

Appendix I

Case studies

This appendix outlines the management approaches adopted by two UK institutions for developing a business case for energy efficiency; and provides six examples of institutions implementing energy management initiatives. Examples relating to sustainability and the environment are provided by four commercial and non-profit organisations as part of Appendix G, *Drivers for sustainable estates management in the FHE sector*.

Developing a business case for energy efficiency:

- a. University of Edinburgh
- b. University of Glasgow

Implementing energy management initiatives:

- c. Canterbury Christ Church University College
- d. Coventry University
- e. University of Edinburgh
- f. University of Leeds
- g. University of Leicester
- h. University of Teesside

a. University of Edinburgh

Summary

The projected impact on the Estates & Buildings budget is considered if there is a freeze on investment in energy efficiency measures due to overall constraints in the planning unit. A projected programme of energy efficiency investment in small measures is outlined, to contain continually and progressively growth in consumption.

The business case for energy efficiency investment

The default case is that the institution faces increases rising to £860,000 pa in utilities spend in the period to 2006-07 – an increase of nearly 20 per cent on a current spend of £4.54 million if no action is taken. A continued annual investment of 5 per cent of utilities spend would reduce the increase to around £500,000 pa – more in line with the current rate of inflation. The projected simple payback of proposed projects range from three to five years, with overall savings cumulating to £1,045,000 over this period and continuing thereafter. The separate major capital investments in combined heat and power (CHP) at Pollock Halls of Residence and the King's Buildings have been excluded from this analysis as they will need to be paying back their investment in engines and infrastructure for at least seven or more years before the cash savings kick in.

The changing character of the institution's estate

The institution's estate has grown significantly over the last 10 years – with gross internal area of academic property increased by 25 per cent including the merge of the Moray House Institute of Education in 1998. While there have been some disposals to counter the additions, these disposals have been mostly ad hoc, poor-fit buildings, often under-utilised, generally with average or low energy consumption. By contrast, nearly all the new buildings recently constructed have been highly serviced laboratory buildings with typically 10 to 15 air changes per hour full fresh air for scientific/medical research purposes. These very energy intensive buildings house the very research groups who place the institution at the forefront of international research in biomedical science etc. It would appear that much of the projected accommodation within the current strategic five-year estate capital projection is planned along similar lines – exacerbating shift to a potentially more energy intensive property portfolio. Even buildings within humanities and social science and

administration have increased energy consumption due to significant expansion of IT facilities in practically every office and in institutional Micro Labs etc.

The institution's current fuel mix and costs in 2001-02

Net electricity consumption last academic year was 61,894,162 kWh at an average of 4.3 pence / kWh costing £2,669,385 (59 per cent of utilities spend). Net gas consumption was 94,734,124 kWh at an average of 1.1 pence / kWh costing £1,072,507 (24 per cent of utilities spend). Oil is now practically insignificant, but water and sewerage services have risen significantly in the last five years and net consumption was 461,459 cubic metres at an average £1.73/cu.m combined, costing £799,480 (17 per cent of utilities spend). However, short-term water services costs might rise by more than 20 per cent in April 2003. This increase could be in the order of £150,000.

The utilities consumption and costs out-turn in 2001-02 with variances against 2000-01 is shown in Table 1.

Table 1 – Utilities consumption & costs out-turn in 2001-02 with variances against 2000-01

Utility	Consumption in 2001-02	Variance on 00-01	Unit cost 2001-02	Variance on 00-01	Cost in 2001-02	Overall Variance	% of £ Total
Electricity	61,894,162 kWh	+5.9%	4.31pence	-3%	£2,669,385	+2.7%	59%
Gas and oil	94,734,124 kWh	-8.0%	1.13pence	+5%	£1,072,507	-3.3%	24%
Water services	461,459 cu.m	+9.1%	£1.73	+14%	£799,480	+24.3%	17%

Future trends in energy supply and unit costs

The privatisations of the 1990s drove down costs for heat, light and power significantly, and the institution has benefited tremendously from opportunities gained through competitive tendering of fuel requirements. For a short period in 1997-2000 the price of gas fell below pre-1973 prices, but has risen again significantly. The electricity industry has shed much of its uneconomic generating capacity – along with most of its middle management – and electricity prices are now at what commentators consider to be an unsustainably low level, with several major players now facing bankruptcy.

