How to do a walk-through energy assessment:
methodology and checklist

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Eskom Energy Management Information Pack: Brochure 3

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How to do a walk-through energy assessment: methodology and checklist

Cutting costs is by far the most pressing reason to strive for energy efficiency - with attractive rates of return, optimising electricity use is one of the most effective strategies available to achieve and maintain lower operating costs.

Business can elicit substantial savings whilst contributing to the health of the environment by switching to energy-efficient operating practices and replacing energy-intensive technologies, systems and processes with energy-saving technologies. Behavioural change tactics can result in cost savings of approximately 10%, whilst the use of energy-efficient technologies can achieve even more substantial savings.

Energy efficiency doesn't happen by itself. It requires ongoing monitoring and management, which involves all the processes for controlling and conserving energy in a business - this is the key to, ultimately, saving money.

Without an effective energy management plan, inefficiencies in a business go unnoticed, electricity is wasted and opportunities to save are not acted upon. Unnecessary energy usage translates into unnecessary costs, which consistently lowers profits and performance.

Gearing up for energy efficiency

There is no way of telling how efficient a business or a process within a business is, or how efficient it could be, without an analysis of how, where, why and when electricity is used - establishing where electricity is being wasted and identifying all opportunities to save are crucial.

It is highly recommended that a walk-through energy assessment be commissioned and conducted before commencing with energy-saving and energy management projects. An assessment is also helpful to identify areas and measures for saving electricity with little or no cost, especially for smaller businesses.

An energy assessment will help to:

- **Identify where and how much electricity is consumed in a building or facility.**
- **Evaluate the efficiency of all components and systems that impact energy use.**

Information gathered from the energy assessment can be used to introduce Energy Conservation Measures (ECM) or retrofit appropriate energy-saving technologies such as electronic control systems.

Energy assessments identify economically justified, cost saving opportunities that can result in significantly lower electricity, water and sewer costs. Assessments often address other issues too, such as indoor air- and lighting-quality and ways to improve building-occupant satisfaction.

An energy assessment is a detailed examination of a building's energy use and operating costs as basis for generating recommendations to reduce usage and costs by implementing operational and equipment changes.

An important facet of energy use assessing is energy accounting and bill auditing. Energy accounting is a process of collecting, organising and analysing energy data. For electricity accounts, usage data is normally tracked and should include metered kilowatt-hour consumption, metered peak demand, billed demand and rate schedules. Similar data is examined for heating fuel and water/sewer accounts. All this information can be obtained by analysing energy bills - creating energy accounting records and executing bill auditing can be carried out internally without hiring outside consulting firms.

