Identify opportunities for no-cost and low-cost measures	<input type="checkbox"/>

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Insert 5

Introducing good housekeeping

While on your energy walk-round, use the checklist below to note in each space the specific good housekeeping measures which need to be followed. Display these checklists in a prominent place. Bring their contents to the attention of everyone who uses your premises - staff, visitors, customers, and any outside contractors such as cleaners.

Lighting

- Switch lights off if daylight is sufficient
- Make sure blinds and furniture do not prevent maximum use of daylight
- Switch on lights necessary only for tasks in hand
- Use only local task lighting if possible
- Switch off lights when leaving room for more than 10 minutes
- Switch off lights when leaving room at end of day
- Use reduced lighting levels for cleaning, night-time and security staff
- Switch off exterior security lighting during daylight hours

Hot water

- Turn off hot (and cold) taps
- Report leaking or dripping taps
- Report if water temperature from taps is excessive
- Turn off electric water heaters when they are not required

Office equipment

- Switch off electrical appliances, including computers, printers and photocopiers, when not in use
- Don't use high energy consuming equipment during daily maximum demand period for electricity unless it is essential to meet operational needs

Space heating

- Close windows and doors when heating is on
- Don't open windows while heating is on (turn heating down instead)
- Check that room thermostat is set to a minimum consistent with comfort
- Check heating controls (eg thermostatic radiator valves) are at the correct setting
- Don't use portable electric heaters (except in last resort)
- Don't place obstructions in front of radiators or heaters
- Switch off (non-automatic) extract fans when room is unoccupied
- Close blinds or curtains at end of daylight
- Turn off (non-automatic) heating when room is unoccupied
- Report faulty door closers and window catches and draughtstripping
- Report if room suffers from under- or over-heating

Boiler room plant

- Check controls are labelled to indicate function, and are set correctly
- Check optimum start/stop controls and weather compensation controls are set and work correctly
- Check boiler sequencing controls are set correctly
- Ensure time switches are set to minimum periods consistent with requirements
- Make sure fans and pumps run only when required

Building:	Date:
------------------	--------------

Actions required	
1 Identify good housekeeping practices room by room	<input type="checkbox"/>
2 Agree good housekeeping practices with occupants	<input type="checkbox"/>
3 Provide feedback of effect of practices on consumption	<input type="checkbox"/>

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Identifying opportunities and responsibilities

The chart below will help you to ascertain both where energy is used and which fuels are used, and under whose control it is. Use this to define how improvements are to be achieved, and with whom you will have to work to bring them about.

End use	Fuel type			Sources of improvement				
	Electricity (normal rate)	Electricity (off peak)	Fossil fuel	Occupants	Facilities manager	Control settings	Regular maintenance	Repairs
Lighting	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Space heating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hot water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Catering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Refrigeration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fans, pumps and controls	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Escalators, lifts	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Distributed office equipment – computers, photocopiers, fax	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Small power items – laboratory equipment, machinery, tools, kiln, vending machines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Central computer suite	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Building:	Date:
------------------	--------------

Actions required	
1 Identify major saving opportunities	<input type="checkbox"/>
2 Implement measures to reduce consumption	<input type="checkbox"/>
3 Identify savings arising from measures	<input type="checkbox"/>

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Publicity and promotion

Use the shaded areas of this checklist to help you launch and sustain your staff-awareness campaign, while gaining control over your energy use.

Once you have successfully started your campaign you may wish to return to this insert and use the whole of the checklist to help you with publicity and promotion in and beyond your organisation.

Consulting with staff

- Comfort conditions appropriate to staff needs and expectations given priority
- Staff views and suggestions sought on ways to bring about improvements in energy efficiency
- Staff kept informed about proposals and plans for improving energy efficiency
- Staff kept informed about what they and the organisation stand to gain by improvements
- Staff suggestions for saving energy acknowledged
- Responsibilities for individual tasks agreed with staff
- Clear and achievable targets established for staff energy saving campaign
- Regular reports to staff on progress towards targets
- Staff achievements in meeting targets given recognition within organisation

Staff training and education

- Relation between global environmental issues and local action stressed in staff induction and training
- Energy efficient good housekeeping practices included in staff induction and training courses
- Everyday examples used to help staff visualise how much energy the organisation uses or wastes
- Domestic comparisons used with staff to illustrate how much energy they themselves control at work
- Practical recommendations on what staff can do on a day to day basis to reduce consumption
- Specific tasks (eg switch-off) allocated to individual members of staff to reduce energy waste
- Advice given on what staff can do at home to reduce their own energy costs

Launching and sustaining the campaign

- Energy efficiency campaign launched
- Staff motivated frequently to maintain campaign momentum
- In-house publicity campaigns organised
- Periodic features on energy efficiency in staff newsletter
- Poster campaign initiated
- Poster locations varied and new posters commissioned
- Stickers used to encourage switching off
- Staff notice-board or newsletter used to report back on progress
- Staff newsletter used to promote the campaign and its achievements

Competitions and incentives (group or individual)

- Incentive scheme (for individuals or departments) evaluated, and implemented if feasible
- Competitions (for posters, captions or energy saving suggestions) assessed, and introduced
- Percentage of savings achieved set aside as rewards - to raise staff incentive. Important - rewards should be for the benefit of staff in general

Exploiting public relations opportunities

- Information leaflet for customers setting out your energy efficiency aims and achievements
- Energy efficiency improvements used in general publicity and advertising
- Relationships established with local initiatives to save energy, such as working with local schools

Building:	Date:
------------------	--------------

Actions required	
1 Consult staff, identify actions, set targets, publicise achievements	<input type="checkbox"/>
2 Introduce energy issues and good practices into staff induction and training	<input type="checkbox"/>
3 Launch motivation campaign	<input type="checkbox"/>
4 Sustain campaign by planned variations to publicity material	<input type="checkbox"/>
5 Provide regular feedback on progress	<input type="checkbox"/>

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Identifying audiences and reporting formats

Use the chart below regularly to choose the specific mechanisms you need for delivering information to a particular group. Remember your choice depends on what you have to report to them and how they prefer to receive information.

