

Fundamental

SERIES 9 MODULE 07

CURRENT THINKING ON...

First steps in energy management

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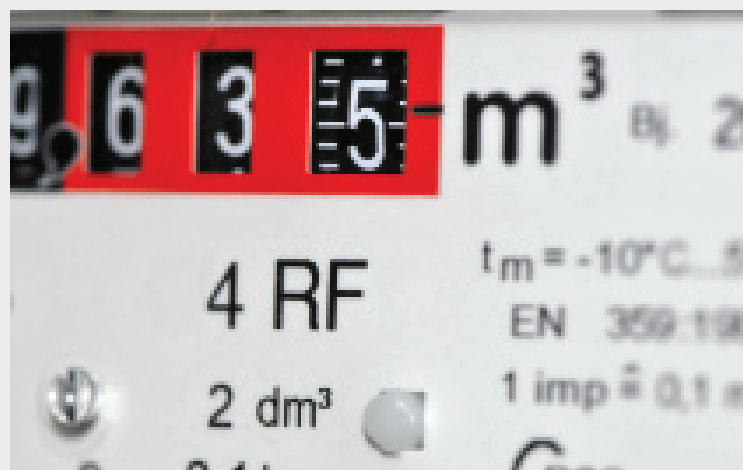
Energy management could be regarded as an ancient art starting in the days of the caveman who stored away heat and light providing resources for the darker and colder periods in the year. In a modern society we have instant availability of many of the energy-providing resources and thereby often fail to manage the resource as effectively as we could and should.

We should be considering the fact that there are many issues related to the supply and application of energy-producing resources. Apart from their future potential shortages they have an impact on our daily lives in terms of cost and environmental impact. We can therefore no longer accept energy providing resources as something that we take for granted; we must control or manage its supply and its use.

In most cases the supply side is out of our individual or organisational control. However, the demand side is not. From the switching on of a light to the operation of a CNC machining centre we have the opportunity to manage efficiently. But to manage effectively we need to understand, and that comes from information sources that tell us when, where, and how much we are using.

Leaving lights on

It is most important that we remember that using energy resources for no practical outcome such as leaving lights on or plant ticking over is nothing but pure waste and therefore should be recognised as unacceptable in our society. Unfortunately the reason is often that there is no 'ownership' of



the use, application or waste – that is until someone has to pay for it.

To manage energy effectively we need to be able to ascertain usage. This is why the Building Regulations, related to efficient use of energy in buildings, has included requirements for sub metering since they were first updated in 2002. The regulations require all new and refurbished sites to install sufficient sub meters to provide a clear indication of periodic energy use by specific energy-consuming equipment rather than just for the whole building. In its basic form this is as a cumulative total – in other words the energy consumed for last week is today's reading minus that for the same time last week. The principle of meter reading is no different from that employed by the meter reader when they come to read our domestic electricity, gas and water meters. In most cases we will get a bill which indicates the quantity consumed for which we have to pay. However, do we accept estimates? Hopefully not, as they

are meaningless. Also, hopefully, we check the billed amount by reading the meter ourselves just to be sure.

Basic relationship

This principle of self reading, especially over shorter periods than the billing cycle of 1-3 months, will allow us to link consumption to the level of activity over that period. This will allow us to develop an understanding of the basic relationship between the use of energy and its application. It seems strange that so many consumers, at all levels, fail to appreciate that energy use is a variable influenced by the application. After all we do not expect to use as much gas or oil in a space heating boiler during the summer months as in the winter as the demand is based on the variance in weather conditions.

The purpose of sub metering is to break down the gross figure for the supply to a building into its component parts so that we can easier assess specific activities

and variances. For instance the gas supply to a manufacturing site could be broken down into space heating, water heating, catering and processes. We therefore need to subdivide these supplies into their specific applications to monitor consumption levels to identify potential waste.

Electricity is even more complex as that supply through the site main meter will then go on to drive lighting, computers, pumps, fans, motors and so many other applications. This diversity of use easily clouds inefficiencies in different plant and equipment. Lights left switched on when there is no one present is quite often the largest source of waste.

