

# Monitoring energy use

Monitoring, analysing and reporting energy consumption are three essential elements of an effective energy management strategy. A well-designed information system for energy management is vital.

Tight budgetary controls of an organisation's energy consumption, as mentioned earlier, could reduce waste and establish a level of energy efficiency. However, evidence indicates that cost controls alone will not provide the information needed to show whether energy is being used efficiently, or how it can be used more efficiently.

To establish proper control over energy use it is necessary to have information on energy flows and inputs across the entire organisation. When treated in this manner, energy use can effectively be managed in a similar manner to other operating resources.

An energy information system can be a very simple manual system, with energy bills being the only source of data. Basic calculations can be done using a personal computer running common spreadsheet software to analyse data.

On the other hand, the information system can be a complex multi-site computer-based system with sub-metering for each energy accountable centre fully integrated into the plant control system. Data can be read on-line as events occur. The system can also be incorporated with the resource and waste management program, quality assurance and maintenance planning.

An effective energy information system will provide:

- *data on energy use, analysed to enable usage to be optimised under varying conditions;*
- *technical and financial information needed to make strategic decisions in regard to operational activities;*
- *information to justify and support a strategy for achieving improvements through target-setting; and*
- *impartial and accurate reporting enabling senior management to assess and control energy consumption and costs.*



# How to establish an energy information system

## *Stage one: effective monitoring*

Monitoring is the process of measuring and recording data. It is the basis of a disciplined approach to energy management that ensures that your organisation's energy resources are used to their maximum economic advantage.

Effective monitoring of energy use will lead to:

- maintenance of savings from any existing efficiency investments;
- identification of new opportunities for savings;
- a database to enable cost control and external comparison;
- an understanding of where the energy resource is used in your business.

Without a clear picture of how much energy your organisation consumes, it is very difficult to assess where improvements are possible and where savings can be made.

However, the choice of an appropriate system for your organisation depends on your current total energy bill and the potential cost savings. Bear in mind that there is a direct relationship between energy intensity and the level of sophistication required.

In the more energy intensive sectors, a sophisticated system with automatic data collection to rapidly identify waste may be justified. In less intensive areas, monthly invoices from the energy supply companies will be all that is required to run an effective monitoring and targeting system. However, if some bills are estimated, if readings are for periods that do not match your accounting periods, or if the supply meter does not correspond with the areas you want to monitor, you will need to install and read sub-meters.

Many organisations install check-meters to verify their energy supplier's meter reading. But effective monitoring of energy use must go one step further. The energy used by each functional group of the organisation must be logged separately, so energy costs can be assigned accurately to departmental managers. The amount of energy used in a given period is calculated from the measured quantities of electricity, gas, oil, coal, etc. Water is included in many systems as well.

## *Stage two: data analysis*

Agreed standards of performance for energy use should be established. When energy is used mainly for heating buildings, standards usually take account of seasonal variations in the weather. Similarly, in a manufacturing operation, allowances are made for variations in the level of production, changes in the product mix, or other factors that directly affect performance. Standards serve as measures or benchmarks for controlling energy use and assessing performance.

An appropriate index is chosen as a measure of the energy used in relation to the results achieved. When energy is being used to heat a building, this may be the energy use per unit of floor area (e.g. kWh/m<sup>2</sup>) or in manufacturing, energy use per widget.

Key information on energy use can then be built into operating statements along with costs and other information on performance such as material use, levels of output, losses and yields. This information may be produced in the form of a set of useful graphs showing load profiles (tracking the amount of energy used hour-by-hour or day-by-day) to make the point that energy is a variable cost, not just another overhead. These graphs can be invaluable to an energy manager for identifying problem areas.

When standards for current performance have been defined and accepted in practice, targets can be set for improvements in the efficiency of energy use. However, targets (for example, aiming to reduce the amount of energy consumed during the coming period by a given percentage) should be set in consultation with those managing and working in particular areas, rather than being imposed from above. Improvements may then involve changes in operating practices, modifications to existing plant or buildings, or capital investment in new more energy efficient practices.