Reporting formats	Audience					
	Senior Managers	Department Heads	Key personnel	Budget holders	General staff	Outsiders
Letter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Memo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monthly cost report	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annual cost report	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Consumption report	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Investment appraisal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Newsletter insert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Campaign wall poster	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In-house publicity leaflet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Good housekeeping checklist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Induction training insert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In-service training insert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Departmental briefing meeting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Boardroom presentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
External presentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Outside publicity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Building:	Date:
------------------	--------------

Actions required	
1 Identify target audiences for reporting	<input type="checkbox"/>
2 Choose appropriate reporting format(s)	<input type="checkbox"/>
3 Report on action required and progress made, as appropriate	<input type="checkbox"/>

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Calculating the contribution to profitability

Energy and water costs often appear to be only a small percentage of total turnover. As a result they are sometimes dismissed, or given a low priority. However, comparisons between utility costs, turnover and trading profit may be more revealing. The table below shows you how to make these comparisons.

The calculation assumes that a 20% saving in energy and water costs can be achieved - about half through good organisation and care, the other half through cost effective investment in proven technical measures. Different percentage savings may be assumed as an alternative.

The procedure involves working out your total utility costs - electricity, gas and other fossil fuels, and water. By comparing the total with company profit you can discover by how much your profits would be increased by the projected 20% saving in energy costs.

In addition, you can also work out by how much your turnover would have to increase to generate a profit equivalent to the projected 20% saving in energy costs.

Annual electricity costs	A	<input type="text"/>
Annual gas costs	B	<input type="text"/>
Annual oil costs	C	<input type="text"/>
Annual cost of other fuels	D	<input type="text"/>
Annual water costs	E	<input type="text"/>
Total electricity, fuel and water costs	$F=A+B+C+D+E$	<input type="text"/>
Annual profit (£)	G	<input type="text"/>
Annual turnover	H	<input type="text"/>
20% of annual energy costs	$J=F \times 0.2$	<input type="text"/>
Percentage increase in profit as a result of a 20% saving in energy costs	$K = 100 \times (J/G)$	<input type="text"/>
Increase in turnover required to achieve an increase in profit equal to the 20% saving in energy and water	$L=J \times (H/G)$	<input type="text"/>

Building:	Date:
------------------	--------------

Actions required	
1 Obtain company turnover and profit figures	<input type="text"/>
2 Calculate contribution of energy efficiency to profitability	<input type="text"/>
3 Present results of the calculation to management	<input type="text"/>

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Seeking support and funding

Completing the chart below will give you the information required for a successful funding proposal.

Current energy costs	£.	<input type="text"/>
Savings already achieved	£.	<input type="text"/>
Proposed measure for reducing costs		<input type="text"/>
Capital cost of investment	£.	<input type="text"/>
Organisational resources required (eg in-house staff time)		<input type="text"/>
Time required to undertake work involved		<input type="text"/>
Optimum start date		<input type="text"/>
Life of measure		<input type="text"/>
Expected cost savings	£.	<input type="text"/>
Expected payback period/rate of return		<input type="text"/>
Expected benefits to the organisation:		
<ul style="list-style-type: none">• cost savings• reduced CO₂ emissions• improvement to working conditions• public relations benefits• other (specify)		<ul style="list-style-type: none">•••••

Building:	Date:
------------------	--------------

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Insert 11

Have you improved your control over energy use?

You can use the chart on this insert to assess how much progress you have made and what now needs to be done to maintain control of energy use. Make photocopies of this page and complete them at regular intervals. Use them as a record of work that you have completed or that you still need to tackle.

Dating the activities in the record sheet will allow you to identify those you need to revisit, for controlling energy use is not something you do once and then forget. It is a continuous process, requiring small but regular inputs.

Section A – Have you introduced control over energy use?

	Yes	No	Insert no	Date
Have you allocated at least one hour per week to controlling your energy use for every £25 000 you spend on energy each year?	<input type="checkbox"/>	<input type="checkbox"/>	1	<input type="text"/>
Have you recently compared your monthly and running totals with previous years?	<input type="checkbox"/>	<input type="checkbox"/>	2/4	<input type="text"/>
Have you recently investigated the reasons for changes in costs/consumption?	<input type="checkbox"/>	<input type="checkbox"/>	2/4	<input type="text"/>
Have you recently compared consumption of similar buildings across your portfolio?	<input type="checkbox"/>	<input type="checkbox"/>	3	<input type="text"/>
Have you recently benchmarked your consumption/cost against industry norms?	<input type="checkbox"/>	<input type="checkbox"/>	3	<input type="text"/>
Have you recently conducted an energy walk-round of your premises?	<input type="checkbox"/>	<input type="checkbox"/>	4	<input type="text"/>
Have you recently encouraged good housekeeping measures?	<input type="checkbox"/>	<input type="checkbox"/>	5	<input type="text"/>
Have you recently identified opportunities for initial energy saving measures?	<input type="checkbox"/>	<input type="checkbox"/>	6	<input type="text"/>
Have you recently run a staff-awareness campaign?	<input type="checkbox"/>	<input type="checkbox"/>	7,8	<input type="text"/>
Have you invested 10% of your annual energy spend on energy saving measures over the past 12 months?	<input type="checkbox"/>	<input type="checkbox"/>	9,10	<input type="text"/>
Have you reduced your energy consumption or costs over the past 12 months?	<input type="checkbox"/>	<input type="checkbox"/>	–	<input type="text"/>

See Section B (overleaf)

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Section B – Will you maintain control over energy use?