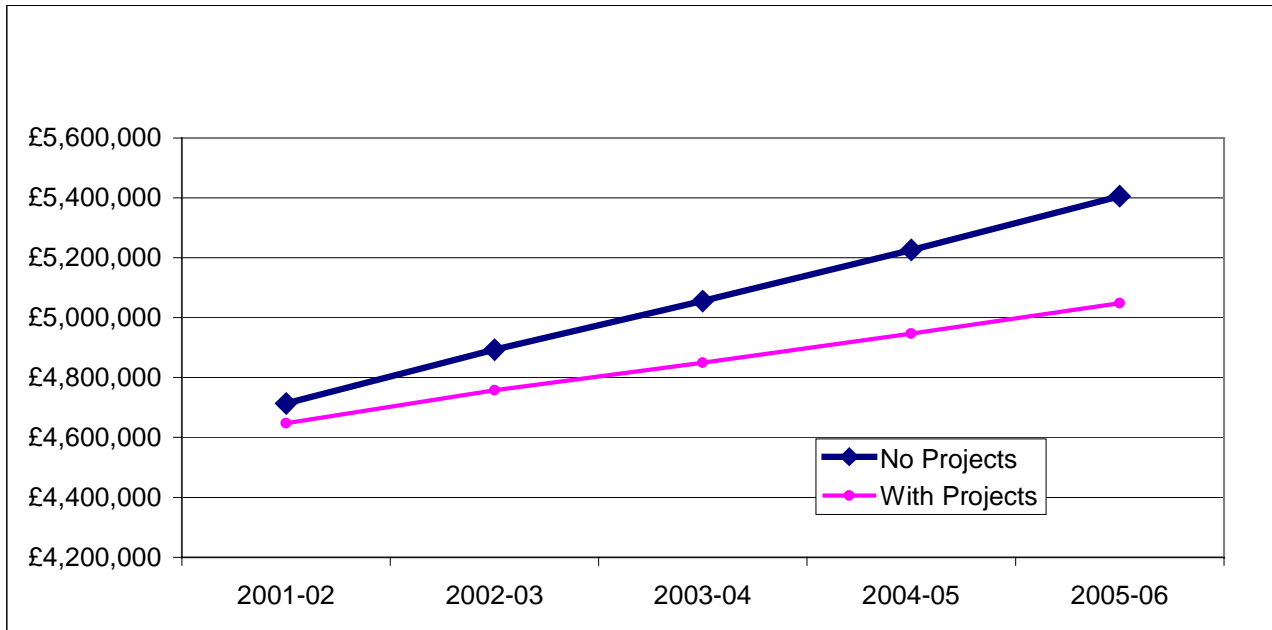
The Energy Information Centre reported at its Scottish Utilities Forum in November 2002 that, while there was some uncertainty in the markets due to the 'Iraq War' factor, they envisaged a 3.4 per cent increase in electricity prices in 2003 and around a 2.7 per cent increase in gas prices in 2003. Oil (which we hardly burn at all) is judged to be slightly overpriced (it is now up 20%!).

A long-term review prepared by ILEX for Government in March 2002 considered the following projected changes in fuel prices as likely:

- electricity likely to remain artificially low until 2005 and thereafter to increase in unit price by 28 per cent between 2005 and 2008
- gas unit prices possibly falling by 2 per cent between 2002 and 2007.

Figure 1 shows that, taking no account of additions to the estate, if no action is taken to contain rises in consumption then it is possible that utilities costs will rise by as much as 19 per cent by 2006-07.

Figure 1 Utilities cost projections 2001-02 to 2005-06 for the University of Edinburgh



To address these potential increases in consumption three parallel strategies are proposed:

- a. Stimulate enthusiasm and co-operation with colleagues in colleges and support groups through the sustainability & environmental advisory group (SEAG).
- b. Formalise *Sustainable Construction Standards* for improved energy and environmental performance. These would require design teams to achieve BRE Environmental Assessment Method (BREEAM) 'excellent' ratings for all new buildings and 'very good' for all major refurbishments, to deliver low energy, loose fit, long life buildings.
- c. Complement this with prudent, ongoing investment in energy efficiency improvements in the existing estate following a series of in-house energy audits of targeted buildings.

Proposed programme of energy efficiency measures

Following a desk review of potential projects that will meet the broad criteria for providing a four year simple payback and will have a significant environmental impact and contribute to the institution's corporate mission, the following list of potential projects has been identified (Table 2).