Gathering energy usage data can start off at the gross level with the fiscal bills from the suppliers. But as suggested we need to shorten the time period. A higher than normal monthly or quarterly bill reflects only the fact that more has been consumed at some time during the preceding 30 – 90 days. This is going to make fault finding and isolation of cause and effect very difficult. Fortunately, with electricity, sites with a half hourly demand of 100kVA or more will usually have an electronic electricity meter installed which acts as a data logger and provides summary information of consumption for EVERY half hour during the billed period. Of course, you will have to pay for this data, either in raw form or else analysed

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by the supplier. To date we do not normally have this information supplied for gas or other utilities but the advent of new and upcoming 'smart' meters will give us this information for all billed utility resources.

Even if we haven't got the fancy sophisticated electronic meters we can still start to become more specific in our understanding by reading our own meters at shorter intervals of our own choice. In this way we can start the process of understanding consumption patterns. For example, if we have reasonable quality information indicating a measure of activity per day or per week in the form of number of products made in that period, we can, by manual reading, then ascertain how much energy was required to produce that number of items. The following period we may produce more or less products in which case we would expect to note more or less energy consumed.

In a simple spreadsheet we can create three columns, the first showing the day, week, month or period for which we regularly gather activity data. In the second column we record the energy consumption (in kWh not £) for that period and in the third we note the actual level of activity (products made or similar).

Average relationship

Before long we can get the spreadsheet software to plot an x-y graph which displays the measurements taken. This will indicate an 'average relationship' between energy and application. Obviously, this will be crude unless we record energy use (kWh) specific to the application so, in an ideal world we would be registering the products coming off a production line and, at the same time, measuring only the energy supplied to that production line alone.

Once we understand this technique it can be applied to every piece of energy-consuming plant



that we wish to improve efficiency. Even lighting can be monitored from the fuse board so that we keep an eye on that particular application floor by floor or area by area.

Once this process is established it can, if necessary, and where deemed useful, be automated via aM&T (automatic monitoring and targeting) software systems. However, it is best to start small to confirm that the data recording is practical, accurate and fit for purpose.

Of course there is no practical need to analyse too far, such as per light fitting, as that becomes

pedantic and contra to the purpose of the organisation. Therefore to simplify our management process we must first identify the big, or significant, energy consumers. It is a relatively simple and practical exercise to carry out a simple energy audit or review of the organisation.

Following is a simplistic sub division of energy consumers in a small office block:

- lighting – by floor;
- lighting – car park;
- heating – by floor;
- cooling – by floor if installed;
- ventilation plant – supply and extract;



- 13 A/three-pin plug ring main – office equipment;
- central computer file server;
- central computer – air conditioning; and
- kitchen/catering.

For a manufacturing concern we would then add production plant such as:

- air compressors;
- works heating;
- works lighting;
- boilers; and
- pumps.

Energy resources

It is also important to remember that this approach has to be further broken down into the different energy resources employed such as electricity and gas as each has its own implications in terms of cost and environmental impact.

Unfortunately, this level of monitoring will require meters and those will cost money. However, we can sell the concept of sub metering to the financial director on the basis that effective monitoring of use will allow us both to assess wasteful practices at then prove the effectiveness of any energy waste reductions approaches that we employ. This may be as staff awareness training, changes in procedures, or installing up-to-date energy consuming plant and equipment.

From the energy audit/review we start to develop a deeper understanding of the location of our prime consumers. Usually, we tend to find the greater they are then the potential exists for greater waste even if it is simply as a result of forgetting to switch off! This relationship between usage and application is fundamental to our understanding as it then allows us to create ratios between units produced and energy consumed. The average ratios derived then allows us to move on to the next stage of creating a forward budget against which we can decide on potential levels of improvement.

Sufficient data, on normalised applications, consumption and practices is therefore a vital tool to aid us in establishing potential improvement targets.