	Yes	No	Report page	Insert
Do you identify who is responsible for day-to-day control and operating efficiency of the services in your premises?	<input type="checkbox"/>	<input type="checkbox"/>	8	6*
Do you run publicity and promotional campaigns to raise staff awareness of energy?	<input type="checkbox"/>	<input type="checkbox"/>	8	7*
Do you report on progress within and beyond your organisation, promoting your results in ways appropriate to your target audiences?	<input type="checkbox"/>	<input type="checkbox"/>	9	8*
Do you compare energy costs with the organisation's profits to demonstrate the contribution of energy efficiency to profitability?	<input type="checkbox"/>	<input type="checkbox"/>	9	9
Do you regularly present a case on investment opportunities to management?	<input type="checkbox"/>	<input type="checkbox"/>	9	10
Do you assess your premises to identify the most fruitful opportunities for saving energy?	<input type="checkbox"/>	<input type="checkbox"/>	10	12
Do you identify the resources of time, skills and funding that you need to maintain control over energy?	<input type="checkbox"/>	<input type="checkbox"/>	10	13
Do you carry out regular inspections of internal conditions, such as lighting and heating, in your premises both during and outside the hours of occupancy?	<input type="checkbox"/>	<input type="checkbox"/>	10	14
Do you carry out regular inspections of the condition of the fabric and the operation of the services in your premises?	<input type="checkbox"/>	<input type="checkbox"/>	10	15
Do you plan your activities seasonally to ensure you maximise the benefits of your actions?	<input type="checkbox"/>	<input type="checkbox"/>	11	16
Do you read your meters weekly or monthly and check readings against invoices?	<input type="checkbox"/>	<input type="checkbox"/>	11	17
Do you have an information system for collecting, storing, analysing and reporting consumption data?	<input type="checkbox"/>	<input type="checkbox"/>	11	18
Do you target your energy consumption and compare it against actual consumption?	<input type="checkbox"/>	<input type="checkbox"/>	12	19
Do you work out your premises' minimum energy requirements and assess the avoidable waste?	<input type="checkbox"/>	<input type="checkbox"/>	12	20
Do you have a property database containing details of your premises, such as type of use, floor area, age and condition, plant and services, switching and metering?	<input type="checkbox"/>	<input type="checkbox"/>	13	21
Do you ensure that your organisation's contracts and purchasing decisions include energy efficiency criteria?	<input type="checkbox"/>	<input type="checkbox"/>	13	22/23/24
Do you have a costed programme of improvement works for future investment in energy efficiency measures?	<input type="checkbox"/>	<input type="checkbox"/>	14	25
Do you invest 10% of your annual energy spend on energy saving measures?	<input type="checkbox"/>	<input type="checkbox"/>	14	26

* You may wish to review these inserts from Part I

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Insert 12

Starting to maintain control

Use this checklist to identify the 'low hanging fruit' according to:

- the immediacy of the returns
- the speed with which they can be introduced
- the size of the resulting benefits
- the ease with which you can calculate and explain the savings.

It is important to estimate or measure the benefits so that you can report your achievements to management.

Identifying 'low hanging fruit'

- Initial check of hot water for excessive standing losses
- Initial check of excess use of lighting and equipment during and beyond occupancy period
- Measurement of achieved temperatures, room by room, during and outside the period of occupancy
- Checks on doors and windows left open during heating season
- Checks on sequencing and cycling of boilers
- Overnight tests used to identify 'out of hours' use of fans and pumps, and water use including leaks

Implementation

- Initial checks carried out and potential improvements identified
- Potential cost savings and other benefits quantified
- Priorities among improvements decided according to viability
- Improvements implemented
- Routines introduced to reduce risk of future re-occurrence

Criteria for initial actions

- Immediate savings available
- Savings can be easily predicted beforehand so action can be justified
- Savings are identifiable once the measure has been taken, so benefits can be illustrated
- Little time is required for implementation or management of these measures
- Need for improvement is obvious and beyond dispute

Reporting and publicising your achievements

- Cost and consumption savings gained by the improvements calculated and documented
- Savings and benefits reported to management
- Savings and benefits publicised to staff
- Formal acknowledgement of the benefits by management

Building:	Date:
------------------	--------------

Actions required	
1 Identify 'low hanging fruit' and introduce improvements	<input type="checkbox"/>
2 Implement procedures to ensure that good practice continues	<input type="checkbox"/>
3 Measure benefits and report to management	<input type="checkbox"/>
4 Obtain management agreement to standards of heating and lighting	<input type="checkbox"/>

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Resources – funding and staffing

This checklist will help you to identify what resources are available in-house for carrying out your programme of gaining and maintaining control over energy use.

Insert 13

	Skills available in house	Time available in house	Equipment available in house	Need for external support	Sufficient funding available
Practical energy management tasks					
Phase 1 - Diagnosis					
Benchmark consumption and compare against building type norms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Analyse daily, weekly and seasonal consumption to identify savings opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Analyse tariffs to ensure fuels purchased at minimum cost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Identify avoidable waste and introduce routines to reduce it as far as practical	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Read meters regularly (daily, weekly or monthly, according to consumption levels)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Establish consumption targets and compare against actual consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inspect delivered conditions to identify need for corrective actions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inspect the fabric and services to identify need for repairs and maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Phase 2 - Active intervention					
Ensure controls are set up and operate correctly, and are inspected annually	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Initiate and contribute to motivational and awareness campaigns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Devise an energy information system including budgeting and exception monitoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Introduce a programme of maintenance and repairs to protect energy efficiency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assess cost/benefits of upgrading or replacing plant and improving building fabric	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Establish a programme of improvements to all major energy uses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secure funds for investment in energy efficiency measures and for managing their installation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Introduce energy efficiency requirements into contracts for purchase and supply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Phase 3 - On-going care					
Compile a property database to complement the energy information system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Continue to monitor consumption and compare with targets - take corrective action where necessary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Audit energy use, cost, delivered conditions, and operation and condition of fabric and services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Market your services both within and beyond the organisation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintain links across different operating departments of the organisation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Report progress regularly to senior management, departmental heads and staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Contribute to the development of an organisation-wide energy policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provide staff training and duty-of-care support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ensure you are informed of refurbishment proposals and identify relevant opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Inspecting delivered conditions

Use copies of this checklist to record your periodic inspections of delivered conditions, and to establish required service levels.

