METERING AND MONITORING—M13A

Eco-efficiency opportunities for Queensland manufacturers

Setting up an electricity monitoring plan

Effective electricity metering can provide useful feedback to your company on electricity usage and inefficiencies. Defining your objectives in a monitoring plan will help ensure meters are installed in the right locations, on the right equipment and for sufficient time to maximise the benefits of the monitoring exercise.

Targeting the monitoring to meet your company's needs is essential. Once the metering data has been obtained, analysis will help to identify opportunities and develop an action plan. This fact sheet provides some ideas on what to consider when setting up an electricity monitoring plan.

There are six steps involved and these align with the ecoBiz program.

Step 1—Plan and organise

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Step 2—Baseline assessment

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Step 3—Survey
(See metering and monitoring fact sheets M13B & M13C)

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Step 4—Action plan
(See metering and monitoring fact sheet M13C)

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Step 5—Implementation

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Step 6—Reassessment and continuous improvement

The monitoring plan can be developed as part of a broader energy management plan that encompasses all energy usage, not just electricity.

Queensland Government

Step 1—Plan and organise

- *Determine the objective of the monitoring plan.*
- *Appoint a project team.*

An electricity monitoring plan can provide confirmation of equipment inefficiencies or help to focus on a problem area. It can quantify electricity use to allow cost-benefit analysis and help with decision-making.

Some typical objectives of monitoring plans include:

- reducing electricity consumption and greenhouse emissions
- meeting the requirements of an energy audit (Australian/New Zealand Standard 3598:2000)
- determining the overall capacity of the plant to see whether it can cope with increased production
- targeting specific equipment to determine the most effective way to operate it (e.g. air-conditioning systems, compressor set up or motor operation)
- determining electrical consumption of equipment over time
- determining whether there is an inconsistent power supply (e.g. occurrence of power surges or brownouts).

As production staff operate equipment on a day-to-day basis, they often have a good idea of where electricity wastage may occur or where to focus a monitoring plan.

Generally, when setting up a monitoring plan it is best to focus on one activity, section or production line at a time—preferably where it is likely that the greatest gains can be made.

Step 2—Baseline assessment

- *Undertake a desktop assessment.*
- *Set up electricity use indicators.*

To undertake a desktop assessment, collect electricity bills for at least the past year. Prepare monthly or seasonal electricity consumption profiles (e.g. kilowatt hour (kWh) or megajoules (MJ) per month) and try to compare these with industry or company benchmarks.

The ecoBiz program has templates that can be used to record the data.
Visit **www.ecoefficiency.com.au** and see Stage 2: Taking the steps.

This assessment is similar to a level 1 overview audit as described in *Australian/New Zealand Standard: Energy audits* (AS/NZS 3598:2000). This assessment should provide a level of accuracy to +/- 40%. More detailed level 2 and 3 audits can be undertaken later to a greater degree of accuracy.

How to read the electricity bill

Electricity bills generally include charges for direct electricity use and demand and service charges. Understanding what the charges are and how they affect the total cost of electricity is fundamental to determining how to improve efficiency and reduce costs. Interpretation of your electricity bill is necessary for the baseline assessment.

Direct electricity use is the total amount of electricity used over the billing period. This can be charged at one or more tariff rates and is based on the meter reading.

The bill should also compare the electricity use for the current period with that of past billing periods. This may provide an indication of seasonal variation, which you should consider when setting up a monitoring plan.

Peak demand charges are a way of charging for the use of the electricity distribution network. It is a way of paying for investment in network infrastructure. It is usually based on the highest average rate of power usage over any 30-minute period during the month. The demand indicator is reset to zero at each monthly meter reading. For some companies, the demand charge can be greater than the electricity consumption charge.

There are also additional **service charges** that cover items such as meter provision, service to property and other.

Some energy suppliers offer financial benefits and rebates for involvement in demand management programs and for installing more energy efficient equipment to reduce peak demand. Contact your energy supplier for more details.

Tariffs

Companies pay for electricity in two ways:

1. market contracts negotiated individually with the electricity retailer based on individual circumstances

or

2. regulated tariffs.

Generally, large electricity users (over 100 megawatts (MWh) of electricity per year) have negotiated market contracts, while smaller companies use the regulated tariffs.

A new electricity pricing and tariff structure is being introduced in Queensland from 1 July 2012. Large energy users (over 100 MWh per year) within South East Queensland will be required to negotiate a market contract with their electricity provider and will not use the regulated tariffs.[1] Understanding the current tariff systems and your site's electricity use will provide a stronger basis for negotiating the most appropriate market contract for your company.

Electricity use, distribution and network costs are all incorporated into the tariff cost structure. When a company uses electricity during peak periods, the demand on the distribution infrastructure is high. Therefore, electricity distribution companies need to build greater capacity to meet this demand. As a result, the tariffs (or cost rate) for electricity use during this period is higher to cover these costs.

Did you know that around 50% of the money Ergon Energy spends on the electricity network each year is to provide electricity for less than 1% of the year on maximum demand (peak) days?[2] Similarly, ENERGEX spends 13% of its infrastructure budget on the 1% of maximum demand days.[3]

A simple way to reduce costs is to change some electricity use to a lower tariff rate. This is generally an off-peak or nightly rate. Where possible, consider operating some equipment during off-peak periods to take advantage of lower tariffs.

1 Department of Employment, Economic Development and Innovation, *FAQs about the new electricity pricing and tariff structures for 2012–13*, Department of Employment, Economic Development and Innovation, Queensland, 11 November 2011, viewed 1 December 2011, ‹www.deedi.qld.gov.au/energy/266.htm›.

2 Ergon Energy, *Tariff trial*, Ergon Energy, Townsville, viewed 9 December 2011, ‹www.ergon.com.au/energy-conservation/demand-management/electricity-demand-trials/tariff-trial›.