From a greater understanding of

Period (hour, day, week etc.)	kWh	Measure (number of widgets etc.)
Week 1	10,000	5,000 units
Week 2	12,000	6,500 units

First steps in Energy Management

our relationship between energy resources and their application within our establishment we have the new opportunity to formalise a future policy and strategy for the organisation. Most organisations are experienced when it comes to experience of matters such as quality, the environment, personnel and health and safety so this is just another of formalisation or standardisation of best practice. The appreciation of where and when energy resources are consumed and by who allows us to become more sophisticated in our day-by-day management approaches, especially those related to something that has an ever-increasing cost implication.

Increasing demand

Some may consider that the use of energy resources is not important enough to expend any management time. However, they should be aware that over the past decade or so there has been an increasing demand for better energy usage reporting. Initially, all businesses were hit with the Climate Change Levy from 2001 which resulted in the opportunity to get (at that time) a possible 80 per cent reduction in the charges on the basis of effective monitoring, reporting and reduction. Larger organisations then became involved in the European Union – Emissions



Trading Scheme which is based on the emissions to atmosphere of their combustion plant. In April 2012 we will have the cost implications, for smaller businesses related to the Carbon Reduction Commitment – Energy Efficiency Scheme.

All of these Government and International schemes are mandatory and function on the basis of charges related to energy consumption and an organisation's need to reduce that figure by specific amounts.

Cost implications

The cost implications of doing nothing, or no compliance are far greater than the solutions that we can employ within our own organisation's energy-consuming activities. There is no hiding place from the consequences of both legislation and the ever-increasing market price for energy resources. We should be suitably motivated to be cognisant of the issues and the potential opportunities.

If your organisation is unable technically or practically to take on the burden of taking control of energy usage then there are many suppliers and consultants who will gladly advise and provide technical backup. We also have sources of help and guidance in the form of the Carbon Trust, The Energy Saving Trust, Chambers of Commerce and others. Training courses are also available directly from the Energy Institute <http://www.energyinst.org/training>.

There is no excuse not to start to manage energy and reduce consumption by taking control of what is, after all, just another purchased item for our businesses.

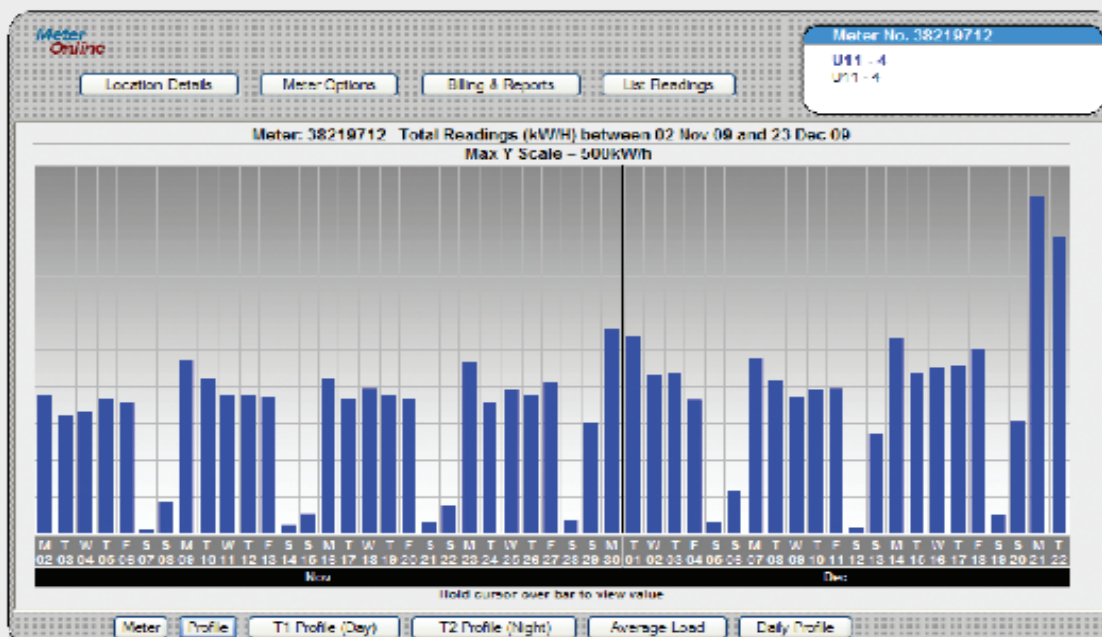
Further Information:

To improve your understanding of energy management and to develop/improve skills there are many options. We would suggest initially getting in touch with professional bodies such as:

- The Energy Institute (EI);
- Chartered Institute of Building Service Engineers (CIBSE);
- Energy Services and Technology Association (ESTA);

Advice on energy use is also available from:

- The Carbon Trust;
- The Energy Saving Trust.



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ENERGY

IN BUILDINGS & INDUSTRY

How to obtain CPD accreditation



Energy in Buildings and Industry and the Energy Institute are delighted to have teamed up to bring you this Continuing Professional Development initiative.

This is the seventh module in the ninth series and focuses on the first steps in energy management. It is accompanied by a set of multiple-choice questions. To qualify for a CPD certificate readers must submit at least eight of the ten sets of questions from this series of modules to **Energy in Buildings and Industry** for the Energy Institute to mark. Anyone achieving at least eight out of ten correct answers on eight separate articles qualifies for an Energy Institute CPD certificate. This can be obtained, on successful completion of the course and notification by the Energy Institute, for a fee of £15 (for members) or £25 (for non-members).

The articles, written by a qualified member of the Energy Institute, will appeal to those new to energy management and those with more experience of the subject.

The forthcoming modules in the ninth series will focus on: photovoltaics, refrigeration, and motors and drives. If you missed any of the modules in this series (the previous modules focused on monitoring and targeting, air conditioning, underfloor heating, biomass boilers, building energy management systems, and heat pumps) please let EIBI know (mark.thrower@btinternet.com) and we will send you the missing modules in 'pdf' format either by e-mail or on a CD.

The previous 80 modules from the first eight series are also available free of charge on CD.

MARK THROWER, MANAGING EDITOR

PLEASE COMPLETE YOUR DETAILS BELOW IN BLOCK CAPITALS

Name..... (Mr, Mrs, Ms)

Business

Business Address.....

.....

.....

.....

Post Code

email address.....

Tel No.

Completed answers should be mailed to:

**The Education Department, Energy in Buildings & Industry,
P. O. Box 825, GUILDFORD, GU4 8WQ**

SERIES 9 MODULE 07: QUESTIONS

First steps in Energy Management

Please mark your answers on the sheet below by placing a cross in the box next to the correct answer. Only mark one box for each question. You may find it helpful to mark the answers in pencil first before filling in the final answers in ink. Once you have completed the answer sheet in ink, return it to the address below. Photocopies are acceptable.

1. Are estimates of energy consumption useful in energy management?

- ☐ Yes
☐ No
☐ Sometimes

2. Monitoring and targeting is:

- ☐ A replacement for energy management
☐ An energy management tool
☐ An option for effective energy management

3. An energy policy should be:

- ☐ Updated each month
☐ Updated every five years
☐ Updated as required
☐ Updated at least annually

4. An energy audit/review provides:

- ☐ An indication of energy efficiency
☐ A confirmation of energy billing
☐ An indication of opportunities for energy use reduction

5. Sub metering is:

- ☐ A requirement of Building Regulations
☐ Necessary to check invoices
☐ Not an essential requirement of M&T

6. Energy management is:

- ☐ An area of continuous improvement
☐ An annual activity
☐ Needs only to be done as and when deemed necessary by the management

7. Energy management supports:

- ☐ Carbon management
☐ Water management
☐ Productivity

8. Is Climate Change Levy is only applicable to large businesses?

- ☐ Yes
☐ No
☐ Only to SMEs

9. Is Energy performance reportable to government departments?

- ☐ No
☐ Only if part of a Climate Change Agreement
☐ Yes

10. How often should energy use be monitored?

- ☐ Once a month
☐ Once a week
☐ Once a day
☐ As often as necessary to provide management information