Conducting an energy audit

Employees are often a most valuable source of information about waste and inefficiencies.

An ideal way of identifying energy management opportunities in your organisation is to conduct an energy audit as part of the process of developing your energy management strategy. An energy audit is a periodic examination of your organisation's energy system, or part of the system, to ensure the most appropriate sources of energy are employed, and that this energy is used as efficiently as possible.

While the audit is the systematic gathering and evaluation of energy data about an organisation and its processes, the purpose is to promote efficiencies, which will benefit the entire organisation including staff. For the audit to be meaningful, it will be necessary to discuss the auditing process with all staff, both senior and general, and obtain their cooperation in data gathering. Employees are often the most valuable source of information about waste and inefficiencies.

An audit can be conducted by the energy manager who has been trained and has expertise in carrying out energy audits, or by hiring an energy-auditing firm. Most accredited energy auditors have technical qualifications as well as the expertise and experience to quickly undertake a comprehensive appraisal of your site's energy use.

An audit consultant can also assist the energy manager by giving independent advice and commenting critically on energy related practices within your organisation.

It is worth noting that it is critical to your success that the consultant is hired at the right time in the energy management process—too late or too early can be counter-productive. For example, if an audit is conducted after your premises have been refurbished, the energy saving recommendations may be too expensive or impossible to implement.

Moreover, anecdotal evidence suggests that a consultant can swallow up your entire energy budget for the purposes of the audit, leaving no money to implement the recommendations. Keep in mind also that the consultant's report must be framed in a style that is relevant to the way your organisation conducts its business.

Approaching the Energy Audit

There are three stages to the energy audit process. These are:

Stage 1: an audit of historical data

Collect and analyse company records of energy use to determine:

- the cost and physical quantities of energy inputs used;
- annual and seasonal trends in energy use and cost;
- the energy use per unit of output.

Stage 2: the screening survey

Undertake a screening study of energy use in the organisation to indicate:

- major energy consuming plant and processes;
- obvious energy waste and inefficiencies;
- gaps in the metering and reporting of energy use;
- priority areas for further investigation of likely inefficient energy systems.

Stage 3: detailed investigation and analysis

Processes identified by the screening survey that justify further investigation will have to be examined.

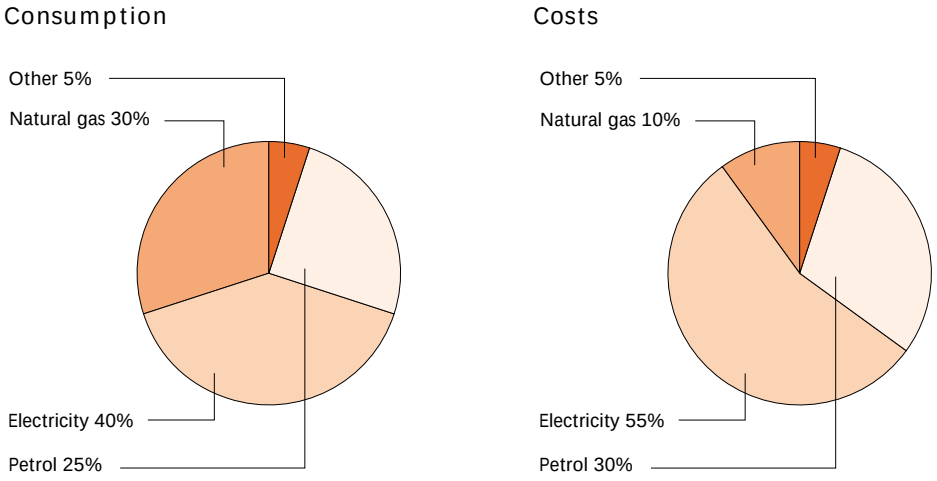
Stage 1: an audit of historical data

The first stage involves the collection of all available energy accounts and production records (if necessary). The objective is to identify and quantify each of the energy forms.

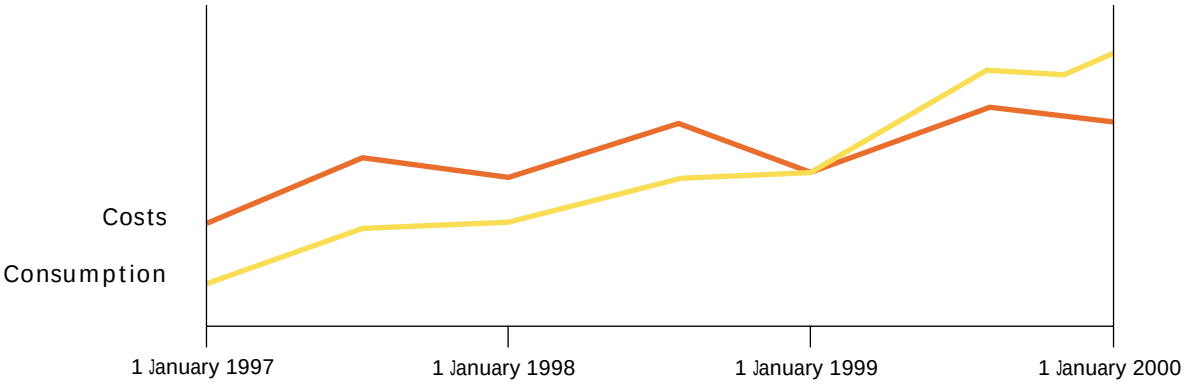
This will provide a basis on which the energy manager/consultant can evaluate future performances and indicate which areas warrant closer examination. Graphs 1 and 2 give an example of typical energy consumption and expenditure patterns.

