Analysis of Energy Consumption

at

ACME Limited

by

A.N. Energy Consultancy

A report written using the BizEE Benchmark energy auditing software package developed by BizEE Software Ltd

www.bizeesoftware.com

Contents

Executive Summary

The energy consumption at ACME Limited is analysed to determine how much energy is used, where it is being used, and how much it costs. An energy-efficiency rating on a scale of 0 (poor) to 10 (excellent) is calculated and compared with the 'best practice' rating of 7. Further calculations show the cost savings that could be achieved by improving energy-efficiency for each of the main categories of energy expenditure in each of the main activity areas of the business. These are explained in Sections 3, 4, and 5, and are briefly summarised below. Section 6 outlines ways of making savings.

Overall Energy Performance

The energy performance at ACME Limited is calculated for each of the fuels used (Section 3). A summary of overall energy performance (all fuels together) is shown below:

Table E1: Summary of fuel use on site

Efficiency rating*	Average annual energy cost	Average annual consumption	Average annual carbon
5.8	£70,000	1,580,000 kWh	483,000 kg CO2

* The efficiency rating is graded from 0 to 10 with 0 being very poor and 10 being excellent. A business employing 'best practice' energy-efficiency measures would typically score around 7.

Overall Energy Cost Breakdown

The main categories of energy expenditure (irrespective of type of fuel) are identified in section 4. The categories are shown in Figure E1 below:

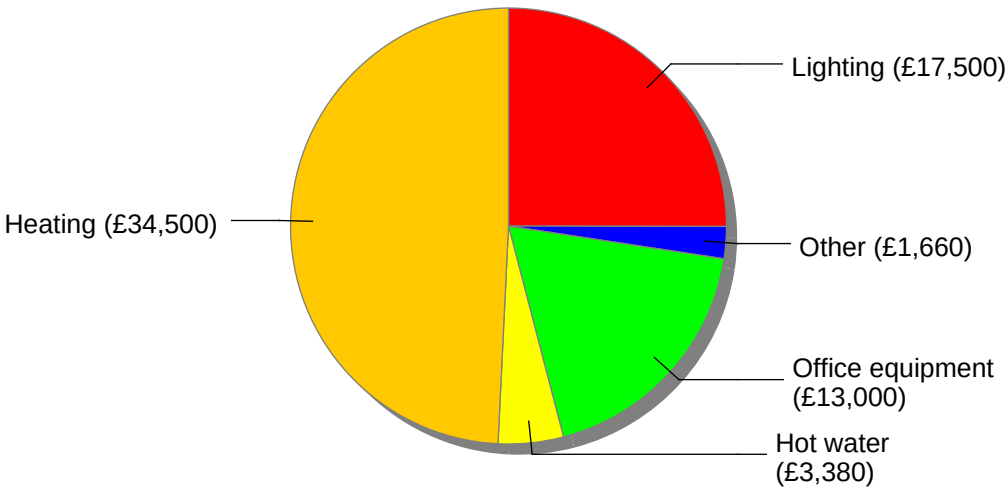

Figure E1: Categories of annual energy expenditure (excluding fixed costs)

Potential for Energy Cost Savings

By comparing the current energy costs at ACME Limited with 'best practice' energy costs (Section 3.1), it is possible to estimate the energy cost savings that could be achieved by improving the energy-efficiency of the business.

It is estimated that **ACME Limited has the potential to save around £16,000 a year by improving its energy-efficiency**. This represents a saving of 23% of the current expenditure.

The following specific energy uses in particular activity areas have been identified (Sections 5 and 6) as having the greatest potential for savings:

- Heating in Upstairs office - potential savings of £6,590 a year (current cost £24,700)
- Heating in Downstairs office - potential savings of £3,650 a year (current cost £6,630)
- Lighting in Upstairs office - potential savings of £1,330 a year (current cost £8,140)
- Office equipment in Upstairs office - potential savings of £1,010 a year (current cost £6,390)

Section 6, "Priority Targets: How to Make Savings", gives information on how such savings could be achieved.

1. Introduction

This report gives the results of an energy performance analysis carried out on ACME Limited. It quantifies current energy consumption and cost, gives an overall energy-efficiency rating to the business, and estimates the likely potential for energy cost savings resulting from improved energy-efficiency.

