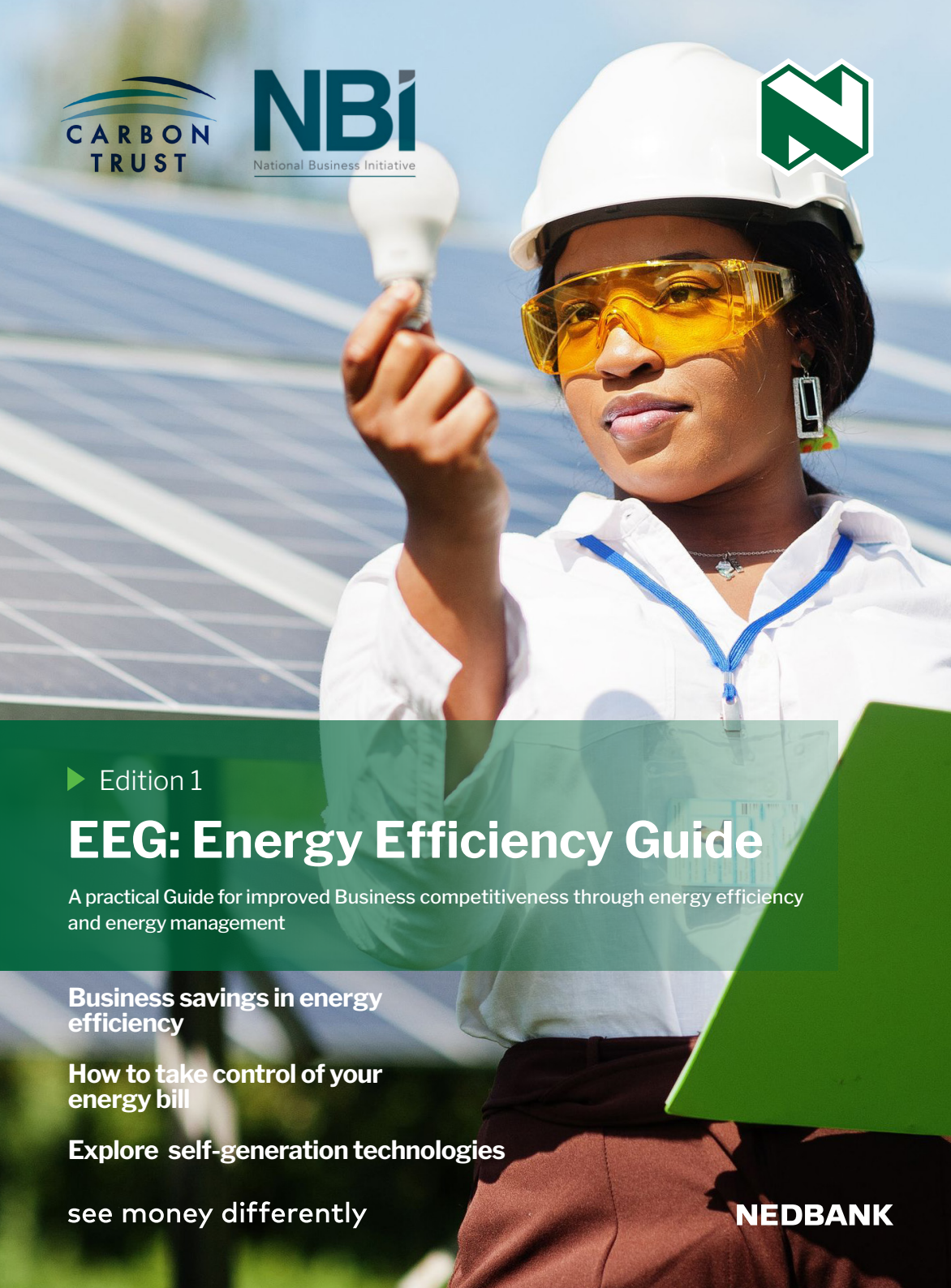


CARBON TRUST

NBI
National Business Initiative

Edition 1

EEG: Energy Efficiency Guide

A practical Guide for improved Business competitiveness through energy efficiency and energy management

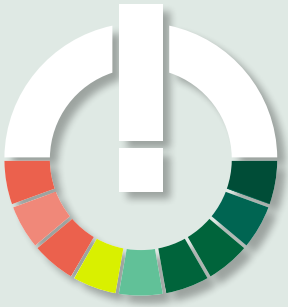
Business savings in energy efficiency

How to take control of your energy bill

Explore self-generation technologies

see money differently

NEDBANK



DEVELOPED BY NEDBANK
in association with the
National Business Initiative
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Acknowledgements

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The PSEE Programme was led by the NBI, supported by the Carbon Trust and funded by the United Kingdom's Department for International Development, and worked in close collaboration with the South African Department of Energy.

We also acknowledge the Nedbank team for supporting and partaking in the PSEE Programme and offering the opportunity to continue the good work through free downloadable publications made available on the bank's website – open and honest knowledge sharing is the key to driving impactful growth for the benefit of all in South Africa. Heartfelt thanks from the authors, the Carbon Trust and the NBI.

Questions, suggestions, comments or possible corrections are welcomed and can be emailed to energyefficiency@nedbank.co.za.

Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AC	Air conditioning
CFL	Compact fluorescent light
CMVP	Certified measurement and verification professional
CO_2	Carbon dioxide
CPI	Consumer price index
ECM	Energy conservation measure
EEM	Energy efficiency measure
EnPI	Energy performance indicator
GHG	Greenhouse gas
HVAC	Heating, ventilation and air conditioning
HFC	Hydroflourocarbons
IEP	Integrated Energy Plan
INDC	Intended Nationally Determined Contribution
IPMVP	International performance measurement and verification protocol
IRP	Integrated Resource Plan
ISO	International Standards Organisation
LED	Light-emitting diode
MD	Motors and drives
M&V	Measurement and verification
NCPC	National Cleaner Production Centre
NEES	National Energy Efficiency Strategy
NBI	National Business Initiative
PSEE	Private Sector Energy Efficiency
PV	Photovoltaic
SANEDI	South African National Energy Development Institute
SARS	South African Revenue Service
VSD	Variable-speed drive
ZAR	South African rand