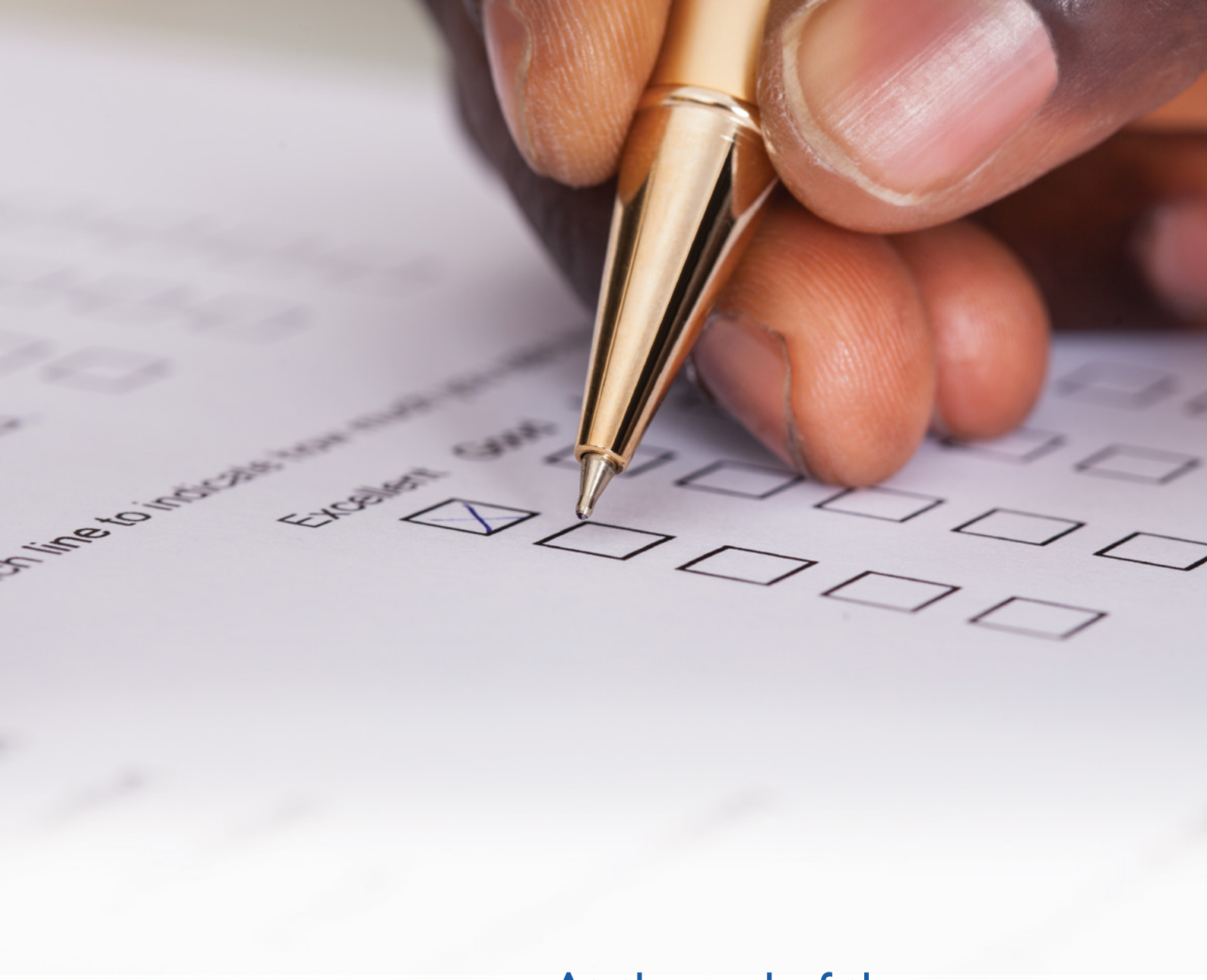
Also, whilst energy assessments as a whole will identify excessive energy use and point to potential cost-effective conservation projects, bill auditing will assist in identifying errors in utility bills and beneficial rate and service options. It could provide an excellent opportunity to generate savings without any capital investment. In addition, accurate data from energy accounting and bill auditing is crucial in making informed energy purchasing decisions from Eskom or your municipality.

Overview of the assessment process

An energy assessment team - with representation by your facilities manager, energy manager, operations and maintenance manager and maintenance and environmental staff - should be established to organise and manage the process for your business. The team should be supported, where needed, by an Energy Services Company (ESCo) - which generally has an engineering background - for a thorough assessment and to provide in-depth knowledge of energy-efficient operational and technology solutions as well as computer modelling skills for energy usage and management.

A typical assessment costs 5% of your annual energy bill.

Energy assessing evaluates the efficiency of all building components and systems that impact energy use. The assessment process begins at the utility meters where the sources of energy coming into a building or facility are measured. Energy flows - inputs and outputs - for each fuel are then identified. These flows are measured and quantified into distinct functions or specific uses - the function and performance of all building components and systems are then evaluated. The efficiency of each of the functions is assessed and energy and cost saving opportunities are identified.

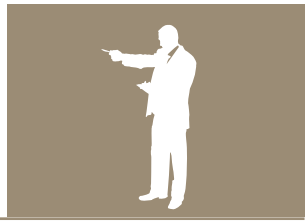


At the end of the process an energy assessment report is prepared, which should document where energy is being used.

It should provide an assessment of the condition of the building(s) and the associated systems and equipment.

Moreover, the report should include recommendations on how to increase energy efficiency through improvements in Operation and Maintenance (O&M) and the installation and implementation of energy-saving technologies and Energy Conservation Measures (ECM).