Table 2 – Proposed energy efficiency projects

	2002-03	2003-04	2004-05	Cumulated annual return	Estimated simple payback
Inverter drives for pumps & fans	£12,000	£15,000	£8,000	£11,000	3
Lighting controls eg, main library	£18,000	£28,000	£26,000	£14,000	5
Awareness raising seminars for technical staff	£5,000	£5,000	£5,000	£5,000	3
Contribution to major replacement projects eg, boilers	£15,000	£20,000	£25,000	£12,500	6
Water infrastructure at the King's Buildings	£10,500	£22,000	£5,000	£12,500	3
Water infrastructure at the Medical Buildings	£0	£11,000	£7,000	£6,000	3
Purified water still replacements	£48,500	£4,000	£0	£17,500	3
Energy audit consultancy [50% subsidised]	£10,000	£10,000	£10,000	£7,500	4
Draught lobbies eg, DHT Lower Ground Fl	£10,000	£12,000	£9,000	£6,000	5
Install push taps on washroom basins	£6,000	£5,000	£3,000	£5,000	3
Energy Savings Incentive Scheme	£12,000	£15,000	£25,000	£20,000	3
Environmental Report for Awareness Raising	£4,000	£0	£5,000	£2,000	4
Contribution to capital projects eg, Charteris	£15,000	£80,000	£80,000	£36,000	5
Poster etc campaign + Card thermometers	£4,000	£3,000	£1,000	£4,000	2
Replace electric htg eg, Drummond St Annexe	£5,000	£10,000	£12,000	£6,000	4
Projected totals	£175,000	£240,000	£221,000	£155,000	4.1

The overall effect of these proposed energy efficiency investments might contain increases in electricity consumption to 1 per cent and increase annual savings on gas and water consumption to 3 per cent. Total projected savings are estimated to be around £360,000 annually at the end of the five-year period.

Complexity and constraints

Delivery of a well-targeted energy efficiency programme has become increasingly difficult in the last five years due to massive change in the way the utility industries have interfaced with large multi-site customers like the institution.

The institution is NOT like Heriot-Watt or Stirling Universities – or indeed like a number of peer institutions like Birmingham – in that it is multi-site and set within the fabric of the city. This means that – unlike Heriot-Watt's Riccarton campus with two main electricity meters, one main water meter and one main gas meter – we have nearly 550 metered fuel streams which require monitoring, bills validating and checking and passing for payment – many of them monthly.

Annual changes to gas contracts, generally three-yearly electricity contracts and changing water and sewerage services tariffs, combined with churn in both existing and new supplies, is taking an increasing amount of staff time. It is vital that this is carried out to a high standard. The institution has been able to save substantial sums through bill validation, rejecting over-charging and identifying leaks and wastage. Introduction of the Climate Change Levy in April 2000 should have increased our annual utilities bill by over £500,000; but following an extensive exercise the institution has managed to certificate much of the utility consumption utilised for research purposes as being for non-business charitable use. This has reduced VAT and CCL exposure by approx £600,000 pa; but the achievement of this and potential for benefiting from the UK Emissions Trading Scheme – through the Institution Carbon Club – takes significant staff resource.

Conclusions and recommendations

There is continuing, underlying growth in the institution's electricity consumption due to significant increase in activity and expansion of the estate. By contrast, improved control over heating and ventilating systems, following past investment in energy efficiency measures, has generally meant a slight reduction in gas and oil consumption. But overall it is likely that utilities costs will increase at a rate significantly greater than inflation if no action is taken to reduce demand.

The utilities industries have been subject to considerable volatility due to major restructuring and to the influence of world events on unit prices. This has made budgeting, and even in-year tracking of utilities expenditure, increasingly difficult and has had repercussions for the whole planning unit. The only prudent solution is to reduce the consumption of fuels through energy efficiency investments. This has been institution policy since 1989 and there has been continual and successful investment in measures to contain increases in consumption.

Pressures on other parts of the Estates & Buildings budget – specifically the commitment to compliance with current and emerging legislation and to tackling the long-term backlog maintenance – means that the ability to continue such an investment programme is under threat. It is recommended that consideration be given to a specific allocation of 5 per cent of the utilities costs – currently circa £230,000 pa – towards the energy efficiency investment programme. This investment would generate annual savings of around £360,000 within five years and repay itself over four to five years. In many cases it would additionally have the effect of improving working conditions for colleagues working in institution buildings and would contribute towards the institution's sustainability policy objectives to cut its running costs and reduce environmental impact.