This report should be considered as an introductory look at the energy consumption at ACME Limited. To follow up on the information contained within this report it is recommended that further guidance be sought from the Action Energy help-line on 0800 585 794 or from www.actionenergy.org.uk.

Interest free loans from Action Energy are available for certain energy-saving equipment from £5,000 to £50,000. Enhanced Capital Allowance is also available on certain energy-efficiency equipment, see the Action Energy website for details: www.actionenergy.org.uk.

1.1. The Importance of Energy Efficiency

Improving energy-efficiency is important for a number of reasons:

- Fuel bills are reduced, making the business more profitable and competitive.
- Comfort levels are increased for staff, which can improve productivity.
- Energy usage is reduced, which reduces emissions of carbon dioxide and therefore helps sustainability goals.

1.2. The Structure of the Report

The next section of the report, "Brief Methodology" gives a short overview of how the figures presented were calculated.

Section 3, "Overall Energy Performance", looks at the energy consumption, cost, and carbon dioxide of each of fuels used on site, comparing current costs to those of an 'equivalent best practice' energy-efficient business, and estimating the total potential savings at ACME Limited.

Sections 4 and 5 look at the breakdown of energy costs and potential savings by energy use, with Section 4 giving an overall breakdown and Section 5 going into more detail and considering each activity area of the business in turn.

Finally, Section 6 focuses on those energy uses that show the greatest potential for cost savings, and gives advice on how such savings could be achieved.

2. Brief Methodology

Energy consumption data were collected from ACME Limited and compared with government benchmark energy consumption figures for organizations of a similar type. Details collected from ACME Limited enable a model of the company's energy usage to be built, highlighting how much energy the company uses, what equipment is using it, and how much it costs. The analysis involves distinguishing the different fuels used on site, and analysing their consumption in different activity areas of the business. ACME Limited is classified as being made up of the following activity areas:

- Downstairs office - 5,000 m²
- Upstairs office - 5,000 m²
- Reception - 1,000 m²

Such a classification of the premises enables a like-for-like comparison of the actual energy consumption of ACME Limited with that of an 'equivalent best practice' business with a good level of energy-efficiency.

In addition, the methodology involves taking into account a wide range of factors specific to the company. These factors are used in the construction of the model of energy use at ACME Limited, and in all comparisons of energy consumption with benchmark figures. The factors include:

- Occupancy hours
- Building and business type
- Equipment present on site
- Local weather conditions
- Prices paid for energy

It is important to remember that results are dependent on the quality of input data provided, and can only act as an approximation.

3. Overall Energy Performance

The following table gives an analysis of the fuels supplying energy to ACME Limited. The figures quantify the energy consumption (and resulting cost and carbon emissions) in a typical year. Cost figures are based on current prices, and include fixed charges (e.g. standing charges) and the Climate Change Levy.

Table 1: Energy performance of the fuels used on site

Fuel	Efficiency rating*	Average annual energy cost	Average annual consumption	Average annual carbon
Gas	4.9	£6,390	556,000 kWh	117,000 kg CO2
Electricity	6.4	£41,700	602,000 kWh	277,000 kg CO2
LPG	6.0	£21,900	425,000 kWh	89,100 kg CO2
Overall	**5.8**	**£70,000**	**1,580,000 kWh**	**483,000 kg CO2**

* The efficiency rating is graded from 0 to 10 with 0 being very poor and 10 being excellent. A business employing 'best practice' energy-efficiency measures would typically score around 7.

Gas has a rating of 4.9 indicating a reasonable level of energy-efficiency, but with the potential for energy cost savings to be made (see Section 3.2).

Electricity has a rating of 6.4 indicating a reasonable level of energy-efficiency, but with the potential for energy cost savings to be made (see Section 3.2).

LPG has a rating of 6.0 indicating a reasonable level of energy-efficiency, but with the potential for energy cost savings to be made (see Section 3.2).

3.1. Comparison with 'Best Practice' Benchmarks

To put the above summary figures in perspective, Figure 1 shows how the average annual energy costs at ACME Limited compare with those of an 'equivalent best practice' business with a good (7.0) level of energy-efficiency.