Conducting a walk-through energy assessment



This section will help you to identify low and no-cost energy efficiency actions and measures that can produce quick results and reduce your energy costs by up to 10% - conducting regular housekeeping walk-throughs and noting down and acting on any maintenance issues can identify opportunities for energy savings and avoid expensive problems later on.

It is designed for use by anyone new to energy savings - especially smaller businesses - and recognises that not everyone has the time or resources to undertake a full carbon management programme.

Conducting a walk-through with a checklist is a commitment to improving energy performance; it will help you to identify:

- What is happening on the ground
- Wasteful energy use
- Opportunities to save energy.

The areas to look at on a walk-through are:

- Heating
- Lighting
- Office equipment
- Factory and warehouse equipment.

Use the walk-through energy assessment checklist on page 14 as a guide.

Note:

The technologies listed in this brochure are relevant to offices, factories and warehouses and serve as an example. Technologies to be considered in a walk-through energy assessment vary per business activity and sector - two important questions to ask as the basis for your particular assessment are:

- Where is energy being consumed in your organisation?
- Which types of technologies and processes consume electricity in your organisation?

As the pattern of energy use in your building will differ throughout the day, it is useful to conduct a series of walk-throughs and to vary the times they are carried out, for example:

- When the cleaners are on duty
- At lunchtime
- The busiest time during a working day
- When you would expect to be using little or no energy
- At night or on weekends.

Varying the times of walk-throughs will provide a better picture of when and where electricity might be wasted. It is also helpful to plan walk-throughs during times of seasonal change, such as when winter is approaching and heating costs tend to increase, and at the beginning of spring and into summer when cooling costs rise. This will ensure that controls are set correctly for the time of year.

Key members of staff should take part in walk-throughs to help identify energy wastage and opportunities to save energy and, importantly, to make them feel part of the energy management process.

Comparing the findings of a walk-through with meter data will help to pinpoint areas of high energy use. It is important to prioritise energy-saving actions when identified rather than doing everything at once - usually, those actions with the biggest savings potential or least disruption to the business will determine this.

In some cases energy-savings are easy to identify and calculate - this guide will help you to estimate the potential savings of many of the common energy efficiency improvements.

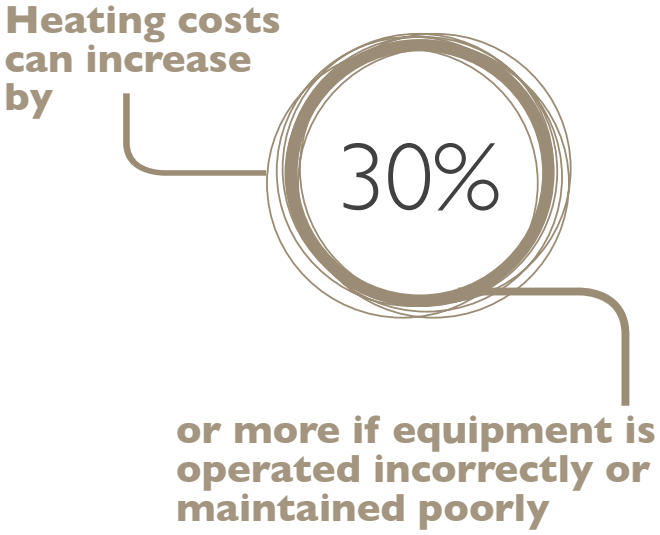
Where savings are more difficult to calculate, contact an Energy Services Company (ESCo) in your region for assistance.

Heating

Heating typically accounts for about 50% of energy use in offices in winter and forms a significant proportion of energy usage in other areas of a building. It is a key target for energy-saving measures - many buildings are overheated, causing discomfort and wasting money.

Overheating is often the result of heating areas such as store rooms or corridors that do not need to be heated to the same temperature as areas occupied by staff. Overheating can also be the result of poor control of heating systems.