This approach would enable us to recommend adoption by the University Court of the *Utilities Policy* circulated to CMG in the autumn and approved in principle. This important framework for continued concerted action to cut our utilities costs, CO₂ emissions and water consumption looks forward to forecast compliance requirements – from as early as 2004 – under an EU Energy Efficiency in Buildings Directive. This will likely require us to label all buildings and progressively control energy consumption as part of the UK contribution to the Kyoto Protocol.

Failure to continue to invest in energy efficiency improvements will lead to likely increases in overall utilities budget of up to £860,000 and would eventually threaten Estates & Buildings' ability to deliver on other key objectives in support of the institution's academic programme.

b. University of Glasgow

Summary

The institution has benefited greatly from the de-regulation of the electricity and gas supply markets, by using its efficient purchasing arrangements to obtain market rate energy prices. Some 90 per cent of all gas and 75 per cent of all electricity purchased by the institution is done by competitive tendering.

The project proposes extending the institution's high voltage network to the buildings forming *Professors Square* and *University Gardens* of the campus. By doing so, this would reduce their current electricity costs by more than 50 per cent.

The assessed benefits are as follows:

- revenue savings of £24,600 per annum
- capital expenditure of £133,000
- internal rate of return of 13 per cent

- payback of 5.4 years
- improved cable network infrastructure and security of electricity supply. In the event of a cable fault, the number of properties that will lose power will be reduced.

The capital requirements and benefits of the preferred option proposal are summarised in Tables 1 and 3. A comparison of the preferred option with alternative options 1 and 2 is shown in Table 2.

Project appraisal

The project complies with the main objectives of the institution's corporate energy policy: *'to reduce expenditure and environmental impact to the lowest practical levels, by employing the best energy and water management techniques'*. The project has also been identified as a priority within the institution's estates strategy.

The feasibility of switching the electricity supplies from Scottish Power's low voltage network servicing Professors Square and University Gardens to the university's high voltage network has been assessed in practical and financial terms. Electrical engineering consultants were commissioned to investigate the viability of the proposal and a further three options were identified in their report, *'High Voltage Connection Exercise'*. Full details of the technical proposals are available in Report Number CP93/353.

The proposal is to replace and upgrade the design of the existing aged, low voltage cable networks in Professors Square and University Gardens, with a new supply network connected to the Main Campus High Voltage Distribution System. New radial feeders will be fed into each property superseding the present ring system layout.

As well as the preferred option, two other proposals were put forward for Professors Square and University Gardens:

Alternative 1 – Adoption of existing Scottish Power Cabling

Alternative 2 – Adoption of the existing network from Scottish Power, with new distribution pillars and feeder supplies being taken from the university's high voltage system. At a future date, other properties may be connected to the feeder pillars with new radial cabling to suit available funds, thus eliminating the original Scottish Power distribution cables.

Alternative 3 – The buildings at 59-80 Oakfield Avenue were also included in the investigation work, but they are not being proposed for funding at this stage, in view of the extensive technical complexity involved.

Reliability checks conducted by the consultant electrical engineers found that the existing *Professors Square* and *University Gardens* cable networks had a reliability factor in excess of 98 per cent, and that these cables could be used in a high voltage connection proposal. However, the Energy Technical Committee advised (endorsed by the University's Electrical Engineer) that the proposed scheme is the best option, as the existing cable network is very old and the opportunity should be taken to upgrade and improve the security of supply.

Table 1 Preferred option – capital requirements and benefits

Address (note 1)	Annual consumption	Existing operating costs, per annum (note 2)	Annual revenue cost savings		Capital requirements (note 3)	Payback period
			%	£K		
	<i>Gjoules</i>	<i>£K</i>		<i>£K</i>	<i>£K</i>	<i>Years</i>
1-13 Professors Square	638	20.0	60	12.0	50.51	4.2
1-14 University Gardens	920	23.8	53	12.6	82.51	6.5
Totals	1,558	43.8	56.5	24.6	133.02	5.4

Notes to Table 1

1. The premises involved are: Professors Square (Nos 1, 2, 3, 4, 7, 10, 12 & 13) and University Gardens (Nos 1, 3, 4, 5, 6, 7, 8, 9, 10, 12 and 14).
2. The buildings in Professors Square are presently on a general block tariff, while University Gardens properties are on contract at a negotiated price of general block tariff less 16 per cent.
3. A 10 per cent contingency has been built into the capital requirements shown above.

