



Lesotho Electricity Authority

GUIDELINES ON EFFICIENT USE OF ELECTRICITY FOR INDUSTRIAL AND COMMERCIAL SECTORS

Contents

1. Background	3
2. Introduction	4
3. Section 1 - Guidelines for Industry.....	4
3.1. Energy Management.....	4
3.1.1. Dimensions of Energy Management.....	5
3.1.2 Energy Audit.....	6
a. Types of Energy Audits.....	6
i. Preliminary	6
ii. General.....	7
iii. Investment-Grade	7
3.1.3 Energy Accounting	8

1. Background

One of the duties of the Lesotho Electricity Authority (LEA) is to 'ensure the operation and development of a safe, **efficient** and economic electricity sector in Lesotho.' For the sector to be efficient, one of the key factors is using the electricity efficiently. The license issued to the Lesotho Electricity Company by LEA requires, in section 36 that LEC 'prepares a Code of Practice setting out the ways in which the Licensee will make available to Customers such guidance on the efficient use of electricity as will, in the opinion of the Licensee, enable them to make informed judgements on measures to improve the efficiency with which they use the electricity supplied to them.' The license condition continues to list some items that such a Code of Practice should include and they are extracted below:

- a) the preparation, and making available free of charge to any customer who requests it, of a statement, in a form approved by the Authority, setting out information and advice for the guidance of Customers in the efficient use of electricity supplied;
- b) the creation and maintenance within the Licensee's organisation of sources from which Customers may obtain further information about the efficient use of electricity supplied to them, including the maintenance of a telephone information service;
- c) the preparation, and making available free of charge to any Customer who requests it, of a statement or statements of sources (to the extent that the Licensee is aware of the same) outside the Licensee's organisation from which Customers may obtain additional information or assistance about measures to improve the efficiency with which they use the electricity supplied to them. Such statement or statements should include the basic information which is publicly available on financial assistance towards the costs of such measures available from Central or Local Government or through bodies in receipt of financial or financial support from Government in connection with measures to promote the efficiency of energy use.

The Licensee has, since the issuance of its license in December 2006, not prepared the Code of Practice referred to above. These guidelines by LEA are therefore aimed at guiding electricity customers and consumers on how to use electricity efficiently. Efficient use of electricity can go a long way in reducing the national electrical load and hence delay capital intensive generation and transmission projects. The guidelines are not meant to be a substitution for the Code of Practice to be prepared by the Licensee as the above prescribed requirements of the Code are meant to be met by the Licensee, not the regulator.

These guidelines are also a supplement to efforts undertaken by the Department of Energy in educating the public on energy efficiency in general.

2. Introduction

Energy is simply defined as the ability to do work. Thus it follows that energy is needed at home as well as in business. In industry, electrical energy is the lifeblood of manufacturing since it is used to convert raw materials into finished products. Electricity is also one of the most convenient, safe and form of energy for use in the home. But with climate change and declining economies taking centre stage globally in recent years, it is imperative that electricity is used efficiently both to cut usage costs and protect the environment.

The good news is that there are so many easy ways to save electrical energy. Making small changes in our homes, offices and lifestyles can make a big positive impact in our wallets, as well as our planet. These guidelines outline some measures that will help in the efficient use of electricity mainly applicable to businesses/industry while the measures applicable particularly to the residential customers/consumers are given in separate guidelines. It is to be noted that some of the measures these guidelines can be downscaled and applied to the residential sector and by the same token some of the measures in the guidelines for residences can be up scaled and applied to the industry/business sector.

3. Guidelines for Industry

This section outlines the measures that will help the industry sector succeed, to some extent, in using electricity efficiently.

3.1. Energy Management

Energy management can be defined as the use of engineering and economic principles to control the use and cost of energy to provide needed services. An energy management strategy is particularly important in industry but some of the activities can be scaled down to achieve energy efficiency at home. Effective energy management has four fundamental components:

Efficient Purchasing – purchasing electricity at lowest available cost (currently there are no options for Lesotho customers, only LEC has the option)

Efficient Operation – operating equipment that consumes energy as efficiently as possible. Examples are using variable speed drives to vary the speed of motors, central control system of outdoor buildings and public/street lighting, and central control system of indoor power supply at public buildings i.e. offices, hotels, schools, etc.

Efficient Equipment – upgrading or replacing existing equipment with more energy efficient versions whenever it is cost effective to do so.

Efficient Design – designing of new or existing plant/buildings using most efficient technologies

3.1.1. Dimensions of Energy Management

There are three dimensions of energy management namely:

- a) Technical – the energy consuming devices and systems that use energy efficiently or inefficiently;
- b) Organisational – the structure and management systems that can support or hinder the achievement of energy efficiency goals; and
- c) Human Behaviour – the personal values, attitudes and practices of individuals in the organisation (or home) that impact on energy use.