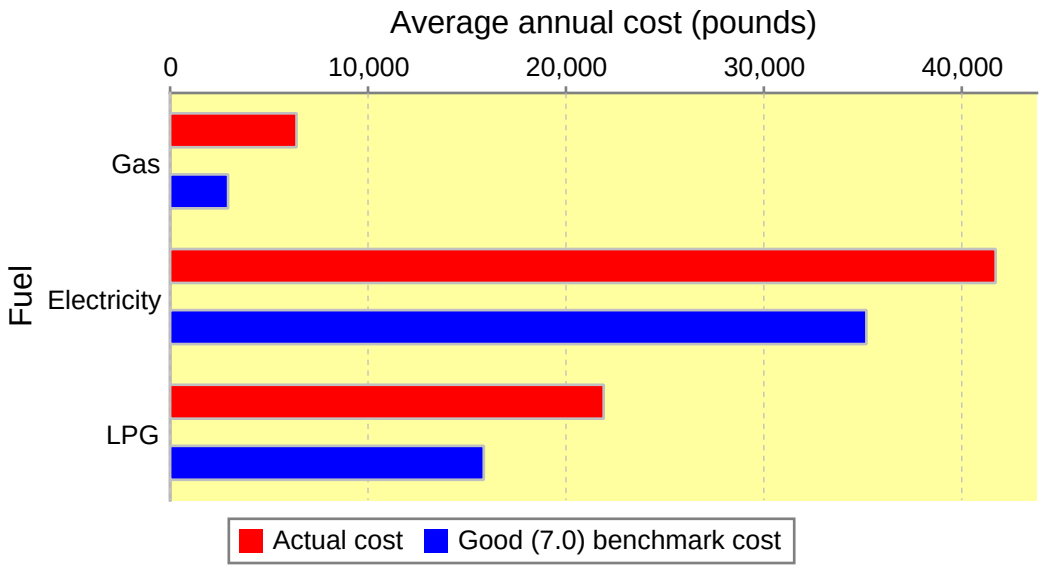

Figure 1: Average annual energy costs at ACME Limited (red) compared with an 'equivalent best practice' business (blue)

3.2. Potential for Energy Cost Savings

A simple comparison of the actual average annual energy costs and those of the 'equivalent best practice' (7.0) business shows that ACME Limited has the potential to save around £16,000 on energy costs, through the introduction of simple energy-efficiency measures. The potential savings are broken down by fuel as follows:

Table 2: Potential energy cost savings for each fuel used on-site

Fuel	Current average annual cost	Potential average annual savings	Percentage saving
Gas	£6,390	£3,460	54%
Electricity	£41,700	£6,530	16%
LPG	£21,900	£6,060	28%
Overall	**£70,000**	**£16,000**	**23%**

Section 5 of the report looks at the specific energy uses in which these savings can be made, and Section 6 targets those energy uses with the greatest potential for savings, giving guidance on how to achieve such savings.

4. Overall Energy Cost Breakdown

The following pie chart shows the main categories of annual energy expenditure at ACME Limited, irrespective of type of fuel:

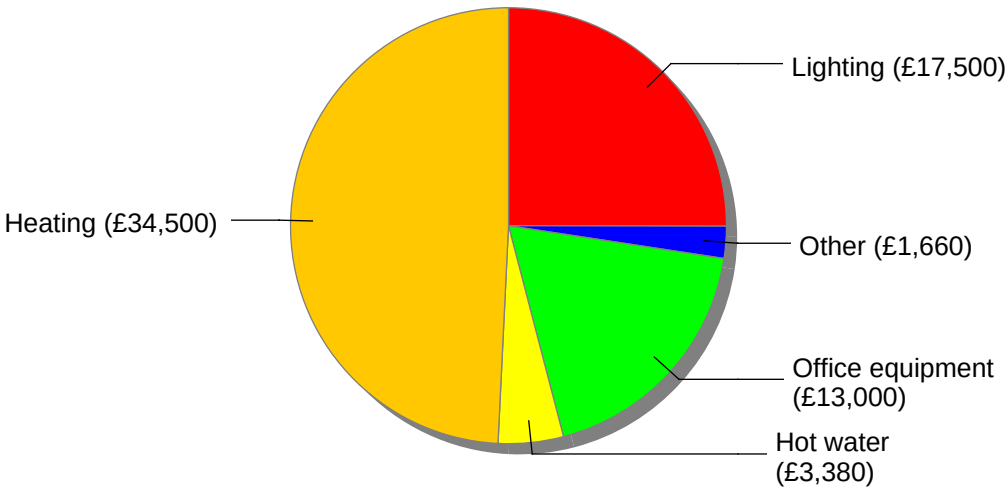

Figure 2: Categories of annual energy expenditure (excluding fixed costs)

The following section goes on to show the costs in individual activity areas of the business.