Table 2 – Alternative proposals

Address	Preferred option	Alternative option 1		Alternative option 2	
	Annual savings	Capital Cost	Payback	Capital Cost	Payback
	£K	£K	Years	£K	Years
1-13 Professors Square	12.0	20.2	1.7	27.1	2.3
1-14 University Gardens	12.6	33.3	2.6	56.7	4.5
Total	24.6	53.5	2.2	83.8	3.4

Table 3 – Financial appraisal over 10 years – high voltage network extension

Location	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Capital (Professors Square)	-45.46	-5.05									
Capital (University Gardens)	-74.26	-8.25									
Savings (Professors Square)		12	12	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4
Savings (University Gardens)		12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Cash flow	-119.72	11.3	24.6	24	24	24	24	24	24	24	24
Discount factor 12%	1	0.893	0.797	0.712	0.636	0.587	0.507	0.452	0.404	0.361	0.322
Discounted Cash Flow (DCF)	-119.72	10.0909	19.6062	17.088	15.264	13.606	12.168	10.848	9.696	6.664	7.728

Net present value = 5.0411

Discount factor 13%	1	0.885	0.783	0.693	0.613	0.543	0.48	0.425	0.376	0.332	0.295
Discounted Cash Flow (DCF)	-119.72	10.0005	19.2618	16.632	14.712	13.032	11.52	10.2	9.024	7.992	7.08

Internal rate of return = 13 per cent

Pay back = 5.5 years

Notes to Table 3

1. All costs £K.
2. De-regulation of electricity supplies presently not qualifying for a contract will take place in 1998.
3. A 5% per cent discount has been factored in for Professors Square properties from 1998 onwards.

c. Canterbury Christ Church University College

Background

Canterbury Christ Church University College has developed an energy strategy, and staff from all levels within the institution provide support for energy efficiency. The energy management function is centralised within the estates department, and an Agenda 21 Group represents staff from across the college, influencing the development of environmental policy. The institution maintains control of energy procurement, using an internally managed competitive tender process.

Development of energy management initiatives

An energy campaign was started at Canterbury Christ Church University College in 1997. The 1996 Energy Management Study was influential in starting this campaign. Resources were made available to develop the energy management function, and steps were taken to implement an energy strategy. Among those involved in strategic issues surrounding energy are the director of resources, the estates committee, estates manager, services engineer, premises surveyor and maintenance engineer.

There is a clearly defined responsibility for raising energy awareness, and training for estates staff has been actively delivered as part of their CPD. Staff awareness is seen as a key issue, and simple 'good housekeeping' information is published on the estates department web pages. New members of staff receive advice on the importance of energy saving, and all staff are invited to suggest their own energy saving initiatives via the web.

A spreadsheet is used to evaluate gas and electricity contract rates, monitor consumption, check the validity of invoices and assist with budget forecasts. It is recognised that there is more work to be done to standardise energy consumption data.

Energy management meetings with 'non-estate' managers have raised awareness of energy demand in other departments. Consequently, the computer services department has introduced 'flat screen' low energy monitors and other Energy Star compliant equipment. Discussions have also taken place with hospitality services regarding the proliferation of refrigerated vending machines and their impact on the utility budget

Some notable energy efficient 'successes' have already been put in place. Two low cost examples are:

- a. Standard GLS lamps in all student accommodation have been replaced with compact fluorescent low energy fittings.
- b. When custom made insulating jackets were fitted to valves and heating pumps, the temperatures inside plant rooms dropped significantly, providing evidence of reduced heat loss and substantial energy savings.

Energy efficiency measures are considered by the estates department at the planning stage of any building refurbishment. The emphasis in practical terms is in providing automatic controls for building services (heating, cooling and some lighting) and will often include improved insulation to the building fabric. Modifications are incorporated into the centrally monitored Building Management System.

d. Coventry University

Background

Coventry University has an energy policy endorsed by senior management, and a staff structure that clearly defines responsibility for energy management. All new staff receive basic energy awareness training as part of the induction process.

The energy manager is a member of the Sharefair HE network. The university is not a member of the Energy Consortium, but utility contracts are negotiated in-house with specialist assistance from external advisors.

Development of energy management initiatives

Coventry University recognised that there were opportunities for reducing waste and began to identify cost savings through energy management as long ago as 1980. Consequently, many of the measures advocated by the 1996 Energy Management Study were already successfully employed at Coventry.