The pros and cons of each dimension of energy management are given below:

a) Change in Technology

Cons

- Needs a strategic decision making
- Has high cost
- Long payback period > 5 years

Pros

- Results in new improved process
- Sustainable on its own
- Up to 60% savings can be realised

b) Change in Operational (Organisational) Efficiency

Cons

- Requires matching of usage to requirement
- Not quick to implement
- Not self-sustaining

Pros

- Low to medium cost
- Payback period is < 3 years

c) Change in Human Behaviour

Cons

- Not always sustainable –needs continuous awareness

Pros

- Centred on the principle of 'if you do not need it, do not use it'
- Quick to implement

- Zero or low cost
- Payback is immediate or short term

An energy management strategy should typically have the following specific objectives:

- Focus explicitly on both consumption and cost of energy
- Link energy efficiency to process improvement strategies
- Obtain senior management commitment
- Conduct an energy audit
- Identify projects and set goals (KPI's)
- Monitor progress
- Celebrate success
- Review and improve processes/policy
- Review objectives

To start an energy management program the following steps should be taken:

- Put administrative and management structure in place which includes appointing a person responsible for energy management
- Conduct an energy audit

3.1.2 Energy Audit

An energy audit is an inspection, survey and analysis of energy flows in a facility with a view to establishing alternatives that can reduce the energy costs.

The survey consists of:

- Organising electricity data – online metering, collecting billing data, load profiles, load factor, power factor, baseline consumption, etc.
- Understanding utility rates and structures – cost of using energy and power, i.e. energy vs. demand charges
- Identifying all electrical power consuming equipment, operating hours, operating procedures, areas for potential savings

In industries where there is more than one form of energy, which is mostly the case, the above activities should be carried out for all available forms of energy used.

a. Types of Energy Audits

There are three common types of energy audits namely: Preliminary, General and Investment-grade.

i. Preliminary

The preliminary audit (alternatively called a simple audit, screening audit or walk-through audit) is the simplest and quickest type of audit. It involves

minimal interviews with site-operating personnel, a brief review of facility utility bills and other operating data, and a walk-through of the facility to become familiar with the building operation and to identify any glaring areas of energy waste or inefficiency.

Typically, only major problem areas will be uncovered during this type of audit. Corrective measures are briefly described, and quick estimates of implementation cost, potential operating cost savings, and simple payback periods are provided. This level of detail, while not sufficient for reaching a final decision on implementing proposed measures, is adequate to prioritize energy-efficiency projects and to determine the need for a more detailed audit.

ii. General

The general audit (alternatively called a standard, mini-audit, site energy audit or detailed energy audit or complete site energy audit) expands on the preliminary audit described above by collecting more detailed information about facility operation and by performing a more detailed evaluation of energy conservation measures. Utility bills are collected for a 12 to 36 month period to allow the auditor to evaluate the facility's energy/demand rate structures and energy usage profiles. If interval meter data is available, the detailed energy profiles that such data makes possible will typically be analyzed for signs of energy waste. Additional metering of specific energy-consuming systems is often performed to supplement utility data. In-depth interviews with facility operating personnel are conducted to provide a better understanding of major energy consuming systems and to gain insight into short and longer term energy consumption patterns.

This type of audit will be able to identify all energy-conservation measures appropriate for the facility, given its operating parameters. A detailed financial analysis is performed for each measure based on detailed implementation cost estimates; site-specific operating cost savings, and the customer's investment criteria. Sufficient detail is provided to justify project implementation.

iii. Investment-Grade

In most corporate settings, upgrades to a facility's energy infrastructure must compete for capital funding with non-energy-related investments. Both energy and non-energy investments are rated on a single set of financial criteria that generally stress the expected return on investment (ROI). The projected operating savings from the implementation of energy projects must be developed such that they provide a high level of confidence. In fact, investors often demand guaranteed savings.

The investment-grade audit (alternatively called a comprehensive audit, detailed audit, maxi audit, or technical analysis audit) expands on the general audit described above by providing a dynamic model of energy-use characteristics of both the existing facility and all energy conservation measures identified. The building model is calibrated against actual utility data to provide a realistic baseline against which to compute operating savings for proposed measures. Extensive attention is given to understanding not only the operating

characteristics of all energy consuming systems, but also situations that cause load profile variations on short and longer term bases (e.g. daily, weekly, monthly, annual). Existing utility data is supplemented with sub metering of major energy consuming systems and monitoring of system operating characteristics.

Listed below are some instruments used to measure data that is needed in carrying out an energy audit.

- Thermometers and thermocouples – to measure temperature of operating equipment and work spaces
- Measuring tape – to check dimensions of walls, ceilings, windows and distances between equipment
- Infrared temperature gun – to measure temperature of steam line exteriors and other hard to reach equipment
- Ultrasonic leak detector – to detect leaks in steam and compressed air distribution systems
- Ultrasonic flow meter – to measure flow of liquids, such as hot water process fluids
- Combustion analyser – to estimate combustion efficiency of furnaces, boilers and other fossil fuel burning machines
- Multimeter – to measure voltage, current and resistance in electrical equipment
- Lux meter – to measure lighting levels

3.1.3 Energy Accounting

Before energy costs can be managed, they first have to be known. Energy accounting provides feedback (from the energy audit analysis) on how much energy an organization uses and how much it costs. It also provides a means to effectively communicate energy data that staff, building occupants and managers can use to improve cost management.

Specifically, energy accounting assists with:

- Recording and attributing energy consumption and costs – this requires a full understanding of the electricity tariffs/utility bills
- Troubleshooting energy problems and billing errors
- Providing a basis for prioritizing energy capital investments
- Evaluating energy programs success and communicating results
- Creating incentives for energy management
- Budgeting more accurately
- Positioning an organization to shop for lower prices for energy in a changing electricity market