Preventing as much heat loss as possible by improving insulation and draught control can also significantly reduce heating bills. Key areas and issues to look out for and key questions to ask when carrying out a walk-through energy assessment are:



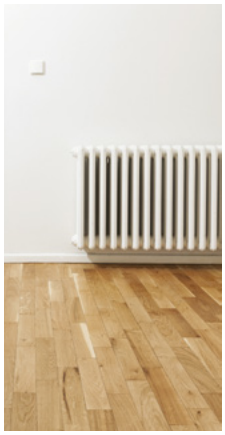
Equipment and heat use

- When were heaters or boilers last serviced? Heating costs can increase by 30% or more if equipment is operated incorrectly or maintained poorly. Ensure it is adjusted for optimal energy efficiency and serviced at least once annually.
- Is there evidence of use of electricity through expensive portable space heaters by staff? If portable space heaters have to be used make sure they have a thermostat to control the temperature or equipped with a simple time switch so they turn themselves off after a designated period of heating, for instance after 30 minutes.

Do all areas have the same heating requirements?

- Consider heating your building in zones to allow heating to be adjustable for each area. Store rooms, corridors and areas where there is a high level of physical activity, require less heat.

- Moreover, do not heat warehouses in an attempt to reduce humidity as a measure to protect product quality. Heating may actually increase humidity. Dehumidification can be more effective to maintain product quality.



Zone controls allow heating or cooling of different parts of a building at different times and at different temperatures according to occupants' needs - energy costs rise by about 8% for every 1°C of overheating.

Control and timing

- Are thermostats correctly set? Thermostats should generally be set from 19 to 22°C for heating.
- Are thermostats placed in the appropriate locations - away from draughts, direct sunlight and any heat source?

Draughts (avoiding heat loss)

- Are windows and doors left open in winter when heating the building? Windows are often opened because rooms are too hot. Instead of opening windows, turn down the thermostat until a comfortable temperature is reached.
- Are cold draughts coming from windows and doors? Draughts are not only a cause for complaint and discomfort but waste money - fit draught strips and seal windows and doors that are no longer used.

Refer to page 10 of Energy-efficient solutions: an overview of technologies - Brochure 6 in the Eskom Energy Management Information Pack - for comprehensive information on the importance of a well insulated building.

Note:

Use promotional material and staff meetings to raise awareness of how to save on heating - refer to Creating an energy awareness programme: behavioural change at work - Brochure 4 in the Eskom Energy Management Information Pack - for advice on how to create and implement an energy efficiency awareness campaign in your business.

Cooling plays a major role in consuming energy in summer. Refer to HVAC systems: energy-effient use and technologies - Brochure 5 in the Eskom Energy Management Information Pack - for comprehensive information on how to optimise the use of Heating, Ventilation and Air Conditioning (HVAC) systems.

Lighting

There are many simple and inexpensive ways to reduce the energy consumption and costs associated with lighting without compromising health and safety or comfort levels.

Key areas and issues you should look out for when carrying out a walk-through energy assessment include:

Are standard (tungsten) lightbulbs still being used?

- Standard lightbulbs are electricity expensive to run for long periods and produce more heat than light.
- Replace standard lightbulbs with energy-efficient Compact Fluorescent Lamps (CFLs) - they have a longer life span, cost less to maintain and use up to 75% less energy.
- Task lighting is a good way to minimise the amount of lighting used. Only light working areas to a higher level and provide background lighting at a lower level for the rest of the occupied space.
- The use of task lighting reduces glare on computer screens and creates a more comfortable working environment for employees.

Note:

Take care when standard lightbulbs are used to task light machinery in workshops - replacing them with energy-efficient lamps can cause a stroboscopic effect, which means standard bulbs can sometimes be the safest option. (The stroboscopic effect usually happens when you have one fluorescent lamp installed. This effect will not happen if you install a double fluorescent lamp or two Compact Fluorescent Lamps (CFLs)).

What type of fluorescent tubes are installed and used?

- Slim-line fluorescent tubes - 15mm diameter T5s and 26mm T8s - use less electricity and are cheaper to buy than older 38mm tubes (T12s). T5s are an energy-efficient alternative of choice and can also be used to replace T8s.
- Installing new energy-efficient fluorescent lighting eliminates flicker and hum, extends lamp life and often reduces energy consumption by up to 75%.