An energy policy is in place, endorsed by the vice-chancellor. A full time energy manager is in post, reporting through the assistant director (engineering), to the director of estates who is himself a major energy champion. The energy manager's responsibilities include energy and water. The university is to appoint an environmental officer, who will deal with environmental issues other than energy and water.

All new members of staff receive induction training in energy efficiency. Estates staff receive formal continuing professional development (CPD) training that includes energy efficiency, but there is no specific budget for energy training. Training sessions aimed at students were not felt to be cost-effective because of the large numbers involved and their rapid turnover. Internal methods of communication, including team briefing, are regularly used, and random checks have shown that most equipment, particularly computers in offices, is turned off when not required.

There are plans to address the automatic shutting down of computers in the short term – power management software is currently often disabled because it is incompatible with the university IT network.

Coventry University has ensured that energy efficiency is a major consideration in new-build and refurbishment projects. Combined heat and power (CHP) schemes have been installed at five locations to provide electricity and heat or cooling. Energy-conscious design has been incorporated into the new library – designed as the world's largest naturally ventilated building of this type. This has resulted in annual running costs that are 40 per cent lower than in a traditional building.

e. University of Edinburgh

Background

The University of Edinburgh formally addresses utilities within its Environmental and Sustainability Policies policy commitment. There are clear staff responsibilities for energy management and a dedicated energy and environmental team is in place

Monitoring and targeting of energy consumption is well established, and the team works closely with architects and engineers to ensure that new buildings and refurbishment projects are designed to be energy efficient. The university invests in energy efficiency technologies through a wide range of initiatives.

The university is actively represented in the Sharefair HE network and other external bodies. The university is a member of the Energy Consortium (CHEEP) and has a purchasing strategy that evaluates environmental benefits in addition to price.

Development of energy management initiatives

Energy management activities at Edinburgh pre-date the 1996 Energy Management Study. A 'Fuel Conservation Group' was set up in 1974, and activities have steadily developed since then; they are currently monitored by the Sustainability & Environmental Advisory Group. A full time energy manager was appointed in 1989, and responsibilities of the post have since been broadened to include other environmental legislation, waste management and sustainable construction issues. Dedicated controls

engineers oversee all Building Energy Management Systems work to ensure that heating and vent systems operate effectively.

Monitoring and targeting of energy consumption was established during the 1980s, and 5 per cent – around £250,000 per annum – of the utilities budget is ring-fenced for investment in energy efficiency. Cumulative savings of more than £10 million have been achieved, and carbon emissions have been cut by 30 per cent.

The university currently participates in the UK Emissions Trading Scheme, and is seeking further reductions in its CO₂ emissions.

A 526kWe CHP engine has recently been installed with £250,000 grant support. A further £1.63 million Community Energy grant has been awarded for a project to install a 2.7MWe CHP engine which is expected to reduce annual energy costs by around £400,000. The two CHP projects are anticipated to cut CO₂ emissions by 2,500 tonnes each year.

The contract for electricity supply includes 25 million kWh p.a. certificated Green Source energy to 45 of the largest of the 200 buildings owned by the university. As a result of this contract the university cut its annual CO₂ emissions by 10,000 tonnes.

Edinburgh was accredited under the Energy Efficiency Accreditation Scheme in 1999, and again in 2002.

f. University of Leeds

Background

The University of Leeds has recently formulated an environmental policy to complement its existing energy policy. Engineering specialists within the estates services department share responsibility for energy management.

The institution supports the Sharefair HE network and other networking opportunities, and is a member of the Energy Consortium. The university has signed a long term operating agreement with an energy supply company to run an energy station that serves both university and neighbouring hospital buildings.

Development of energy management initiatives

The implementation of an energy policy, and internally produced guidance for consultants and contractors, has highlighted internal and external awareness of energy issues. Business case submissions for the replacement of plant and equipment must identify energy performance and potential savings. The 1996 Energy Management Study did help to raise awareness at the time but maintaining interest is an ongoing challenge.

Professional staff within Estates undertake CPD, which includes relevant courses or seminars relating to energy issues. Within the estates department, a general level of awareness is maintained through the promotion of good housekeeping.

The reporting line is through the head of maintenance and operations to the director of estates. A technical officer responsible for the Building Management System reports to the mechanical services manager. Other systems, managed by the electrical services and energy manager, include an extensive network of more than 200 sub-meters to monitor energy use.