LIST OF UNITS

GJ	Gigajoule
GWh	Gigawatt-hour
kVAr	Reactive power
kW	Kilowatt
kWh	Kilowatt-hour
Lumens	Total amount of visible light
lux	Lumens per square metre
m^2	Square metre
m^3	Cubic metre
MJ	Megajoule
MW	Megawatt
PJ	Petajoule

01 Using this guide

THIS GUIDE HAS BEEN DEVELOPED AS A PRACTICAL TOOL TO ALLOW YOUR BUSINESS TO MANAGE ENERGY CONSUMPTION.
THE GUIDE SHOULD ALLOW YOU TO IDENTIFY AND IMPLEMENT ENERGY MANAGEMENT STRUCTURES, PROCESSES AND SIMPLE PROJECTS. IT WILL ALSO GIVE YOU THE TOOLS REQUIRED TO CONDUCT PROPER CHECKING OF PROPOSALS FROM ENERGY MANAGEMENT CONSULTANTS TO ENSURE MAXIMUM BENEFIT TO YOUR BUSINESS.

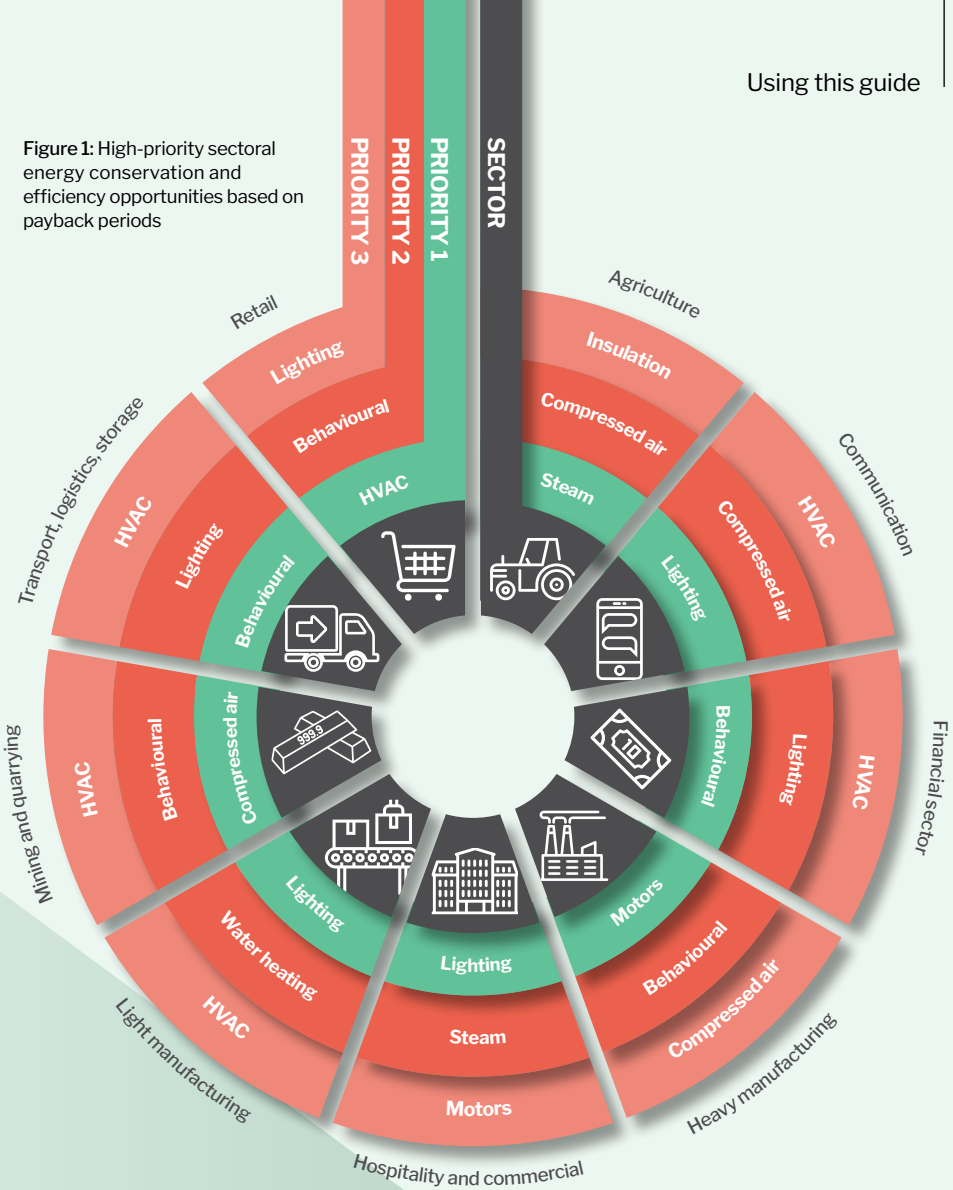
01

Using this guide

The guide aims to provide an overview of different energy efficiency and renewable-energy opportunities that are accessible to your business, so that these opportunities can be considered in your project planning process to reduce your energy bills and increase business competitiveness.

This guide has been compiled using energy management knowledge and information, and South African data collected from over 5 000 businesses over a two-year period. From the data collected, Figure 1 provides an overview of the top three priority areas (based on payback periods) for nine industry sectors. This figure can be used to direct you to the relevant section of the guide to derive the maximum benefit for your business.

Figure 1: High-priority sectoral energy conservation and efficiency opportunities based on payback periods



Behavioural	Compressed air	HVAC	Insulation
Lighting	Motors	Steam	Water heating

02

THIS SECTION DISCUSSES THE MAIN ENERGY, ENERGY EFFICIENCY, CLIMATE CHANGE AND CARBON EMISSIONS LEGISLATION, POLICIES, TAXES AND INCENTIVES IN SOUTH AFRICA THAT MAY AFFECT YOUR BUSINESS.

An introduction to energy efficiency in South Africa

02

An introduction to energy efficiency in South Africa

Energy efficiency is recognised globally as a critical solution to reducing energy demand and consumption, managing global carbon dioxide (CO_2) emissions and improving economic competitiveness.

It is also one of the most attractive options available for business cost reduction and climate change mitigation. Looking at energy production and use from a global perspective, the Institution of Mechanical Engineers has developed an energy hierarchy[1] to inform decisions. This hierarchy is included as Figure 2.