Your analysis may be designed to show changes in patterns of energy consumption over time, when applied to accurate monthly consumption data.

This technique will:

- establish your current pattern of energy consumption and when it began;
- identify periods in which the pattern changes;
- quantify savings achieved from energy efficiency measures.

Control charts can then be plotted that show the difference between actual and predicted energy consumption. This system highlights a problem if consumption rises above a predetermined acceptable level.

## *Stage three: reporting*

Information is data that has been processed so that it speaks clearly to end-users and helps them make decisions. When designing a reporting process for your organisation, the aim is to reduce the amount of data that senior management receives, while increasing the quality of relevant information at their disposal—quality information is the key to effective energy management.

Remember that senior management in most organisations is drowning under a constant wave of information. Instead of producing streams of data, your means of reporting should be audience-specific. You have to be clear in your mind about the type of information end-users need to make decisions.

There will most likely be six main audiences. These are:

1. senior management
2. departmental managers (or budget holders)
3. key personnel
4. energy management staff
5. energy representatives
6. general staff

The questions to ask when you establish a reporting process are:

- what are these audiences interested in knowing?
- are they getting the right information in the form that is most useful?



As a general rule, only people who have significant control of energy use need to be supplied with reports. Senior management needs to know how much money energy management has saved. Departmental managers and budget controllers need to know if the department is meeting its targets and/or staying within budget, and if benchmarking standards are being met. Plant operators need feedback on their performances. While general staff need simple feedback on how well their department or section is doing.

Information to recipients will need to be delivered with varying degrees of precision. For example, precise numbers may be required for an operational manager since it may be used for the purpose of forecasting problems in the plant, where as a general trend may be sufficient for a different audience. It is up to you to decide how the energy information needs to be customised for the different types of people within your organisation.

### Rules for an effective monitoring system

Record only the most relevant variables

Ensure measurements are accurate enough to be useful

Ensure recordings are regular and frequent enough to pick up any relevant highs and lows, and are compatible with the rate at which control actions occur

Record relevant associated data simultaneously, e.g. ambient temperature and production rate

Install sub-meters to measure energy use by areas with separate accountability

### Benefits of an energy monitoring system

Increased profitability and competitiveness

Reduced consumption of non-renewable fuels

Better information for analysis of energy consumption trends or tariffs

Reduced time wastage, as accurate information is obtained quickly

Enhanced profile of energy management within the organisation

Improved security of processes and energy supply

### Tips

Getting the most out of your energy information system.

An effective energy information system should:

- consider who will use the information and involve them in making a realistic assessment of their needs;
- keep data input and analysis as simple as possible and compatible with your aims;
- motivate people to use energy efficiently;
- justify the expense of running the system to senior management;
- provide an insurance role that preserves existing performance;
- serve a pro-active role that identifies new opportunities for savings.



## CASE STUDY 5

*Ford Australia is a large user of energy in its vehicle manufacturing processes including metal casting, stamping, plastic moulding and assembly. In an attempt to use resources more efficiently and economically, Ford Australia has introduced a number of energy monitoring and saving measures. For the Ford Broadmeadows site, a modular energy monitoring system that could be readily expanded and simple to operate was designed. The system is based on a simple modular concept that can be applied to any size business, and implemented at a fraction of the cost of a proprietary system. This is now the largest energy monitoring system in Australia. Installation of this system has saved Ford over \$200 000 in energy bills in the last twelve months. The system paid for itself in less than eight months. By using monitoring systems and by benchmarking against North American, European and Asian plants, Ford Australia has become a world competitive manufacturer.*

It is essential to get energy management information into mainstream financial accounting, thus raising the profile of energy management and identifying savings from energy measures. If this information is not clearly integrated into the organisation's financial management system, this lack of awareness is a major barrier to the implementation of successful energy management policies.