Inspection checklist	Building or zone of building:	Date:
-----------------------------	--------------------------------------	--------------

	During hours of occupancy	During cleaning	Morning and evening outside the hours of occupancy	Night-time	Week-ends	Holidays or shut-down periods
Lighting checks						
Lights in use only when daylight unavailable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Levels of artificial lighting are appropriate to occupants' actual needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Switching arrangements encourage switching off when appropriate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Task lighting provided where appropriate, with background light levels reduced where possible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Exterior lighting extent, times and levels are appropriate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heating and internal temperatures						
Minimum temperatures compatible with comfort or other requirements achieved	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reasonably uniform temperatures are maintained without excessive fluctuations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hot water service						
Water at taps hot only when needed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Draughts and cold spill						
Staff are surveyed to assess whether there are draughts or cold spill from windows that cause discomfort	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Establishing service levels						
Required illumination levels for each zone of each of the premises established - and compared with actual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maximum and minimum temperatures and times of availability for each zone of each of the premises established - and compared with actual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maximum and minimum ventilation rates established - and compared with actual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maximum and minimum humidity levels established - and compared with actual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maximum and minimum temperatures and times of availability of hot water supply and hot water storage established - and compared with actual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Building:	Date:
------------------	--------------

Actions required	
1 Inspect delivered conditions	<input type="checkbox"/>
2 Establish required levels of service	<input type="checkbox"/>
3 Deliver required conditions for minimum use of energy	<input type="checkbox"/>

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Inspecting fabric and services

Use this checklist to assess the conditions of your building, and how well functioning are its services.

Lighting

- Lights are in positions where they provide the most effective lighting
- Lamp shades are cleaned regularly to ensure maximum light output
- Diffusers and shades are highly translucent to ensure maximum light output
- Light colours are used on walls, ceilings and floors to maximise reflected light
- Light switches operate lamps in banks corresponding to available daylight and occupation patterns
- Occupancy sensing used where appropriate
- Switches are labelled to encourage unnecessary lights to be switched off
- 38 mm tubes are replaced by 26 mm diameter high-efficiency tubes on failure or maintenance replacement
- Most small lights used continuously for four hours or more per day are compact fluorescent

Space heating

- Radiators and heat emitters are free of all obstructions, and air filters in convectors are clean
- Time and temperature settings of electrical panel and storage heaters are checked
- Thermostatic radiator valves control competently (sensor heads not above hot surfaces or pipes)
- Fan convectors have individual controls
- Controls settings are reviewed periodically to ensure they meet requirements at minimum cost
- Boilers are regularly maintained including witnessed periodic combustion efficiency checks
- Boiler programmers or timers operate heating for the minimum period consistent with comfort
- Heating system is zoned, and with areas of similar requirements in same control zone
- Pumps and fans operate only when the system is working

Windows, doors and roof insulation

- Windows and rooflights are kept clean to ensure maximum amount of daylight
- Blinds or curtains allow maximum use of daylight
- Windows are draughtstripped and held tightly shut by window catches
- Doors are draughtstripped and held tightly shut by door latches
- Roof insulation is at least 150 mm thick and with no gaps
- Excessive glazing has been replaced by insulated panels to reduce summer overheat and winter coldspill

Domestic hot water

- Water storage temperature is at minimum level consistent with avoidance of Legionella
- Hot water storage vessel is fully insulated
- Hot water pipes are fully insulated
- Water at taps is at a safe temperature
- Instantaneous water heaters are used to supply taps which are remote from storage vessels

Mechanical ventilation

- Extract fans operate only when needed
- Motorised valves and dampers operate without sticking
- Air flows from grilles and vents are unobstructed and filters are clean

Building:	Date:
------------------	--------------

Actions required	
1 Carry out regular inspections of fabric and services	<input type="checkbox"/>
2 Identify opportunities for improvements	<input type="checkbox"/>
3 Inform those responsible for repairs and maintenance of need for improvements	<input type="checkbox"/>

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The 'energy year'

Plan your energy management activities accordingly to fit in with the seasons

Spring

Adjust heating systems to ensure that overheating does not occur, including ensuring radiators are cooler than in winter

Check that the warm-up or pre-heat period of your building is shorter than in winter

As heat losses to outside are less, ensure that the heating is turned off earlier in the day

Re-set time switches for British Summer Time (but not solar dial or off-peak tariff)

Autumn

Check timers, including resetting at the end of British Summer Time

Do not automatically turn on the heating on 1 October: do so only when it is actually required to keep the building warm

Once heating is switched on regularly, check room temperatures are at the minimum required for comfort but do not overheat

Check that buildings are comfortable only during the period of occupancy, not before or after

Avoid the whole building being heated to full comfort levels just for security staff

Generally inspect the external fabric of the building - its walls, windows, doors, and roof looking for damage that could result in heat loss

Check that loft insulation is in place and to the currently recommended thickness

Check that all external doors fit and close properly, and door closers, where fitted, operate effectively

Check that draughtstripping has been fitted to all external doors and windows, and is still effective

Check that all windows fit and close properly; repair any damaged handles and catches

Summer

If your premises close down ensure all non-essential heating, ventilation and lighting systems are switched off

Plan a programme to ensure energy efficient operation when days become shorter and temperatures lower

Check building fabric and pipe insulation and the condition of draughtstripping to doors and windows

Prepare a schedule of items needing repair or maintenance before the autumn

Ensure boilers are serviced and pumps checked

Clean fan convector filters

Winter

Ensure that supplementary electric heaters are not used, as they raise electricity bills greatly

Where appropriate, label all light switches to ensure that only necessary lights are turned on

Check that security lighting comes on only when it is almost dark

Ensure the buildings are heated and lit only when, where and to the extent required. This is particularly important during weekends and holidays

Check that controls enable different weekend settings

If the buildings will be unoccupied over a holiday period, such as Christmas or New Year; make sure that only minimum services operate

Ensure heating system controls operate in response to periods of mild weather

Ensure that cleaning staff use only the minimum of lighting necessary

Building:

Date:

Actions required

- 1 Use the summer period to assess hot water usage
- 2 Plan activities around the seasonal changes
- 3 Prepare investment proposals to suit the accounting year

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Meter reading

Monday morning is recommended as the best time to take readings. If you have an annual energy spend over £20 000 in a single building, daily readings may be warranted. Always record the date and the actual reading before trying to work out the consumption as this will reduce the likelihood of error.

When reading meters, make sure you understand how main meters and sub-meters are related. If your premises are multi-tenanted or if you want to bill departments for their true energy costs, then you will need to install sub-meters.