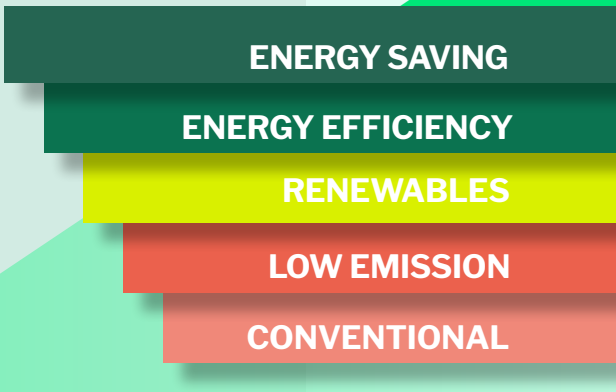


Figure 2: Institution of Mechanical Engineers energy hierarchy

[1] www.imeche.org [Accessed 06/03/2019].

THE ENERGY HIERARCHY PLAN FOR ENERGY USE AND SUPPLY

ENERGY SAVING

Switch off | Eliminate waste

Switch off energy-using equipment when it is not in use, avoid unnecessary journeys that will burn liquid fuels, close gaps in buildings that could result in heated or cooled internal air escaping, and other opportunities to reduce wastage.

ENERGY EFFICIENCY

Better equipment and appliances | Lower energy losses

Energy efficiency can simply be defined as the ratio of input energy versus output energy. As such, energy efficiency can be improved with better conversion of energy from one form to another, or better use of energy by a device or process.

A simple example of improving the conversion of energy from one form to another could be to cook on a stove plate the same size as the pot you are using. That way there are fewer losses from the plate being larger than the pot, and the electrical energy is transferred into heating energy to the pot more efficiently.

An example of better use of energy by a more efficient device is the improvement in motor vehicle fuel consumption. This has been achieved by improved engineering on components in the motor and better transfer of the energy from the motor to rotational energy in the wheels.

RENEWABLES

Sustainable energy production

Renewable energy is generated from power sources, such as the sun, the wind, water or sustainable biomass, that will not be depleted.

LOW EMISSION

Low carbon generation | Carbon capture

Low-emission power generation is any conventional power generation with carbon capture and storage to reduce CO_2 emissions. Nuclear power is often included in low-emission power as it has no CO_2 emissions during operation.

CONVENTIONAL

Sources of last resort | Offset to compensate

Conventional power includes fossil fuel-fired power generation. There are some environmental and efficiency opportunities within this category, such as switching from coal to gas power generation, as gas is cleaner burning and has fewer emissions.

The energy hierarchy was designed to focus attention and resources on the most impactful areas of energy management, thus reducing costs. Therefore, in your business you should always start with energy saving, and then move to energy efficiency and so on. This approach will ensure that maximum returns are delivered and reduce your capital expenditure.
As a rule of thumb, costs increase as you move down the hierarchy.

Energy saving and waste reduction can be achieved by behavioural change, awareness and training. This is discussed in further detail in the '**Business savings and resilience opportunities in energy efficiency**' section.
Choices regarding energy efficiency, renewable energy and energy generation can be influenced by government policies and incentives. As such, governments and world bodies are promoting energy efficiency through a number of incentives, taxes and penalties. South Africa has been no exception and has a number of instruments to promote energy efficiency. Below is a short overview to provide context to the energy and energy efficiency environment in South Africa.

INTEGRATED ENERGY PLAN AND INTEGRATED RESOURCE PLAN (BOTH REVISED IN 2016)

- The Integrated Energy Plan (IEP) provides the roadmap for future energy infrastructure and policy, while the Integrated Resource Plan (IRP) focuses on electricity supply options for South Africa up to 2050. These updated documents were published for comment in November 2016. The IRP recognises enhanced energy efficiency in the South African economy as a scenario for policy adjustment.

NATIONAL ENERGY EFFICIENCY STRATEGY 2005 AND DRAFT POST-2015 NATIONAL ENERGY EFFICIENCY STRATEGY (GAZETTED DECEMBER 2016)

- South Africa is recognised as the 11th largest emitter of CO_2 globally, and consumes 40% of the energy in Africa. There are numerous opportunities to use energy more efficiently. The South African energy efficiency strategy sets targets and proposes that these are met through a number of policy, incentive, finance, business and sector programmes. Businesses should make sure they comply with all regulations and policies, and should explore any incentives available in their sector. The first version of the National Energy Efficiency Strategy (NEES) was successful, and many of the goals to reduce specific energy consumption per sector were achieved. As such, a new strategy has been developed that will take South Africa from 2015 to 2030. Sectoral targets and goals have been set in the new draft strategy. The time period for these targets is 2015 to 2030, and the targets are outlined below:

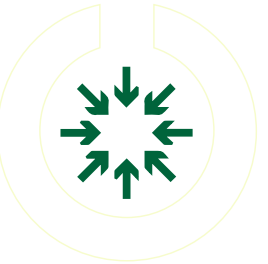
  - Public sector – **50% reduction** in energy consumption per m^2 (gigajoules per square metre) (GJ/m^2).
  - Municipal services – **20% reduction** in energy intensity (GJ/head population served) and **30% reduction** in fossil fuel intensity of municipal vehicle fleets (total fossil fuel consumption/head of population served).
  - Residential sector – **33% reduction** in specific energy consumption of new household appliances and **20% improvement** in average energy performance of the residential building stock, excluding plug loads (GJ/m^2).
  - Commercial sector – **37% reduction** in energy consumption (GJ/m^2).
  - Industry and mining sector – **16% reduction** in weighted-mean specific energy consumption and **40 petajoule (PJ) energy saving** from specific energy-saving interventions undertaken by mining companies.
  - Agriculture sector – **1 PJ electricity saving** through officially supported projects.
  - Transport sector – **20% reduction** in average vehicle energy intensity per km (megajoules per kilometre) (MJ/km).
  - Production and distribution – **10 PJ electricity saving** from grid-connected cogeneration plant and average total electricity distribution losses below 8% and average non-technical losses below 0,5%.

