

An introduction to energy audits

The Great Barrier Reef Marine Park Authority (GBRMPA), has proposed an agency Environmental Management System (EMS), as well as undertaking energy audits for ReefHQ Great Barrier Reef Aquarium and supported energy audits on two Commonwealth owned islands in the Great Barrier Reef, (Lady Elliot Island and Low Isles). This information sheet provides an overview of the key steps in an energy audit.

A guide to determining energy use and how to reduce it

An audit is an essential first step to reducing energy costs and greenhouse gas emissions. Auditing helps us find areas where energy savings can be made, work out which changes should be made first and understand the costs and benefits of implementing these changes. Assessments are best carried out as part of an ongoing energy management program.

Behavioural change through staff education can often provide the greatest benefit for the least cost. Even small

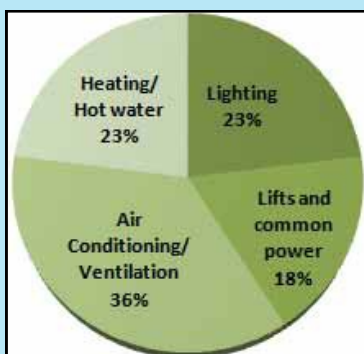
savings across one or more areas can achieve a large saving overall and so the audit must review both the detailed and the general energy use practices. Broadly, there are three levels of energy audit, varying in their scope, resource requirements and accuracy. These are presented in Table 1. A decision must be made on what level of audit to use depending on goals and resources.

Table 1: The three levels of energy audit

Audit level	Scope	On-site investigation	Margin of error for estimation of energy savings
Level 1	Overview of energy use	Optional	High (+/- 40 %)
Level 2	Energy measurement and monitoring	Comprehensive	Moderate (+/- 20%)
Level 3	Extensive energy measurement and monitoring by qualified auditor. Can be site or process specific. May involve energy simulation modelling.	Comprehensive	Accurate (+/- 10%)

DID YOU KNOW?

A typical office block or commercial building in Queensland will use energy in these proportions...



Project name:
Energy Audits

Project number:
2.4E.414.15.08

Objective: Provide information on how to conduct an energy Audit

Year: 2009-2010



Four phases of an energy audit:

1) Investigation Phase

The most important phase requires a detailed analysis of each room, including:

- Location/Room Name
- Type of electrical device, and a small description if necessary
- The quantity of that type of electrical item in the room
- The power rating (from the nameplate, device manual or energy meter)
- Hours used each week, including after hours use.

Collect building/room information about:

- Energy consumption for the past one to two years
- Tariffs and related energy supply contracts
- Floor areas, staff numbers, production levels
- Occupancy hours
- After-hours power usage
- Lighting, air conditioning and water heating systems in use (including fittings, hours of use, leaks etc.)
- Building orientation and insulation levels
- Building Management Systems, control strategies and maintenance schedules

2) Monitoring Phase

It is useful to obtain detailed information on the overall site as well as the major energy use categories. Key plant and equipment should be inspected, and a range of parameters measured, including:

- Electrical & gas load profiles
- Internal temperature/humidity
- Ventilation rate
- Light levels
- Process specific monitoring.

It is also important to gather feedback from maintenance staff on issues concerning building and plant operation, and maintenance which could be impacting on energy efficiency.

3) Analysis and Reporting Phase

This phase determines overall energy efficiency of a building or complex.

USEFUL TERMS:

Watt (W) = unit of power

Kilowatt (kW) = 1000 Watts

Kilowatt hour (kWh) = a unit of power which equates to 1000 Watts (1 kW) over an hour

1 kWh = an appliance that uses 1 kW over 1 hour will consume 1kWh of electricity

This formula can be used to work out how much energy your appliances use:

$\text{kWh/week} = \text{quantity of appliance} \times (\text{average Watts} / 1000) \times \text{operating hours per week}$
eg. 5 microwaves $\times (850\text{W} / 1000) \times 7.5 \text{ hours per week} = 32 \text{ kWh/ week}$, or 15 photocopiers $\times (12000\text{W} / 1000) \times 20 \text{ hours per week} = 3600 \text{ kWh/ week}$.

The GBRMPA has developed an Energy Audit Manual to help make analysis and reporting of energy use easier (Energy Audit Manual and Emissions calculators available on the GBRMPA website).

Once data are entered into the template it will automatically calculate how much energy is currently being used and identify the potential savings. A series of totals will be displayed, including:

- Annual kWh
- Direct Savings kWh / week
- Air-conditioning Bonus
- Total Savings Potential kWh / week
- Annual kW Savings Potential
- Annual CO₂-e Reduction (kg)

4) Post Audit Phase - Time to take action!

- Producing an action plan for staff can be helpful, include: recommended tasks, allocated roles and a timetable for their completion
- Regularly monitor the results of implemented actions and review the plan as required.

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