Does an opportunity exist to use Light Emitting Diodes (LEDs)?

- LED lighting can provide substantial energy savings. LEDs typically have a long lifespan and need less frequent replacing than other types of lights. (Please note that LEDs are much more expensive than other types of lights - a proper feasibility study should be conducted before investing in LEDs).

Are lamps, fittings and roof lights clean?

- Dirty shades and roof lights greatly reduce lighting levels

Are lights switched off when the building is not occupied?

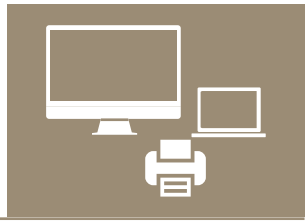
- A lot of energy is wasted when unnecessary lights are left on after hours.
- Carry out an after hours walk-through to check if this is a problem.
- Consider installing motion sensors to automatically turn off lights in unoccupied rooms and spaces. Lighting control technologies such as motion- and daylight-sensors limit electricity wastage by controlling when and where light is provided.
- Give staff and cleaners the responsibility to switch off lights.
- Use promotional material and staff meetings to raise staff awareness.

Make sure that the most energy-efficient type of lighting is installed in your building. The table below shows different types of bulbs/tubes and energy-saving alternatives.

Existing lamp type	Energy-efficient option	Benefits and energy savings up to:
Standard (tungsten) lightbulbs	Replace with energy-saving Compact Fluorescent Lamps (CFLs) in the same fitting	75% plus longer lamp life
Standard (tungsten) lightbulbs	Replace with energy-saving Light Emitting Diodes (LEDs) in the same fitting	85% plus longer lamp life
38mm (T12) fluorescent tubes in switch-start fittings	Replace 4-lamp T12 fluorescent tubes with 2-lamp 15mm T5 fixtures	10% plus longer lamp life
High wattage filament lamps or tungsten halogen lamps (as used in flood lights)	Replace with high-pressure sodium or metal halide lamps	65 to 75% plus longer lamp life
Mains voltage reflector lamps, filament spot and flood types	Replace with low-voltage tungsten halogen lamps or metal halide discharge lamps	30 to 80% for equivalent lighting performance
Fluorescent fittings with 2ft 40W, and 8ft 125W fluorescent lamps (the old T12 lights with single pins)	Replace with energy-efficient fittings using reflectors/louvers or efficient prismatic controllers with high-frequency electronic or low-loss control gear and tri-phosphor lamps	30 to 45% with much improved lighting quality - the use of high-frequency electronic control gear eliminates flicker, hum and stroboscopic effect.
Fluorescent fittings with opal diffuses or prismatic controllers, which are permanently discoloured	Replace with new prismatic controllers or replace fittings as above	No reduction in energy consumption but an increase in the amount of light by between 30 and 60%

Implement energy-saving measures outlined in this brochure and you can cut your lighting costs by up to 30%.

In the office



Office equipment has become integral to daily business activities. However, it is not always appreciated how much computers, printers, photocopiers, teleconference facilities and many other office technology conveniences can cost a company.

Apart from substantial savings on heating and lighting, energy consumption in offices can be reduced by looking at the way equipment is used - in an air conditioned office it can take half as much energy again to remove the heat generated by office equipment as it takes to run the equipment in the first place.

Do computers have built-in energy-saving features?

- The best known energy label for office equipment is the Energy Star rating, whereby equipment automatically enters a low power mode after a pre-set amount of time. However, these savings can only be achieved if the energy management software has been enabled.
- Screensavers do not save energy - they only save the screen image from 'burning in' when the image does not change for a long period.

Are computers left on overnight?

- Computers' energy consumption can be reduced by 75% per year by switching off at night and during weekends. Energy consumption can be reduced by 90% per year if the monitor is also switched off when not being used (including during lunch times) and the standby options are activated.

Are photocopiers located in air conditioned areas?