WHITE PAPER: NATIONAL CLIMATE CHANGE RESPONSE POLICY (2011)

- This document calls for a drastic reduction in greenhouse gas (GHG) emissions in South Africa. It should be read and understood in conjunction with South Africa's Intended Nationally Determined Contribution (INDC), submitted to the United Nations Framework Convention on Climate Change in 2015. The White Paper identifies the major opportunities for climate change mitigation in South Africa as energy efficiency, demand management and reducing the emissions intensity of the energy mix in South Africa. It is important to note this, as a number of these opportunities will be discussed throughout this booklet as opportunities that can be implemented in your own business.

DRAFT CARBON TAX BILL (2015)

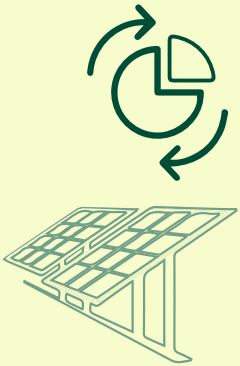
- The Draft Carbon Tax Bill discusses a proposed tax on scope 1 (direct) emissions. The scope 1 emissions of your business comprise the CO_2 emissions from onsite combustion of fuels, such as coal, oil and liquid fuel, and the refrigerant gases that may escape your heating, ventilation and air conditioning (HVAC) system. This means it does include fuel you burn in your company's vehicles, but it does not include the emissions related to your electricity consumption [these are called scope 2 (indirect) emissions]. You should prepare your business by calculating your carbon footprint and determining your tax liability, should the tax come into force. For assistance calculating your carbon footprint please see the *Nedbank Carbon Footprinting Guide*[2].



THE BROADER ENERGY REGULATORY FRAMEWORK, AND THE POTENTIAL IMPACT ON YOUR BUSINESS, SHOULD BE CONSIDERED TO ENSURE THAT YOU ARE WELL PREPARED FOR THE FUTURE ENERGY LANDSCAPE IN WHICH YOUR BUSINESS WILL OPERATE.

A FULL UNDERSTANDING OF THE POLICY PAPERS AND STRATEGIES COULD ALSO ASSIST IN UNLOCKING INCENTIVES FOR YOUR BUSINESS, AND PREPARING FOR REDUCED FUTURE TAXES.

[2] https://www.nedbank.co.za/content/dam/nedbank/site-assets/AboutUs/About%20Nedbank%20Group/Green%20and%20Caring/9124_Carbon_Footprinting_Guide_Ed2.pdf.



South African energy efficiency and renewable-energy incentives

THERE ARE TWO TAX INCENTIVE STRUCTURES THAT ARE SPECIFICALLY DESIGNED FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY IN SOUTH AFRICA. IN ADDITION TO THE MOST COMMON INCENTIVES OUTLINED BELOW, YOUR BUSINESS SHOULD CONSIDER OTHER FUNDING OPPORTUNITIES:

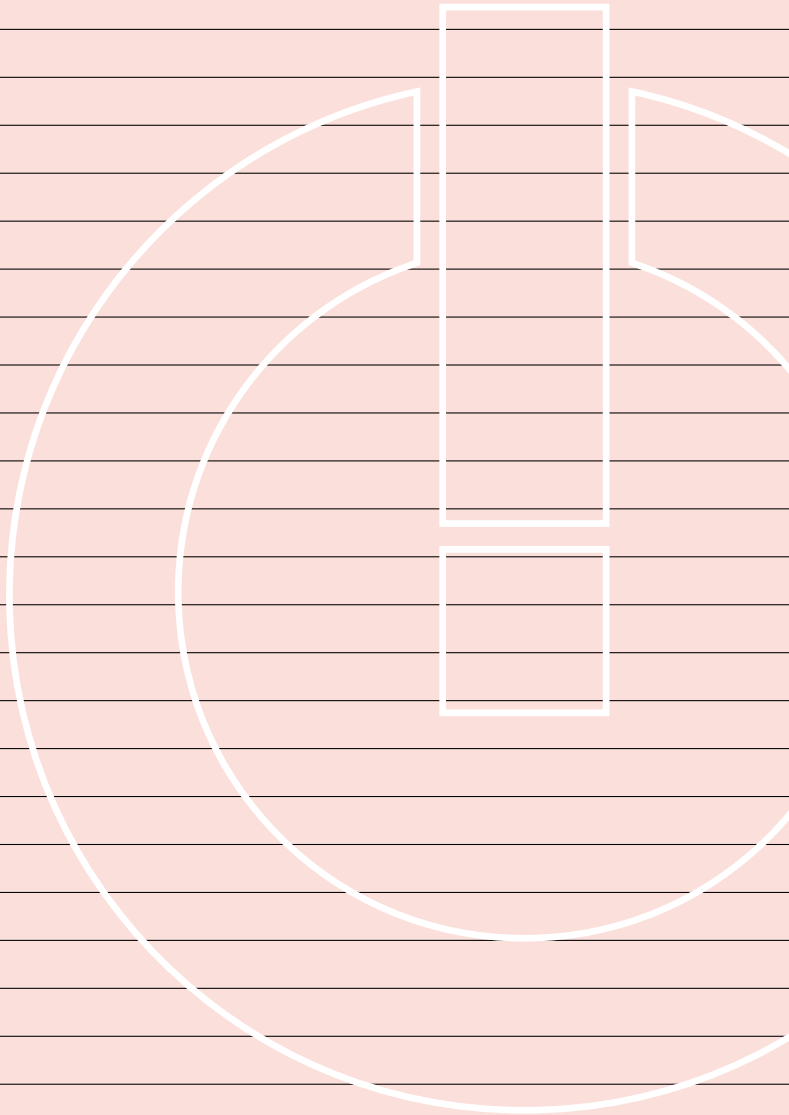
SECTION 12B OF THE INCOME TAX ACT, 58 OF 1962

Section 12B allows businesses that have installed rooftop solar photovoltaic (PV) plants to depreciate these assets on an accelerated basis and thereby receive tax advantages for pursuing these projects. This accelerated depreciation tax allowance positively impacts the business case for solar PV in a material way. For installations under 1 MW a business can decide to depreciate the plant in one year, and for larger installations depreciation of 50/30/20 over three years can be used. No application process is required, but the company may have to provide supporting documents if the depreciation is queried by the South African Revenue Service (SARS).