3 ENERGEX, *Cool change*, Energex, Brisbane, 2011, viewed 9 December 2011, ‹www.energex.com.au/sustainability/energy-conservation-and-demand-management/cool-change-energy-smart-suburbs›.

Table 1 below outlines some current Queensland tariff options.

Table 1: Current Queensland tariff options[4]

Tariff#	Comments
Tariff 20—General supply	Suitable for smaller companies that operate 9 am – 5 pm weekdays.
Tariff 21—General supply	A higher rate of charge than Tariff 22, but a lower monthly cost.
	Suitable for low energy users (330 kWh per month or less).
Tariff 22—General supply	Low rate of charge for off-peak hours.
	Suitable for companies that operate mostly outside of 7 am – 9 pm weekdays.
Tariff 37—Non-domestic heating time of use	Not available to new customers.
	For companies that have after-hours heating demand.
	Very low monthly service fee.
Tariff 41—General supply demand (low voltage)	Appropriate for companies using 16 000 kWh per month or more and a load factor* of more than 30%.
	It has a low general energy consumption rate, but also a demand charge based on maximum demand for the previous month, 60% of the previous 11 months or 75kWh—whichever is greatest.
	Appropriate for companies where electricity use is fairly constant with low peak demand.
	Companies on this tariff should investigate their peak demand.
	High monthly fee.
Tariff 43—General supply demand time of use (low voltage)	Appropriate for large electricity users (over 200 000 kWh per month) with a load factor* between 35% and 75%, and which use significant amounts of their energy off peak (outside 7 am – 11 pm weekdays).
	The energy charge is medium between 7 am and 11 pm weekdays, but very low after hours.
	There is also a demand charge based on maximum demand for the previous month, 60% of the previous 11 months or 400 kWh—whichever is greatest.
	Relatively high service fee.

 # Note that Queensland power suppliers generally charge consumption in c/kWh and demand in $/kW (kilowatts) with an additional service fee, compared with some interstate suppliers that charge in kilovolt amperes (kVA). See the Metering and monitoring—M13B: Electricity metering *fact sheet for further explanation.*

The load factor *is the ratio of the average level of usage for any period of time to the highest level of usage in any 30 minutes (maximum demand) during that period.*

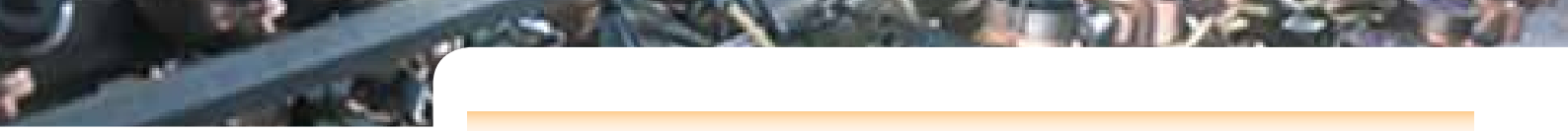
Electricity use indicators are helpful in comparing electricity use over time, especially in situations where production is not constant. Typical indicators for the manufacturing industry include kilowatts or the dollar cost of electricity per production unit or employee, or kilowatts per square metre of the gross floor area for office buildings. One or more indicators can be chosen as long as the data for the corresponding data unit is monitored and/or recorded at the same time as electricity consumption.

Step 3—Survey

- *Identify equipment or fixtures that use large amounts of electricity.*
- *Set up electricity meters to gather data.*

Depending on the objective of the monitoring plan (see Step 1), a more detailed survey using sub-meters is undertaken to determine where most electricity is being used and potential opportunities for savings. The meters help provide a higher degree of accuracy of where electricity is used compared with the baseline assessment, which only generally identifies overall electricity consumption.

4 Based on Queensland Government with input from Origin Energy, *Tariffs*, Origin Energy, Sydney, viewed 1 December 2011, ‹www.originenergy.com.au/2088/Electricity-tariffs-QLD›.



Level 2 and 3 audits as described in Australian/New Zealand Standard: Energy audits (AS/NZS 3598:2000) can be undertaken. A level 2 audit has an accuracy level of +/- 20%, while a level 3 audit is accurate to +/- 10%.

The *Metering and monitoring—M13B: Electricity metering* fact sheet provides information on determining which pieces of equipment should be metered and choosing suitable meters with appropriate settings so that useful data is recorded.

Step 4—Action plan

- *Interpret the monitoring results.*
- *Determine opportunities for improvement.*
- *Develop an action plan.*

The *Metering and monitoring—M13C: Interpretation of electricity monitoring results* fact sheet provides some guidance on interpreting common electricity monitoring results. It provides an indication of what the results could mean and some opportunities for improvement.

Opportunities for improvement are identified through the interpretation of the monitoring results. Opportunities should be added to an action plan and then further investigated to check whether they are cost-effective and feasible.

The action plan should list:

- electricity saving opportunities
- capital costs
- estimated operating costs
- estimated annual savings
- the payback period
- the date of implementation
- the person responsible for the plan.

Step 5—Implementation

- *Follow through with timely implementation of the action plan.*
- *Additional metering may be required to prove savings.*

Step 6—Reassessment and continuous improvement

- *Reassess the plan and continue monitoring to find new opportunities to save electricity and money.*
- *Assess whether estimated savings are realised post-implementation.*

More information

For more information, including the other fact sheets referred to in this document, visit **www.ecoefficiency.com.au**

This series of fact sheets provides examples and suggestions to the modern manufacturer on how to achieve both economic and environmental benefits from eco-efficiency. Visit the project website at www.ecoefficiency.com.au for more ideas and case studies. This fact sheet has been compiled by the Working Group for Cleaner Production through UniQuest at The University of Queensland.

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