5. Energy Cost Breakdown by Activity Area

This section breaks down energy costs into areas of the business, and individual energy uses within those areas. Where appropriate, the estimated potential for savings through improved energy-efficiency is also given.

5.1. Downstairs office

The distribution of energy expenditure within Downstairs office is shown below:

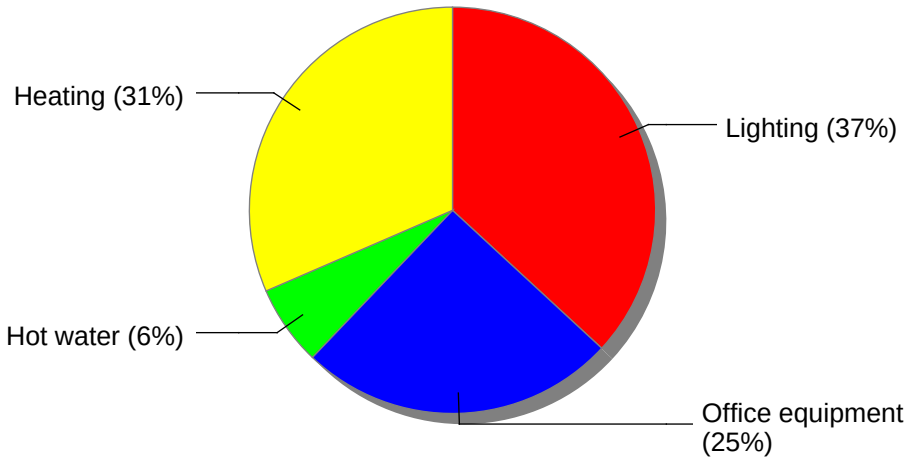

Figure 3: Categories of annual energy expenditure in Downstairs office (excluding fixed costs)

Below is a table showing all energy uses in Downstairs office, the cost of current consumption and, where appropriate, the potential savings for each energy use:

Table 3: Energy uses in Downstairs office - average annual costs and potential savings

Energy use	Current average annual cost	Potential average annual savings	Percentage saving
Heating	£6,630	£3,650	55%
Hot water	£1,340	£194	14%
Lighting	£7,760	£947	12%
Office equipment	£5,310	£827	16%
Total	**£21,000**	**£5,620**	**27%**

5.2. Upstairs office

The distribution of energy expenditure within Upstairs office is shown below:

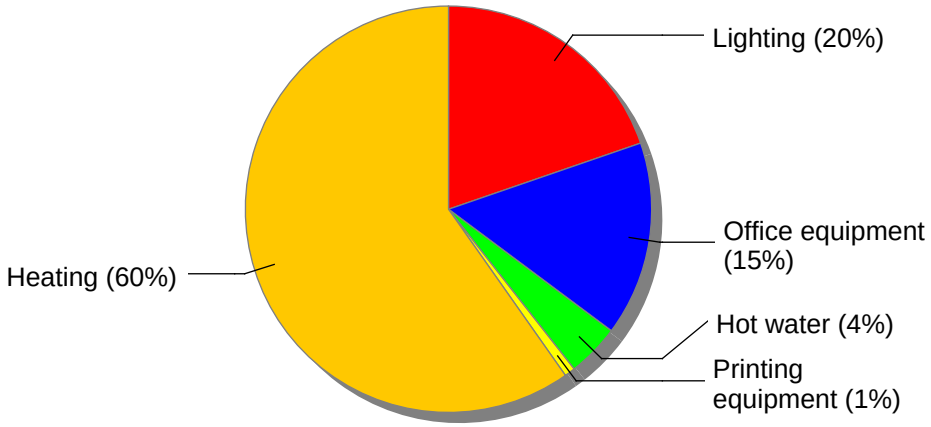

Figure 4: Categories of annual energy expenditure in Upstairs office (excluding fixed costs)