SECTION 12L OF THE INCOME TAX ACT

Section 12L is administered by the South African National Energy Development Institute (SANEDI), which is a state company set up in 2012 to help accelerate green energy projects. This incentive offers a tax deduction of 95c per kWh of energy saved to all taxpayers through energy conservation or efficiency initiatives for a 12-month period after implementation of the energy efficiency project. This section is applicable to all energy carriers and to both greenfield and brownfield projects. The objective is to encourage South African businesses to use energy more efficiently and to conserve energy. To access this incentive an accredited measurement and verification (M&V) professional body is required to monitor energy savings.

Further detail on both government and other funding opportunities can be found in the PSEE's *Guide to Energy Efficiency Funding in South Africa* at **http://www.nbi.org.za/focus-areas/environmental-sustainability/energy/private-sector-energy-efficiency-programme/.**



03

THIS SECTION DISCUSSES MANAGEMENT ACTIONS WITH LOW CAPITAL COST TO MANAGE YOUR BUSINESS'S ENERGY BILL.

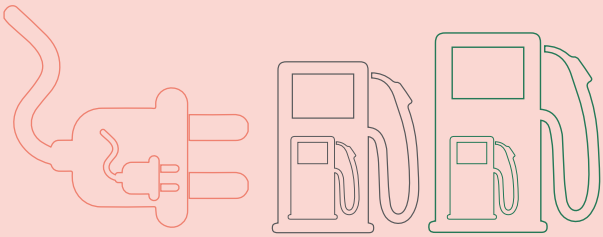
Business savings and resilience opportunities in energy efficiency

03

Business savings and resilience opportunities in energy efficiency

There are numerous opportunities for your business in managing your energy bill and implementing energy-efficient technology. In the first instance the majority of solutions are very low risk to business operations and later on you may consider other solutions that require innovative reviews of the way your products are produced. There are projects for varying risk appetites in all sectors, and the intention of this booklet is to help you identify, prioritise and implement the applicable opportunities for your business.

A clear benefit of energy efficiency will be increased competitiveness in your sector through lower operational costs. **In the last 10 years energy costs in South Africa have risen[3], as outlined here:**



ELECTRICITY[4] BY **317%**

DIESEL[5] BY **95%**

PETROL BY **106%**

[3] Coal and gas prices have also increased, but are subject to your individual business's contract terms and negotiations.
[4] Eskom Historical Average Prices and Increases.
[5] http://www.sapia.org.za/Portals/_default/AnnualReport2015/SAPIA_AR_2015_FA-spread.pdf.

Electricity costs are expected to continue increasing at levels above the consumer price index (CPI). Liquid fuel pricing and coal pricing are, however, market-related, supply-contract-related and often subject to changes in supply and demand. However, energy efficiency and renewable-energy self-generation can insulate your business from all of these price rises.

It is important to note that energy conservation and energy efficiency do not have to be cost-intensive. As an example, staff awareness and a clear programme to switch off energy-consuming equipment when not in use should be implemented in all businesses, and such an intervention is free (although challenging to maintain!). The magnitude of the savings on your bill could be as much as 30% simply by ensuring that everything is switched off when not in use.

FROM THE PSEE PROGRAMME DATA COLLECTED AT OVER 5 000 SOUTH AFRICAN COMPANIES, FIGURE 3 SHOWS THE AVERAGE SAVINGS, COSTS AND PAYBACK PERIOD FOR RECOMMENDATIONS TO REDUCE ENERGY COSTS THROUGH BEHAVIOURAL CHANGES.

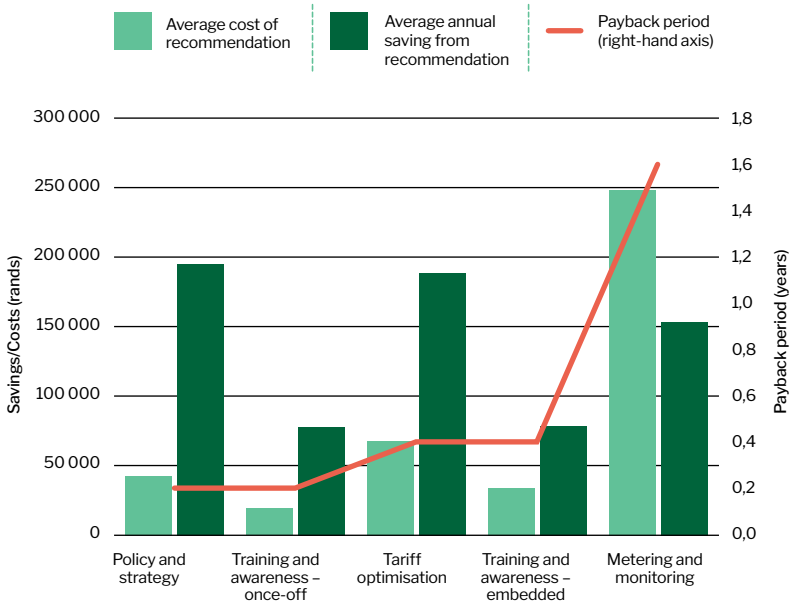


Figure 3: Average annual savings, costs and payback periods for behavioural change recommendations

All the behavioural change recommendations have a simple payback period of less than one year and are relatively low-cost options; only the installation of metering systems may require capital expenditure. However, with proper monitoring and review of metering data, this could be a method to reduce energy consumption out of business hours and other wasteful energy use. Tariff optimisation and implementing an energy policy and strategy will yield the highest potential savings.

FIGURE 3 COVERS FOUR TYPES OF RECOMMENDATIONS FOR EACH CATEGORY

POLICY AND STRATEGY
Recommendations relating to implementing a company energy policy with set targets to be achieved within a certain timeframe.