Most energy saving projects have been initiated by the estates services department. An energy efficiency campaign focused on the estates buildings achieved savings of 10 per cent, but the present method of recovering utility costs provides little incentive for other departments to save energy because the charges are not an accurate reflection of actual use.

A significant increase in gas prices prompted a recent campaign to advertise the fact that costs were rising dramatically, but although awareness levels may have increased, there was little change in user behaviour. This was felt to be largely due to the absence of financial incentives within academic departments to save energy.

The estates department is considering alternative methods of allocating energy costs to user departments, including using information from sub-meters to relate costs to actual use.

g. University of Leicester

Background

At the University of Leicester, energy savings initiatives have the support of senior managers. A dedicated energy manager is in post and the university monitors and targets energy consumption. Energy efficiency is targeted within refurbishment and new-build works, and there has also been investment in best practice technologies. The university has involved its academic staff in energy efficiency in a number of ways.

The institution is represented on the ShareFair Higher Education Energy Management Network, and utilities are purchased using the Energy Consortium.

Development of energy management initiatives

Energy management at the University of Leicester has the support of the vice-chancellor, and a dedicated energy manager is in post.

The university is developing its monitoring and target setting system to integrate financial and engineering aspects of energy management. This will provide a useful tool for reporting on energy use as part of Earthcare, the university's energy awareness and motivation programme.

The estates office is developing energy codes of practice to target the inclusion of energy efficiency in refurbishment and new-build works. This will form part of the estates office's drive towards the implementation of a quality system across its design, maintenance and management activities.

There has also been investment in best practice technologies, including the use of automatic control and energy monitoring for remote buildings via the site computer network (Ethernet). Energy savings of approximately 10 per cent have been achieved through the installation of motor controls to refrigeration equipment.

The university has also made use of its academic resource to improve energy performance at its sites. An MSc student recently investigated the use of fume cupboards and promoted their efficient operation, achieving electricity savings worth £6,000 per annum. Estates staff and academic departments have collaborated to establish PhD research projects which may improve existing energy management practices. One of the projects will investigate an environmental management system approach to energy management, and the other will focus on the marketing of energy awareness within the university.

The estates office is collaborating with the department of biology to increase the efficiency of lighting in plant growth cabinets, and is working with the department of engineering to design and secure external funding towards the installation of a 40 kW_e photovoltaic array, to be integrated into the roof of the engineering building during summer 2003.

h. University of Teesside

Background

There is high-level management support for energy efficiency at the University of Teesside. The university has adopted an energy policy, and a member of the vice-chancellor's executive chairs the energy steering group that formulates the energy conservation strategy.

The institution is represented on the Sharefair HE network and uses its membership of the Energy Consortium to obtain competitive prices for supplies of electricity and gas.

Development of energy management initiatives

The 1996 Energy Management Study raised the profile of energy and its use at the institution, although high rates of staff turnover since then have impeded progress.

Outputs from the 1996 study were used in the development of the current university energy policy. Earlier recommendations from the HE funding councils, including the HE21 initiative, prompted the corporate management committee to form an energy steering group. The terms of reference for the energy steering group were to develop an energy policy and associated conservation and awareness strategies. The operations and energy manager acts as secretary for the group, and coordinates policy making with operational aspects of energy management.

The energy steering group plans to focus on motivation and marketing in the short to medium term. There is a strong feeling that the majority of staff and students do not give much thought to energy and its use.

An energy awareness campaign has been planned. A series of workshops will offer guidance relating to specific buildings. Supporting literature will be developed for each building. The university intends to establish energy monitors within each building to monitor and practice both policy and strategy at a local level.

The estates department monitors the provision of all main services including electricity, gas and water, with emphasis being on encouraging the careful and efficient use of energy throughout the university. Utility costs are met from a central fund and so there is no direct cost incentive to motivate energy users.

Training is made available to staff in a strong position to control or influence energy use. Members of the estates department have recently received several days training in the operation of the site Building Management System. This has identified opportunities to reduce the consumption of energy in existing buildings which were commissioned before they were fully occupied. Mechanical and electrical services are being targeted to ensure that control settings are appropriate for the current patterns of use.

Estates staff are also evaluating options for retrofitting equipment removed from original specifications in order to reduce capital costs. Life cycle costing is being promoted to ensure that the effect of short term decisions on future revenue budgets is fully understood by senior decision makers.