- Where possible, place photocopiers in areas that are naturally ventilated, which will help to avoid any air conditioning plant having to compensate for the associated heat gains. Run copies in batches to reduce the amount of time machines are idling before and after use, which will allow them to remain in power save mode for a longer part of the day.

Is any other office equipment left on unnecessarily?

- Activate the 'energy-saving mode' where available on printers and fax machines, which will allow the equipment to automatically power down after a set time. By switching off laser printers in the evening and on weekends, energy consumption can be reduced by 75%.
- Don't forget to switch off cold drink vending machines and water coolers overnight and during weekends. Install a plug-in, seven-day timer to reduce the likelihood of machines being left on after hours; these can be bought cheaply at most DIY stores.
- Check what equipment is being used in the office kitchen: old kettles, urns or refrigerators tend to be less efficient than newer models - it could be worth investing in new, energy-efficient models to improve performance and save money in the long run.

Are air conditioning systems left on unnecessarily?

- The best way to ensure that air conditioners are not left on unnecessarily in unoccupied rooms is by installing occupancy or movement sensors. These detect when someone enters a room and then activate the system. Once the room has been left vacant for a certain period of time the air conditioner shuts down.
- As with lights, air conditioners are often left on unnecessarily when people leave offices and meeting rooms - everyone expects that someone else will do the switching off but, more often than not, nobody does.
- With incidences of power outages late afternoons just before closing time, people leave work for home forgetting that air conditioners were running before the power outage. This causes air conditioners to spring back to life once power is restored and, therefore, consume electricity unnecessarily throughout the night and sometimes over weekends.

Note:

Air conditioners should be serviced - and filters cleaned - on a regular basis.

Geysers

Smaller offices equipped with a 20- to 100-litre electric element geyser mostly need warm water for washing hands in bathrooms and dishes in the kitchen. Replacing a large geyser with a 5-litre under-basin geyser would be a huge energy saver in smaller offices. (Larger geysers are only needed in organisations where workers need to shower).

Mixer taps at basins are huge energy savers since staff and cleaners (almost) always use the 50/50 - or the hot water - setting when cold water could have been used for a task. The first water coming out of the tap is always cold and the tap is closed before the hot water arrives. Although hot water wasn't needed, the geyser now needs to heat the cold water that is re-filling the geyser.

In the factory/warehouse

There are some excellent opportunities for saving energy on the factory floor or in the warehouse. Although the processes and systems and specific equipment used will be unique to each business operation, it is possible to highlight a few common areas where savings opportunities can be found.

Compressed air

- Check for wasteful leaks in the compressed air system (20 to 50% leakage is normal). Make immediate repairs. Leakages mostly occur where clamps are not tightened sufficiently or at fittings where appliances are connected - correct fittings will ensure no leakages. (Leakages at fittings can also be due to worn rubber o-rings). Leakages due to a damaged compressor hose seldom occur. (The easiest way to check for leakages is during quiet operational periods when there is no demand for air).
- Does the compressor run when not needed? Often unaware of how much it costs, many factories run compressors for most of the day - and even overnight - when compressed air is not needed. Encourage staff to switch off the compressor when not in use.

Note:
Service compressors regularly.

Electrical equipment

- Is equipment left running when not in use? Conveyor systems, machine tools and other equipment should be switched off when not in use.
- Are higher efficiency motors fitted? Typically, if a new IE1 motor costs R1.00, an IE2 motor will cost about R1.13 and an IE3 motor R1.66. All of these motors will have the same design life - 20 years - but the energy savings that will be achieved over just a few years from using an energy-efficient motor should make the decision to upgrade from IE1 to IE2 an obvious one. (Most electric motors are designed to run at 50 to 100% of rated load - maximum efficiency and power factor is usually above 75% of rated load).

Refrigeration

- Is the refrigeration equipment well maintained? Badly maintained chiller plants will increase energy consumption. Are the chiller units free of ice build-up and regularly serviced? Is the chiller outlet free of debris and blockages?
- Is the temperature of the condenser units of air conditioners kept as cool as possible? Make sure condenser units are not installed in closed or confined areas where hot air might accumulate or where they can be exposed to direct sunlight during the day.
- Are doors left open longer than is necessary? Make sure door seals are effective and in good condition to prevent ambient air from entering unnecessarily.