Spot check meter readings

Spot check readings may be used for diagnosing avoidable waste. Examples include taking readings before and after weekends or holidays to assess whether equipment or systems are operating needlessly when the building is unoccupied.

Automatic versus manual metering

Manual monitoring and targeting systems involve entering readings taken manually from meters, invoices or electronic data interchange systems.

Automatic systems, by contrast, receive half-hourly or hourly data from Building Energy Management Systems (BEMS), pulse output meters or data loggers. Pulse output meters have dropped in price and are readily available.

Deregulation of the electricity industry in 1990 created a need for half-hourly consumption metering so that electricity usage could be credited to the supply company. Consumption figures are available through a modem link to a bulletin board provided by your regional electricity company or from the industry clearing house UKDCS.

The increasing availability of half-hourly electronic data has created a significant opportunity to improve data input to monitoring and targeting systems. Electronic data monitoring removes the need for keyboard entry of consumption figures and is quicker and more accurate than invoices or manual meter reading.

The main hazard of half-hourly data is that it provides a vast and potentially unmanageable quantity of information - which can hide rather than illuminate patterns and trends. Having the raw data is less important than analysing it intelligently. Metering should be regarded as an aid to improve energy management not an end in itself.

Manual

- Photograph your existing meters, record the meter number and site details.
- Decide if you need to install sub-meters to monitor individual departments or parts of the building
- If you need to install sub-meters, consider pulse output meters offering automatic data collection
- To minimise input errors, design a form to record meter readings that looks like the meter display
- Choose reliable and conscientious staff to act as meter readers
- Train staff to read each of your meter types and to record the readings clearly and accurately
- Consider installing the same meter type across all of your premises to reduce likelihood of reading errors
- Institute a regular procedure for reading meters at the same time each week, preferably Monday morning – easily remembered
- Establish a back-up procedure to provide cover for sickness and holiday periods
- Setup a procedure and train staff to enter data into a spreadsheet or database
- Create or use proprietary software to check and validate this data, to ensure it corresponds to the appropriate meter; to identify errors and to deal with missing data

Automatic

- Photograph your existing meters, record the meter number and site details
- If you have a Code 5 electricity supply meter, find out if it is possible to obtain half-hourly data
- Install sub-meters to monitor individual departments or parts of the building you want to treat separately
- Decide if these meters can be read using any existing BEMS or if you need to install data loggers
- Install a communications system using existing LAN network, UHF radio or modem link to gather consumption data from the various out-stations and transmit it to the central processor
- Install a proprietary software package to collate consumption data and prepare it for analysis
- Install software to authenticate the source of the data
- Provide power backup in the event of power failure to ensure data integrity
- Ensure the software detects faults in data
- Ensure software restores after faults in communications links and can help edit incomplete data files
- Train staff to use this software
- Review and update data collection in response to an analysis of users' reactions to the reports produced by the system

Building:	Date:
------------------	--------------

Actions required	
1 Establish routines for reading meters regularly	<input type="checkbox"/>
2 Train staff in meter reading	<input type="checkbox"/>
3 Ensure meter reading data is analysed intelligently	<input type="checkbox"/>

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Choosing an energy information system

There are several approaches to setting up an energy information system, which range in cost and complexity. Paper systems may be adequate, but the larger your fuel bill, the more justification there is in setting up a computer-based energy information system - or a monitoring and targeting system - using proprietary software.

Such systems offer a wide variety of energy-specific functions and options:

- how consumption data is entered
- the statistical and analytical functions performed
- the tables, charts and other graphical outputs available
- the type and frequency of reports produced.

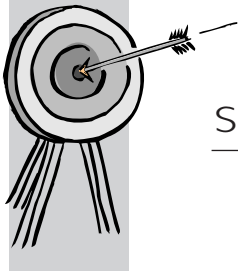
The price of pulse meters and data loggers is coming down, while their reliability is increasing. Automatic data systems - where meters are read at half-hourly intervals and the data transferred electronically to a monitoring and targeting system - are therefore no longer the preserve of large organisations. Instead, their feasibility should be considered in any organisation spending more than about £20 000 per year on energy. The cost of setting up such a system will not result in any immediate energy savings, so it needs to be devised in parallel with other tasks that show more immediate results. To set it up, use some or all of the savings you achieved from picking off the 'low hanging fruit'.

Use this checklist to help you compare systems from a range of suppliers

Criteria for assessing a software system	System A	System B	System C
Is the system proven?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have many systems been sold?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do similar organisations use it?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can I ask them how well the system works?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is it compatible with existing systems?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does the software run under Windows?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can the system be expanded progressively?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can I use existing equipment, at least initially?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can my staff be easily trained to use it?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can existing data be imported easily?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can we download from our mainframe?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is adequate help given to kick-start new users?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can I install the system myself?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is on-site training provided?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is there an accessible telephone help desk?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the software updated regularly and at reasonable prices?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is there a user group in my region or building sector?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do these groups influence development?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do data entry requirements suit my organisation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do analyses meet my specific needs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do graphs and charts provided give me useful management information?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do reports produced meet my requirements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Capital cost - system (including metering, loggers, computers, communications and training)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Capital cost - data acquisition and loading (including premises survey, invoice data loading, data validation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annual running cost (including staff, bureau services, data purchase and system upgrades)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TOTAL COST	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Actions required	
1 Investigate feasibility of information systems	<input type="checkbox"/>
2 Check alternative systems against criteria	<input type="checkbox"/>
3 Select and install information system	<input type="checkbox"/>
4 Load and validate data	<input type="checkbox"/>

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Setting targets

Insert 19

Set your targets with the help of this checklist, and take appropriate follow-up action.