The energy manager/consultant will list all energy forms for the current year and convert them to a common unit. This will give the relative importance of each energy form. Listing the unit cost and total expenditure of each energy form is also desirable so that priorities may be assessed based on the relative importance of each fuel.

If similar records are available for several years, the consultant can then establish a general trend or pattern in energy use over a number of years (Graph 2.) The projected savings due to an energy management strategy may then be estimated.



Graph 1: Typical energy consumption and costs



Graph 2: Typical trends in energy use in a business

Seasonal patterns

The seasonal consumption pattern for each major form of energy provides valuable information. The space heating or cooling components can often be estimated from such profiles where consumption is metered separately. In this part of the process it is possible to determine your premise's cooling and heating energy with a reasonable degree of confidence.

Review purchasing arrangements

Purchasing energy supplies at the most favourable price is an important aspect in minimising energy costs. So detailed information on annual and seasonal consumption, costs, and average prices enables a preliminary analysis of alternative tariffs, contracts and purchasing agreements for each fuel.

Plot energy consumption against output

With sufficient data the energy manager/consultant can determine the level of output during each billing period and calculate the energy use per unit of service or product. Relating consumption and output data in this way gives a broad first estimate of the energy intensity of your operation.

Calculate the specific energy consumption

This is where energy use is related to a single product or single activity. An index will provide the best means of comparison of current performance with those of the past. In some cases you may also be able to compare your energy use with other organisations in the same industry. Industry associations can often assist you in this regard. For example, the Property Council of Australia publishes regular energy surveys of commercial buildings.

Stage 2: the screening survey

The survey can be very simple in small plants where there may be few fuels and processes, or very complex where there is an array of equipment and processes. Whichever, the basic principles are the same, and their aim is to establish where obvious energy losses are occurring in the organisation.

This stage involves conducting an initial survey to review the organisation's gas and electricity metering system, collect detailed energy consumption data for each process and develop a plan of action to senior management. The plan should detail the most important areas of energy cost reduction based on the screening survey. It should also outline the sequence of action necessary to reduce energy costs in the most efficient manner.

Items requiring action should be ranked according to the cost and time required for implementation, and the expected payback period or rate of return of each project. The ranking method should be described in detail in the report.

Stage 3: detailed investigation and analysis

At this stage you will find that the results of the screening survey will enable you to develop a list of priorities for further detailed studies. But you may also find that some areas such as lighting, air-conditioning, motor drives, compressors or other industrial processes will need more sensitive analysis. You may need specialist assistance here to help you select only those processes that are most likely to yield significant cost savings for a reasonable effort. The survey also should aim to develop norms and targets for energy consumption, which are necessary to control energy use.

The results of this detailed investigation and analysis, together with those obtained from the screening survey, should be used to update your organisation's energy management strategy, and establish targets for energy efficiency and regular reviews of energy use.

Tips

Companies that can provide energy audits and energy management services including planning, implementation and training, are listed in the 'Sustainable Energy Services' section of the Energy Smart Allies Directory.

The Institute of Engineers, Australia, publishes a register of Accredited Energy Auditing Organisations. This includes advice concerning the areas of competence of each consultant.

It is recommended that organisations obtain three quotations from energy management consultants.

Prospective consultants should be willing to visit your site as part of the preparation of their audit proposal. They should be able to quickly assess from their experience whether potential exists for savings and therefore whether it is worthwhile proceeding with the audit.

Selection

The following point scoring system could assist in evaluating energy audit tenders.

Evaluation criteria are outlined below. Points ranging from 0 to 5 can be applied to these criteria. A score of 0 for any criteria would disqualify a company.

The criteria are:

- relevant experience
- general track record
- technical skills
- management skills
- methods of reporting and data gathering

Preparation for the audit

Once the consultant is selected it is recommended that you compile a comprehensive set of existing site and energy data. This saves the consultant time, allowing them to concentrate their time and efforts on identifying energy savings in your organisation.

CASE STUDY 9

Manningham City Council, incorporating Templestowe Council, had an energy audit conducted in 1992. The audit concluded that high-energy costs were due to inefficient air-conditioning systems and excessive lighting levels. It found that by investing $104 000, energy costs could be reduced by $43 000 per annum. Manningham acted on the recommendations. This success led to an environmental audit, carried out in 1994, identifying further savings of $12 822 in energy consumption. A Workplace Environment Committee and two energy conservation officers are monitoring a range of workplace energy issues with a strong commitment to ongoing energy efficiency programs with staff involvement.