Below is a table showing all energy uses in Upstairs office, the cost of current consumption and, where appropriate, the potential savings for each energy use:

Table 4: Energy uses in Upstairs office - average annual costs and potential savings

Energy use	Current average annual cost	Potential average annual savings	Percentage saving
Heating	£24,700	£6,590	27%
Hot water	£1,730	£482	28%
Lighting	£8,140	£1,330	16%
Office equipment	£6,390	£1,010	16%
Printing equipment	£349	-	-
Total	**£41,300**	**£9,410**	**23%**

5.3. Reception

The distribution of energy expenditure within Reception is shown below:

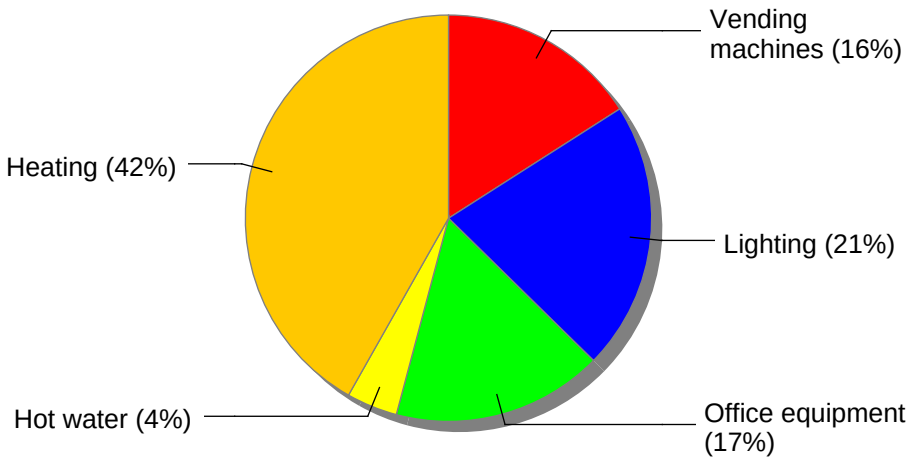

Figure 5: Categories of annual energy expenditure in Reception (excluding fixed costs)

Below is a table showing all energy uses in Reception, the cost of current consumption and, where appropriate, the potential savings for each energy use:

Table 5: Energy uses in Reception - average annual costs and potential savings

Energy use	Current average annual cost	Potential average annual savings	Percentage saving
Heating	£3,180	£511	16%
Hot water	£308	£45.10	15%
Lighting	£1,630	£265	16%
Office equipment	£1,280	£201	16%
Vending machines	£1,210	-	-
Total	**£7,610**	**£1,020**	**13%**

5.4. Miscellaneous Energy Uses

Certain energy uses at ACME Limited are not tied to any particular activity area, and so are covered separately.

Below is a table showing the miscellaneous energy uses at ACME Limited, the cost of current consumption and, where appropriate, the potential savings for each

energy use:

Table 6: Miscellaneous energy uses - average annual costs and potential savings

Energy use	Current average annual cost	Potential average annual savings	Percentage saving
Lifts	£97	-	-
Total	**£97**	**-**	**-**

6. Priority Targets: How to Make Savings

This section identifies the specific energy uses that have the highest potential for energy cost savings, and gives recommendations on how to cut their energy consumption.

6.1. Heating in Upstairs office

Table 7: Potential energy cost savings for Heating in Upstairs office

Current average annual cost	Potential average annual savings	Percentage saving
£24,700	£6,590	27%

Setting the Target Heating Temperature

Overheating is a likely cause of excessive heating costs. It is recommended that office space should not be heated above 19C, although many companies find 20C a more comfortable working level. Choose a target heating temperature and set thermostats appropriately. Maintaining the thermostat temperature will require effective control:

Effective Control of Warm Air Heating

- Use local thermostats to control the operation of the air-handling units.
- Do not control the heating temperature by opening windows!
- A thermostat must be located in a spot that has a temperature representative of the area it is controlling. Ensure that it is not placed next to a source of heat such as a photocopier, or near an outside door that's in frequent use.
- Ensure that the heating timer allows 7-day control, so that the building is not heated on unoccupied days. Consider fitting optimum-start control to the heating system: this ensures that the heating comes on to pre-heat the building no sooner or later than necessary to meet the required temperature by the required time.
- A large proportion of the energy cost of a ducted warm air heating system comes from the electrical cost of fans. Ensure that fans are properly controlled, and are always switched off when there is no demand for heating or ventilation.