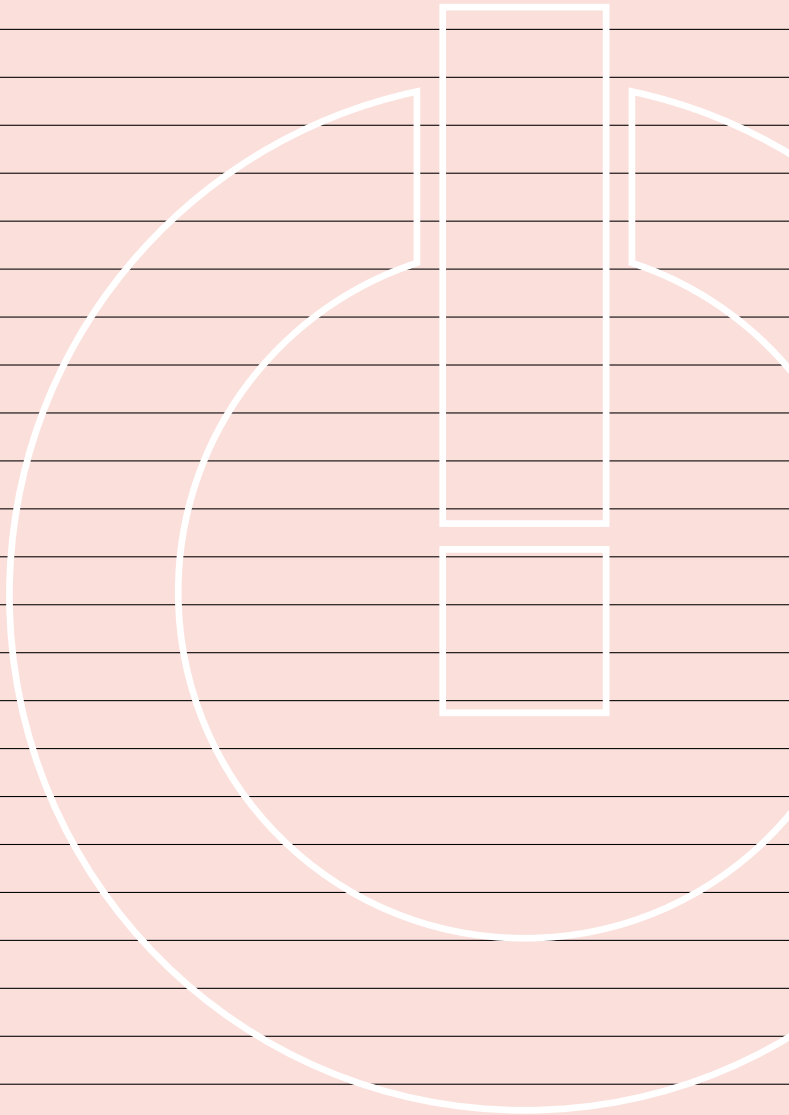
TRAINING AND AWARENESS
Recommendations relating to training of staff with regard to energy management, for example to switch off lights and other equipment when not needed. This training can be once-off or become integrated into existing regular meetings. Integrated training may be advisable for longer-term results depending on your business energy spend.

TARIFF OPTIMISATION
Recommendations relating to optimising the tariff plan to reduce energy costs. An example of these could be switching to a tariff plan that has lower costs during the key hours of operation.

METERING AND MONITORING
Recommendations relating to installing metering or monitoring systems to measure energy consumption accurately.

This illustrates the clear benefit that behavioural changes with limited input costs can have on the energy consumption of your business.

For information on creating an awareness campaign and how to increase the uptake of energy efficiency use the guide available at **http://www.nbi.org.za/focus-areas/environmental-sustainability/energy/private-sector-energy-efficiency-programme/.**




000327.5 KWH
.023 KW
SET TIME

04

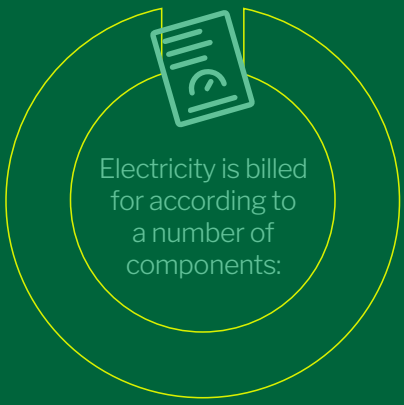
THIS SECTION DISCUSSES OPPORTUNITIES IN ELECTRICITY AND ENERGY BILL MANAGEMENT TO SAVE YOUR BUSINESS COSTS, EMISSIONS AND ENABLE EFFECTIVE CHOICES OF ENERGY SOURCES.

Understanding and managing your energy bill

04

Understanding and managing your energy bill

There are a number of business energy-saving tools to help you understand the way that your business pays for energy. Below are some simple tools to help you save energy spend, identify electricity tariffs that are optimal for your business's energy use and identify abnormal energy consumption and bills.



Electricity bills

Table 1: Components of your electricity bill explained

Component (unit)	Explanation	Analogy
Energy use (kWh)	This is the total amount of electricity that was used for the month. This will represent the sole component of residential bills and one of the major components of business electricity bills.	Electricity use could be compared to the volume of traffic moving along a highway.
Demand (kW)	This is the total amount of power that your energy utility needs to generate for your business. As your utility does not know when you will use the power, they constantly need to have capacity available to meet your demand for electricity. There is a cost to building power stations to have the capacity available, and thus businesses need to pay for the maximum demand that they use every month.	Demand is like the number of lanes on the highway – they may not always be fully used, but need to be available for peak times when they are needed.
Reactive energy (kVAr)	Electricity has a waveform, and certain equipment changes the pattern of the wave. This means that energy utilities need to generate more electricity, and this reactive energy is often charged for.	Reactive energy could be compared to the emergency lanes: traffic cannot flow through these lanes normally, but they are an essential part of the highway system.
Service charges (ZAR)	These are billed to recover administrative and office costs. There may also be environmental and other levies.	In the analogy these charges would be like your vehicle licence.

When you work through your electricity bills you should see these line item charges, and once you understand the billing you can start to manage your consumption and consequently your billing. Beyond this you should look at the different tariff options of your municipality or electricity utility. There are tariffs that focus on recovering most of the revenue from the demand component of consumption (kW), or from the kWh consumption and/or from the time of day that energy is used. As such, you should consider all of the options available to purchase electricity for your business. Switching electricity tariffs can often save large amounts of money for your business.