Basis of the target

Target based on established norms for the type of building

Target based on the better performers in a stock of similar premises

Target based on theoretical consumption with allowance for actual efficiencies of plant in practice

Targets set in accordance with projected savings from major improvements in efficiency

Setting targets

Identify means by which current consumption is to be reduced

Make realistic allowances for changes in weather, occupancy, production rates, building services or fabric

Decide on the most appropriate basis for setting a target (see list of options below)

Identify the base energy budget for efficient operation to meet business needs

Evaluate the avoidable waste

Identify consumption rates for random or spot checks

Get management to set targets on reducing avoidable waste

Issue week-by-week consumption targets to enable fast response to excess consumption

Issue meter reading targets week-by-week consistent with annual target

Methods of setting targets

External norms, such as benchmarks (see insert 3) may be used

In an estate containing a number of premises of similar type, function and occupancy, targets can be based on the better performers in the stock

The theoretical fuel consumption can be calculated using basic physics, with or without the application of a computer model. Allowances will need to be made to account for actual efficiencies of building services in practice, as opposed to their ideal performance in theory

Major improvements in efficiency, such as replacement boilers or lighting control systems, allow calculations of projected savings which provide targets

Monitoring against targets

Monitor consumption regularly, compare consumption against target

Identify exceptional consumptions, or where targets are exceeded

Undertake a combination of scheduled and spot checks

Notify as soon as possible those responsible locally for managing energy so that causes can be diagnosed

Identify corrective actions required

Ensure corrective actions are taken

Review targets from time to time, and re-set at lower level when feasible

Building:	Date:
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Actions required	
1 Establish how target is to be achieved	<input type="checkbox"/>
2 Set target and monitor consumption	<input type="checkbox"/>
3 Take corrective actions whenever target is missed	<input type="checkbox"/>

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Minimising avoidable waste

Avoidable waste is a valuable concept, being instantly recognisable as something that should be reduced or eliminated.

The actions listed below will help you to minimise avoidable waste in your building or estate of buildings

Single building

Meter electricity and fuel use during shut-down periods such as holidays and weekends to ensure only those services actually required are operational

In a simply-serviced building where fossil fuel is used for space heating and hot water (and perhaps catering), summer consumption of fossil fuel represents the base load of hot water plus boiler and pipework standing losses. Meter this for a month when space heating is not in use, and assess whether the cost per person per day is a reasonable rate of expenditure

If opportunity allows, run the hot water boilers and pumps when the building is unoccupied. The consumption can then be compared for a similar period when the building is in normal occupation. There may be very little difference in consumption with inefficient systems. Calculate the base load annual consumption from the unoccupied measurement. Further checks may be justified if the base load is above 12% of annual consumption

For each month of the year subtract the base load figure from the total monthly fossil fuel consumption to give the space heating load. Compare the variations in space heating with average monthly external temperatures to ascertain how well controlled your space heating is. Check particularly that warmer outside temperatures are matched by lower space heating use

Run an energy efficiency week for staff

- Meter consumption of electricity and fossil fuels before any announcement is made, and during the week beforehand
- Meter energy use during the energy efficiency week
- Compare the three figures to obtain an indication of how much energy could be saved if staff took the same degree of care all the time. Bring this to the attention of staff as part of a good housekeeping campaign

Estate of buildings

Identify a group of buildings with similar building fabric and services, functions, occupancy and equipment

Monitor consumption across each of the buildings, or use fuel invoice information. Convert to an index by dividing consumption by floor area, number of occupants or some other measure. Compare the consumptions of electricity and fossil fuels for a given period, such as a week, month, quarter or year

Try to determine why the highest consumers are less efficient than the lowest consumers

Introduce the necessary corrective actions through good housekeeping, repairs, maintenance or new plant

Building:	Date:
------------------	--------------

Actions required	
1 Monitor consumption to assess minimum requirements	<input type="checkbox"/>
2 Identify and quantify avoidable waste	<input type="checkbox"/>
3 Take corrective actions to reduce avoidable waste	<input type="checkbox"/>

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Setting up a property database

Photocopy this insert and use it to help you set up a database to assist in the energy efficient management of your premises

Building:	Date:
------------------	--------------

Basic information system contents

Name of local manager of each building	<input style="width: 100%;" type="text"/>			
Person responsible for energy management	<input style="width: 100%;" type="text"/>			
Official address(es) and reference numbers used by fuel suppliers	<input style="width: 100%;" type="text"/>			
Location(s) and reference number(s) of utility meter(s)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border: 1px solid black; padding: 2px;">Electricity</td> <td style="width: 50%; border: 1px solid black; padding: 2px;">Gas/oil</td> </tr> </table>	Electricity	Gas/oil	
Electricity	Gas/oil			
Fuel delivery point(s) and size of storage tanks of oil or LPG if applicable	<input style="width: 100%;" type="text"/>			
Initial meter readings when you commence your management of the building - this will help you to reduce or eliminate errors in utility bills	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; border: 1px solid black; padding: 2px;">Gas/oil</td> <td style="width: 33%; border: 1px solid black; padding: 2px;">Electricity (full price)</td> <td style="width: 33%; border: 1px solid black; padding: 2px;">Electricity (off peak)</td> </tr> </table>	Gas/oil	Electricity (full price)	Electricity (off peak)
Gas/oil	Electricity (full price)	Electricity (off peak)		
Ownership details, or lease type (responsibility for services/repairs)	<input style="width: 100%;" type="text"/>			
Floor area (in m ²) - from lease information, cleaning schedules or other source. (Note whether measured gross, or leased area, heated area.) Note dates of survey	<input style="width: 100%;" type="text"/>			
Floor plans - sources include fire escape maps, local council sewer records	<input style="width: 100%;" type="text"/>			

Useful supplementary information

Occupancy levels and hours of use (from facilities manager)	<input style="width: 100%;" type="text"/>
Building construction - age and type of walls, floors, roofs, windows and doors, including insulation levels (probably available from property department)	<input style="width: 100%;" type="text"/>
Building services - heating, lighting, hot water; mechanical ventilation, air-conditioning (available from maintenance department)	<input style="width: 100%;" type="text"/>
Switching and control arrangements for lighting, heating, hot water; mechanical ventilation	<input style="width: 100%;" type="text"/>
Energy-consuming equipment loads - particularly where these affect maximum demand charges. Known problem areas recorded - such as hot or cold spots, draughts, unreliable systems	<input style="width: 100%;" type="text"/>

Additional documents

Copies of fuel invoices - these should be checked to ensure they match the building - correct address, premises name and fuel account. Oil delivery quantities should not exceed tank capacity

Floor plans, including zoning for heating system, location of meters and plant-room