Ventilation System Maintenance

To keep a ducted warm air heating system energy-efficient it needs to be well maintained. Ensure a good flow of air through the system by cleaning convector grilles and cleaning or replacing filters regularly. Carry out any required maintenance specific to the exact type of warm air heating system present.

Boiler

- Boilers should be serviced annually to maintain efficient operation.
- When existing boilers reach the end of their useful life, replace with high efficiency or condensing boilers.

6.2. Heating in Downstairs office

Table 8: Potential energy cost savings for Heating in Downstairs office

Current average annual cost	Potential average annual savings	Percentage saving
£6,630	£3,650	55%

Setting the Target Heating Temperature

Overheating is a likely cause of excessive heating costs. It is recommended that office space should not be heated above 19C, although many companies find 20C a more comfortable working level. Choose a target heating temperature and set thermostats appropriately. Do not control the temperature by opening windows!

Effective Control of Radiator Heating

A correctly set thermostat is often not enough to ensure that the area is not overheated:

- The thermostat must be located in a spot that has a temperature representative of the area it is controlling. Ensure that it is not placed next to a source of heat such as a photocopier, or near an outside door that's in frequent use.
- Install thermostatic radiator valves (TRVs) on radiators: these are particularly important in individual rooms, and should be used in conjunction with a central thermostat.
- Radiators should be well balanced and TRVs set to appropriate levels and left alone: they should not be used as on-off switches. Staff should either be taught how to use them, or the TRVs should be locked at an appropriate setting.

Ensure that the heating timer allows 7-day control, so that the building is not heated on unoccupied days. Consider fitting optimum-start control to the heating system: this ensures that the heating comes on to pre-heat the building no sooner or later than necessary to meet the required temperature by the required time.

Boiler

- Boilers should be serviced annually to maintain efficient operation.
- When existing boilers reach the end of their useful life, replace with high

efficiency or condensing boilers.

6.3. Lighting in Upstairs office

Table 9: Potential energy cost savings for Lighting in Upstairs office

Current average annual cost	Potential average annual savings	Percentage saving
£8,140	£1,330	16%

The simplest measure to immediately improve lighting energy-efficiency is to ensure that lights are only switched on when necessary, depending on the levels of natural daylight present. Ensure that staff know where light switches are, and encourage them to adopt energy-efficient practices.

In an open plan office area such as Upstairs office there should be a sufficient number of light switches to make it possible to light only the areas of the room that are occupied at any one time. Plenty of light switches also allow for the lights to be turned off near windows when daylight is sufficient. Individual desk lamps can be an effective option if there are often just a few staff in a large office area: it is a lot better to light a couple of desks than to light an entire office for just a couple of staff.

Automatic Lighting Controls

Automatic lighting controls are worth considering to ensure that lights are only on when needed. For example:

- Occupancy sensing controls / presence detectors: these can be ideal for intermittently used areas such as corridors, store areas and toilets.
- Daylight linked switching controls: these sense the levels of daylight present and turn the lights on and off automatically to maintain a sufficient level of light.
- Timer controls: to turn lights on and off at predetermined times.

Choosing the right equipment

- Compact fluorescent (CFL) bulbs use four or five times less energy than standard light bulbs with an equivalent light output, and last around 10 times longer.
- T8 (26mm diameter) fluorescent tubes are about 9% more efficient than T12 (38mm diameter) equivalents, and they are cheaper. When T12 tubes fail, always replace them with T8s.
- When purchasing new lighting equipment (e.g. for a refurbishment), always look into the energy-efficiency of the equipment being purchased, and ensure that the lighting requirement of the area is not overestimated.

6.4. Office equipment in Upstairs office

Table 10: Potential energy cost savings for Office equipment in Upstairs office

Current average annual cost	Potential average annual savings	Percentage saving
£6,390	£1,010	16%

- Activate energy saving / standby software on office equipment, including PC's photocopiers, printers and fax machines.
- Turn off equipment when not in use.
- Ensure that staff computers are switched off at the end of every working day.
- Encourage staff to turn off computer monitors when they are not using them. Contrary to popular belief, most screensavers do not save energy!