Bills and meter readings

Looking at electricity bills and taking regular meter readings help to track energy use and control energy costs.

Reviewing electricity invoices and checking meter readings regularly will help to build a picture of your energy performance.

These measures will also help to:

- Ensure that you only pay for electicity used
- Assist in comparing current consumption and costs with those of previous years
- Enable assessment of seasonal consumption patterns
- Identify unexpectedly high or unusual patterns in energy use so that quick action can be taken
- Establish a pattern of energy consumption, which can be compared against the business' "ideal" or optimal energy used - inconsistencies between the two could show where energy is being wasted.

Know the location of your energy meters

- Remember, there may be more than one meter should you use other energy sources in addition to electricity.

What type of meter is used?

- Note: meters that need to be read manually will either have a digital display or an analogue dial.

Analysing data

- Record meter readings regularly. If there is any change that can't be explained, or no energy use reduction when you would expect to see one (such as during summer holidays), check controls and settings - equipment may have been left on unnecessarily. Ideally energy use should be plotted over time to make it easier to see trends.
- Fluctuations in energy use may have many possible explanations, including variations in workload, holidays, the season or the weather.
- If there is an unexpected fluctuation, check if there is some equipment malfunction or if any change in your working method has caused an increase in energy use.

Pay less for your energy

There are many factors that affect the price of a unit of electricity. To reduce costs, bear in mind that - depending on the tariff - the price of a unit can vary significantly throughout the day and could be substantially cheaper at night.

There are several ways of paying less, for example:

- Make maximum use of cheaper electricity rates, especially night-time rates
- Minimise use during peak periods of demand
- Check whether the tariff you are billed at is correct
- Check with Eskom that the load amount drawn from the supply has no unusual characteristics that may affect the unit price.

Next steps

Once the opportunities for saving have been identified, it's time to act. The following steps should help you to implement the necessary measures.

Step 1. Give someone the responsibility

Give one person the responsibility for the energy-saving initiative in your building - he or she could:

- Read meters and check electricity bills
- Carry out a walk-through energy assessment at designated times to identify new points or areas of electricity waste
- Make sure all staff know about the main points or areas of electricity waste and educate them on how to save and the benefits of saving
- Manage specific energy-saving projects.

Step 2. Plan and organise

Draw up an action plan, a simple schedule of the improvements that need to be made and when they will be made. When writing an action plan:

- Make someone responsible for each improvement
- Allocate resources, both time and money (if needed), for each improvement
- Where possible, set deadlines for completion and keep checking whether each improvement has been implemented
- Identify a management structure and reporting lines so that the person(s) with day-to-day responsibilities have access at director-level to ensure that the improvements proceed as planned
- Prioritise improvements according to energy cost savings and time taken to recoup the investment.

Step 3. Involve staff

Although one individual may be responsible for achieving and maintaining optimal energy efficiency, the involvement and commitment of all staff is crucial. Refer to Creating an energy awareness programme: behavioural change at work - Brochure 4 in the Eskom Energy Management Information Pack - for advice on how to create and implement an energy efficiency awareness campaign in your business.

Example: Energy assessment walk-through checklist

Walk-around date:	Checked	Further action needed Y/N
Heating (see page 5)		
Are there complaints from staff about the temperature level?		
Have heaters/boilers been serviced in the last 12 months?		
Are portable space heaters being used?		
Are heaters and air conditioning units operating in the same space?		
How is hot water provided?		
Are pipes insulated?		
Do all areas have the same heating requirements?		
Are thermostats working and set correctly?		
Are timers working and set correctly?		
Are other heating controls working and set correctly?		
Are there any obstructions in front of radiators or heaters?		
How are extractor fans controlled (such as in toilets)?		
Are windows and doors open when heating or air conditioning is on?		
Are there any cold draughts coming from windows or doors?		
Lighting (see page 7)		
Are lights switched off (is daylight sufficient?/room not in use?)		
Are any old large diameter fluorescent tube lights still in use?		
Are lamps, fittings and roof lights clean?		
Are traditional tungsten lightbulbs still in use?		
Are light switches labeled and arranged conveniently?		
Is exterior lighting switched off when not needed?		
In the office (see page 9)		
Do computers have built-in energy-saving features and are these features activated?		
Are computers left on overnight?		
Are monitors switched off when not in use?		
Are photocopiers located in air conditioned areas?		
Are printers and photocopiers left on overnight/on weekends?		
Are vending machines/water coolers left on all the time?		
In the factory/warehouse (see page 11)		
Are pumps/fans/compressed air switched off when the equipment they serve is not in use?		
Do you hear compressed air leaks?		
Are refrigeration units run efficiently?		
Are condenser units properly ventilated?		
Are condenser units protected against direct sunlight?		
Are the door seals of refrigerators in good condition?		