Photograph(s) of exterior, interior of building, and boilerhouse/plant rooms

Actions required

- | | |
|---|--------------------------|
| 1 Establish property database and gather basic data | <input type="checkbox"/> |
| 2 Seek supplementary information from within the organisation | <input type="checkbox"/> |
| 3 Compile dossier of additional plans, photos and details | <input type="checkbox"/> |

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Matrix for assessing contract procedures

Level	Reviewing existing contracts	Evaluating potential suppliers	Checking compliance	Auditing performance
4	Continuous rolling programme to ensure all existing contracts reviewed to decide whether they need to cover energy efficiency issues. Where necessary, reference to protecting energy efficiency inserted in tendering procedures for renewal of contracts.	Whenever appropriate, performance of suppliers is evaluated against established energy efficiency criteria. Wherever necessary, only those meeting criteria invited to tender.	Wherever appropriate, regular and methodical checking by staff with appropriate expertise. Corrective action identified and subsequently monitored. Records maintained of supplier performance.	Wherever appropriate, completed contracts reviewed, with reporting of achieved levels of energy efficiency along with other critical aspects of supplier performance.
3	Most major contracts routinely reviewed to see whether they need to cover efficiency issues.	Agreed criteria for evaluating suppliers exist and routinely used to evaluate potential tenderers on most major contracts.	Periodic checking by experienced staff on most major contractors, identifying corrective actions and issuing instructions accordingly.	Most major completed contracts reviewed, with reporting of energy performance as one of regular topics addressed.
2	Some ad hoc action taken to review whether major contracts need to cover energy efficiency issues.	Ad hoc criteria exist and sometimes used to evaluate suppliers of services and purchases.	Ad hoc approach to compliance checking against energy criteria only during other general inspections of progress.	No general auditing but ad hoc action to review energy efficiency only if and when performance audited for other purposes.
1	Informal consideration of energy efficiency issues only in contracts specifically for energy goods or services.	Energy efficiency informally and occasionally used to evaluate potential suppliers only in contracts specifically for energy goods or services.	Informal and occasional checking only on contracts specifically for energy goods or services.	Informal and occasional auditing only on contracts specifically for energy goods or services.
0	Little or nothing known about the extent to which energy efficiency issues are dealt with in any of the organisation's current contracts.	Little or nothing known about the ability of existing suppliers to deliver energy efficient products or services in practice.	No attention paid during inspections to issues relating to energy efficiency.	No attention paid during post-contract auditing to issues relating to energy efficiency.
Select your priorities for action: A = first D = last				

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Purchasing interventions

Insert 23

Service	Potential saving %	Objective	Proposed Intervention
New-build	30	Improve energy efficiency and provide lowest cost of ownership	Brief must consider energy efficiency issues at both individual component and integrated systems levels
Plant and equipment maintenance:	30		
boiler replacement		Improve combustion efficiency and reduce case losses	Use condensing/high efficiency boilers with low case losses
burner controls		Reduce boiler standing losses	Ensure boilers remain cold unless their power is required
burner maintenance		Use correct flame shape, set combustion with instruments	Require written statement of setup and obtain independent audit of combustion conditions
controls set-up		Delivery of required service to specified levels	Specify time/temperature for each service and audit
controls replacement		Controls to be competent for task	Select for lowest consumption, not lowest cost. Commissioning tests to be specified before installation
motor replacement		Reduce power consumption	Specify high efficiency motors, use variable speed drives when possible
pump/fan replacement		Select for lowest cost ownership, not lowest first cost	Require report on viability before approval
system balance		Ensure even supply of heating/cooling throughout building	Require list of valve settings and temperatures/airflows achieved
Vending machines	30	Economise in use of lighting, heating and refrigeration	Tender/lease documents to state energy consumption when idle and at full output rate
Refurbishment	25	Improve energy efficiency and provide lowest cost of ownership	Brief must consider energy efficiency issues at both individual component and integrated systems levels
Building fabric maintenance	25		
flat roof covering		Increase insulation when low marginal cost opportunity exists	Specify insulation to optimum marginal benefit/marginal cost
painting of doors and windows		Reduce air infiltration caused by paint build-up	Specify painters to remove any paint build-up stopping doors and windows closing tightly
window replacement		Reduce heat losses through frame and glass	Specify frames with good insulation, use low emissivity glass
Catering	20	Avoid unnecessary energy and water use	Specify requirements to avoid waste of energy and water. Use to be metered and audited
Small power equipment	20	Minimise energy consumed	Specific identification of energy consumption as selection criterion
Water leaks	12	Detect leaks using a combination of consumption checks and physical tests	Local water authorities may offer these services. Check total costs if shared savings contracts offered
Building cleaning	10	Avoid unnecessary use of lighting and hot water	Use lights only in immediate work area/corridors. Maximise use of cold cleaning chemicals
Ground maintenance	8	Avoid excess shading by trees and shrubs leading to increased use of artificial light	Work to include trimming of trees and shrubs near buildings
Security staff	7	Include energy efficiency duties within task	Duties to include turning off lights in unoccupied areas (respecting safety), closing doors/windows, reporting wasteful practices, reading meters
Monitoring and targeting	5	Maximise use of available information and minimise delays in reporting performance	Specify requirements for delivered reports, targeting accuracy, avoiding delays in reporting of anomalous consumption
Purchasing	5	Energy efficiency requirements to be included wherever appropriate	Specifications to include energy efficiency statements/requirements/tests
Vehicle maintenance	5	Minimise fuel cost	Discriminate against vehicles larger than necessary and those using higher-cost fuels
Tariff selection and optimisation	4	Reduce cost of supply without agreeing to onerous contract terms/high overall costs	Tender on total costs of contract. Avoid self-renewing or long-term agreements
Room hire	3	Make users responsible for energy use	Specify hirer's duty to avoid waste of energy
Energy surveys	-	Concentrate on viable/feasible energy/cost saving options	Set viability limits, require analyses of potential savings at both component and system levels
Actions required			
1	All immediate opportunities identified and achieved	<input type="checkbox"/>	
2	Memos issued and diary entries made for future interventions	<input type="checkbox"/>	
3	Dates for auditing results and reporting to management set in diaries	<input type="checkbox"/>	