FURTHER, IT IS WORTH INSTALLING A METER ON THE MAIN INCOMER OF THE ELECTRICITY TO YOUR BUSINESS TO CONFIRM THAT YOU ARE BEING BILLED CORRECTLY. ELECTRICITY METERS, LIKE OTHER ELECTRONIC EQUIPMENT, CAN FAIL OR BE PARTLY OPERATIONAL; AND IN THIS CASE A CHECK METER CAN BE USED BY YOUR BUSINESS TO IDENTIFY ANY ERRORS. FURTHERMORE, ACCOUNTS DEPARTMENTS AND METER READERS MAY MAKE ERRORS, AND AS SUCH IT IS WORTH HAVING A WAY TO CHECK YOUR MONTHLY BILL.

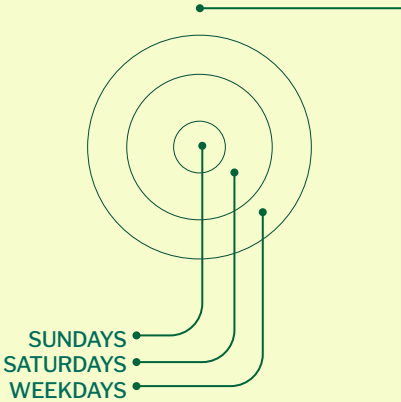
A short explanation of time-of-use tariffs may be required. The energy wheel in Figure 4 contains times for peak (red), standard (yellow) and off-peak (green) times. These times are structured according to when demand is highest on the national grid, and the cost per kWh charge is structured to try to manage and reduce consumption during peak times.

There may be some summer and winter variation in tariffs and times. The concept of the time-of-use tariff as applied in Figure 4 for weekdays (outer circle) is as follows:

The off-peak (green) rate for kWh consumption will be charged from 00:00 to 06:00, and from 22:00 to 00:00.

The higher, standard (yellow) rate for kWh consumption will be charged from 09:00 to 17:00, and from 19:00 to 22:00.

The peak and highest (red) rate will be charged from 06:00 to 09:00 and 17:00 to 19:00.



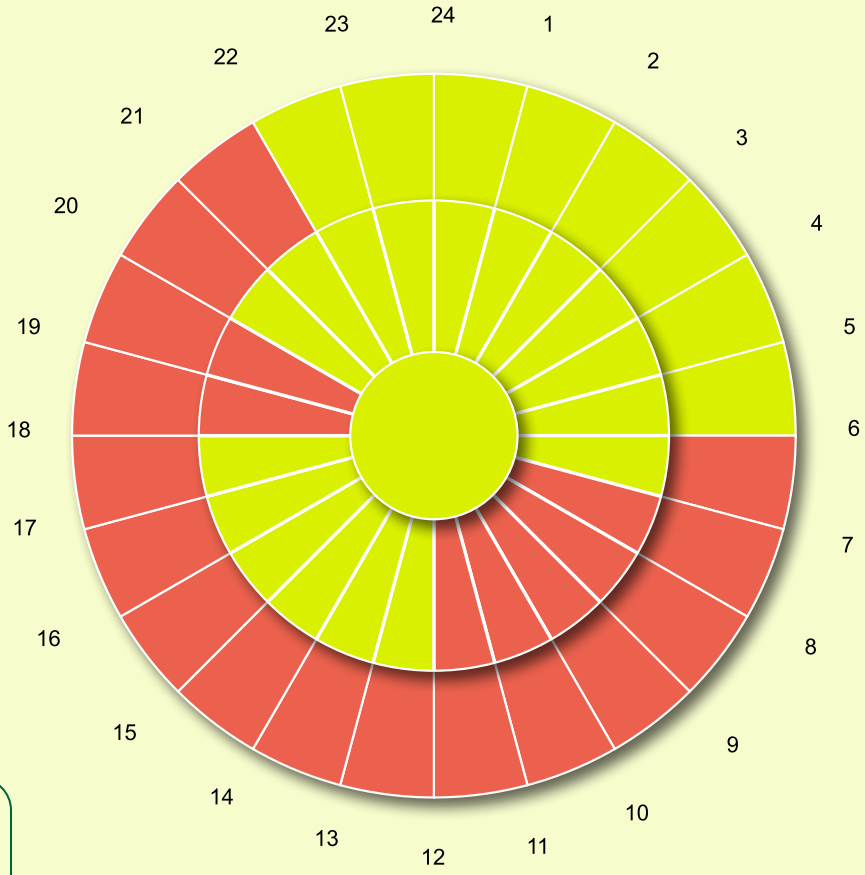


Figure 4: Time-of-use tariff wheel

Source: This energy wheel is from Eskom. You should use your own electricity provider's peak, standard and off-peak times when evaluating your tariff.

You can determine the rate for kWh consumption (R/kWh) moving clockwise around the circle and using the correct weekday, Saturday or Sunday circle.

Demand charges

Understanding how demand is charged for is also valuable when managing your electricity bill. The highest electricity demand in any 30-minute interval in the month is recorded as your maximum demand, and this is the amount for which you are billed.

Depending on your tariff structure:

you may just pay that highest demand for the month;