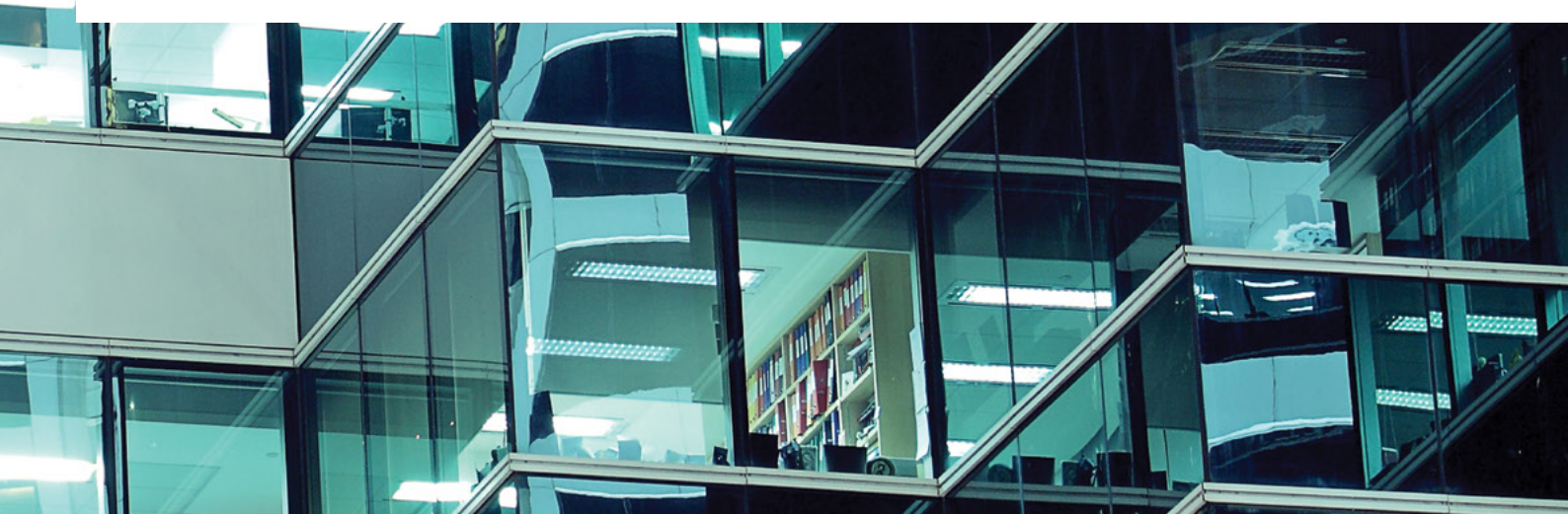
Credits:

The information in this brochure has been sourced from –

- www.carbontrust.com
- www.hoveyelectric.com

The Eskom Energy Management Information Pack comprises:

Energy management action plan	Brochure 1
Business case for energy efficiency	Brochure 2
How to do a walk-through energy assessment: methodology and checklist	**Brochure 3**
Creating an energy awareness programme: behavioural change at work	Brochure 4
HVAC systems: energy-efficient use and technologies	Brochure 5
Energy-efficient solutions: an overview of technologies	Brochure 6
Green growth cycle: energy efficiency in support of competitiveness	Brochure 7



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