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Fuel purchasing decisions

Use this insert to help you minimise your organisation's fuel purchase costs, and review other purchases for their energy implications

Purchasing all fuels at minimum tariffs

- Ascertain levels at which annual costs and monthly demand qualify for negotiated tariffs
- Identify buildings within your estate which meet the criteria for negotiating tariffs with fuel suppliers
- Prepare a league table of relevant premises to establish where highest unit rates are incurred
- Ensure detailed daily, weekly and monthly consumption information is available to suppliers
- Consider installation of half-hourly metering for electricity to provide consumption profiles
- In complex cases computer programs considered to analyse alternative tariffs
- Cross check tariff analyses with recommendations from utility suppliers
- Ensure tariff changes occur at times of the year when maximum benefits will be obtained
- Carefully examine competitive bids to ensure contract prices are comparable
- Ensure supplier's terms and conditions meet your requirements
- If you use a tariff consultant, look carefully for self-renewing agreements, or those where new savings extend the contract beyond the original term. It is not unknown for long-term agreements to end in acrimony

Reviewing other purchases

- Ensure you are kept informed of proposed purchases of items which involve fuel consumption
- Review proposed equipment for its energy use implications and encourage purchase of energy efficient alternatives
- Review purchasing agreements and introduce energy efficiency clauses wherever practical
- Evaluate potential suppliers for their ability to deliver energy efficient goods or services
- Periodically check compliance of suppliers and service providers against your energy efficiency requirements

Examples of equipment to check:

- Catering appliances
- Dishwashers and refrigeration
- Office equipment
- Hot and cold vending machines
- Small power items
- High efficiency motor options
- Variable speed drive options

Building:	Date:
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Actions required	
1 Identify purchasing decisions with greatest energy impact	<input type="checkbox"/>
2 Introduce energy efficiency requirements into these decisions	<input type="checkbox"/>
3 Check compliance of suppliers periodically	<input type="checkbox"/>

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Starting a programme of improvement works

Use this checklist to help you choose your improvements, and to prepare your brief and programme of works.

Briefs and specifications for outside contractors and consultants

- Brief contractors and consultants about your performance requirements
- Devise a standard brief and general performance specification
- Specify limits for standing losses, fuel conversion efficiency, and operation at part load
- Ensure building services are designed to be managed and monitored effectively
- Devise equitable systems for keeping a retention on works until building services proven to operate competently

Programming the works

- Conduct site investigations to identify energy efficiency improvements required
- Brief suppliers, write detailed specification or performance specification, as appropriate
- Assess tender organisations for their ability to deliver energy efficiency
- Invite tenders only from those who are competent to deliver the quality you require
- Assess contractual and technical aspects of tender submissions
- Arrange for supervision of the works to ensure design intentions achieved on site
- Witness commissioning (carried out by senior surveyor or commissioning engineer)
- Obtain record drawings, operating instructions and maintenance schedules
- Ensure staff receive training in the operation of newly installed plant and systems
- Keep a log book of control settings and any changes made

Possible improvements for consideration

Lighting

- Improve switching arrangements to encourage staff to switch off when daylight available
- Provide translucent shades and efficient reflectors to light fittings
- Replace 38 mm tubes with 26 mm wherever possible
- Install compact fluorescent lights to replace incandescent bulbs
- Install automatic controls, such as time switches, daylight sensors or occupancy sensors

Space heating

- Install space temperature controls, such as room thermostats or TRVs
- Install time switches to ensure systems operate only when needed
- Ensure optimum start controllers bring building up to temperature within 30 minutes of occupancy for at least 60% of heating starts
- Introduce separate zones for spaces with different heating requirements
- Introduce weather compensators to adjust flow temperature according to external conditions

Hot water

- Insulate hot water storage vessel and all pipework
- Consider local hot water generators to avoid long pipe runs

Building fabric

- Ensure all accessible lofts have minimum of 150mm of loft insulation, in good condition
- Draughtstrip all external doors and windows
- Install double glazing
- Insulate flat roofs
- Replace excessive areas of glass with insulated panels
- Consider internal and external wall insulation

Building:	Date:
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Actions required	
1 Plan a programme of future improvement works	<input type="checkbox"/>
2 Devise standard briefs and specification clauses	<input type="checkbox"/>
3 Evaluate alternative technical measures	<input type="checkbox"/>

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Have you improved your control over energy use?

	Yes	No	Date	Refer to insert
Have you allocated at least one hour per week on maintaining control of your energy use for every £25 000 you spend a year on energy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	1
Have you benchmarked your consumption and compared it with building type norms?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	3
Have you identified who is responsible for day to day control of the services in your premises?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	6
Have you run publicity and promotional campaigns to raise staff awareness of energy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	7
Have you reported on progress within and beyond your organisation, promoting your results in ways appropriate to your target audiences?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	8
Have you compared energy costs with the organisation's profits to demonstrate the contribution of energy efficiency to profitability?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	9
Have you regularly presented a case on investment opportunities to management?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	10
Have you assessed your premises to identify the most fruitful opportunities for saving energy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	12
Have you identified the resources of time, skills and funding that you need to maintain control over energy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	13
Have you carried out regular inspections of environmental conditions in your premises both during and outside the hours of occupancy?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	14
Have you carried out regular inspections of the condition of the fabric and the operation of the services in your premises?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	15
Have you planned your activities seasonally to ensure you maximise the benefits of your actions?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	16
Have you introduced a routine for reading meters weekly or monthly and checking readings against invoices?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	17
Have you introduced an information system for storing, analysing and reporting consumption information?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	18
Have you analysed the patterns and trends in consumption, set targets and compared against actual consumption?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	19
Have you worked out your premises' minimum energy and water consumption requirements and assessed the level of 'avoidable' waste?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	20
Have you compiled a property database containing details of your premises, such as type, floor area, age and condition, plant and services, switching and metering?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	21
Have you ensured that your organisation's purchasing decisions include energy efficiency criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	22/23/24
Have you prepared a costed programme of improvement works?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	25
Have you invested 10% of your annual energy spend on energy saving measures?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	-

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