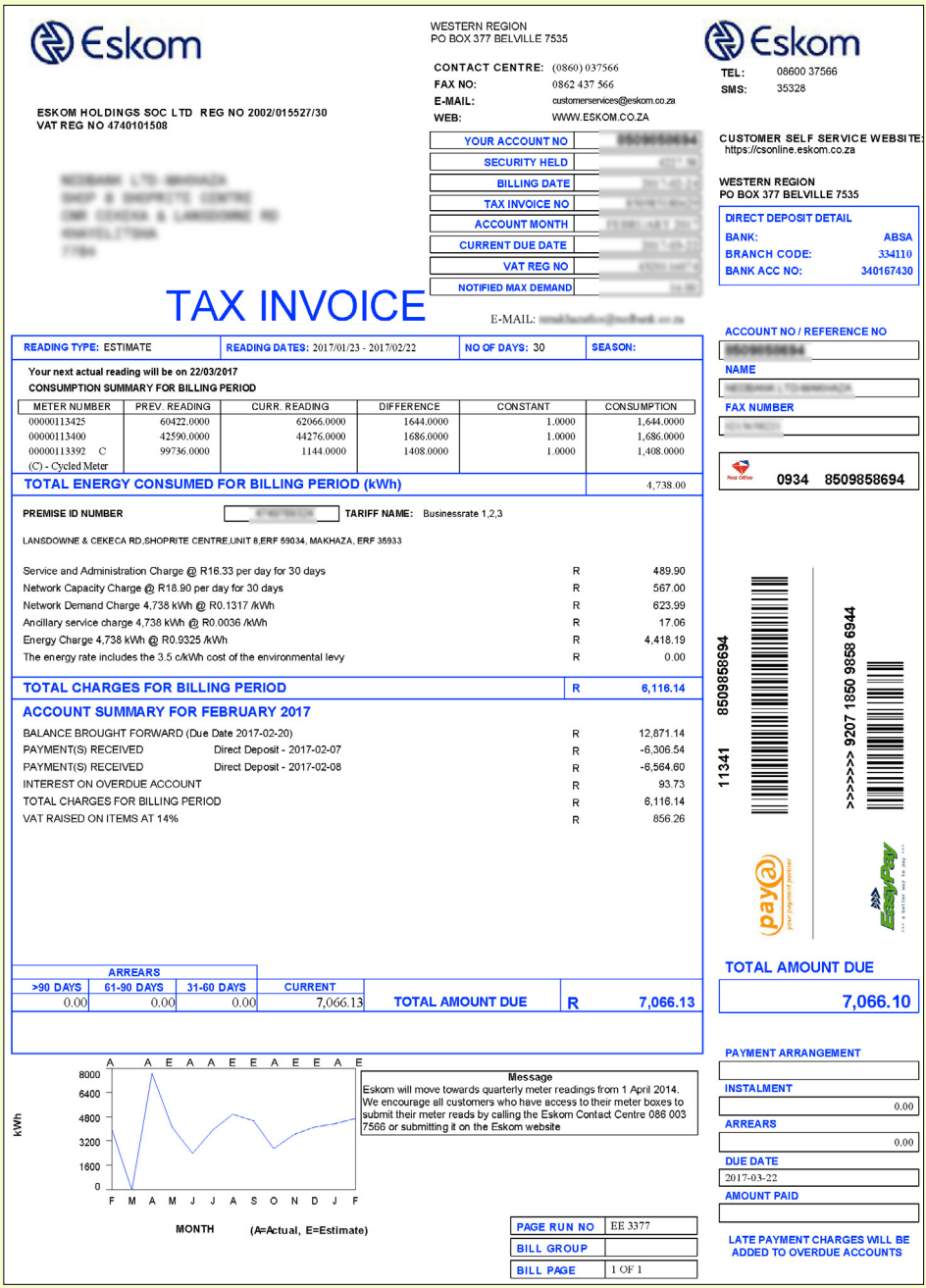
you may have to notify your utility in advance of your maximum demand;
and/or

your maximum demand may run in a rolling 12-month period, thereby extending charges for a momentary lapse in energy management if your demand spikes.

For the case where your business is required to notify the utility of your demand in advance, and if your notified demand is exceeded, there may be additional penalties to pay. If demand components form a financially substantial portion of your bill, you should take some time to familiarise yourself with how demand is charged on your tariff. You should be able to get a tariff booklet and explanation from your energy utility to assist with your research.

AN ENERGY BILL FROM ESKOM HAS BEEN INCLUDED IN FIGURE 5 WITH AN EXPLANATION OF THE COMPONENTS OF THE PARTICULAR TARIFF. YOUR BILL WILL LOOK DIFFERENT DEPENDING ON THE MUNICIPALITY OR UTILITY THAT SUPPLIES POWER TO YOU, BUT YOU SHOULD ENGAGE WITH YOUR ENERGY UTILITY TO HELP YOU UNDERSTAND YOUR BILL BETTER.

YOU WILL SEE ALL RELEVANT ACCOUNT DETAILS AT THE TOP OF THE BILL AND A MONTHLY PATTERN OF USAGE IN A GRAPH AT THE BOTTOM. THE BILLING AREA IS LARGER IN FIGURE 6.



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SMS: 35328

ESKOM HOLDINGS SOC LTD REG NO 2002/015527/30
VAT REG NO 4740101508

[redacted]

YOUR ACCOUNT NO [redacted]
SECURITY HELD [redacted]
BILLING DATE [redacted]
TAX INVOICE NO [redacted]
ACCOUNT MONTH [redacted]
CURRENT DUE DATE [redacted]
VAT REG NO [redacted]
NOTIFIED MAX DEMAND [redacted]

CUSTOMER SELF SERVICE WEBSITE:
https://csonline.eskom.co.za

WESTERN REGION
PO BOX 377 BELVILLE 7535

DIRECT DEPOSIT DETAIL
BANK: ABSA
BRANCH CODE: 334110
BANK ACC NO: 340167430

TAX INVOICE

E-MAIL: [redacted]

READING TYPE: ESTIMATE | READING DATES: 2017/01/23 - 2017/02/22 | NO OF DAYS: 30 | SEASON:

Your next actual reading will be on 22/03/2017

CONSUMPTION SUMMARY FOR BILLING PERIOD

METER NUMBER	PREV. READING	CURR. READING	DIFFERENCE	CONSTANT	CONSUMPTION
00000113425	60422.0000	62066.0000	1644.0000	1.0000	1,644.0000
00000113400	42590.0000	44276.0000	1686.0000	1.0000	1,686.0000
00000113392 C (C) - Cycled Meter	99736.0000	1144.0000	1408.0000	1.0000	1,408.0000

TOTAL ENERGY CONSUMED FOR BILLING PERIOD (kWh) 4,738.00

PREMISE ID NUMBER [redacted] TARIFF NAME: Businessrate 1,2,3

LANSDOWNE & CEKECA RD,SHOPRITE CENTRE,UNIT 8,ERF 59034, MAKHAZA, ERF 35933

Service and Administration Charge @ R16.33 per day for 30 days	R	489.90
Network Capacity Charge @ R18.90 per day for 30 days	R	567.00
Network Demand Charge 4,738 kWh @ R0.1317 /kWh	R	623.99
Ancillary service charge 4,738 kWh @ R0.0036 /kWh	R	17.06
Energy Charge 4,738 kWh @ R0.9325 /kWh	R	4,418.19
The energy rate includes the 3.5 c/kWh cost of the environmental levy	R	0.00
TOTAL CHARGES FOR BILLING PERIOD	**R**	**6,116.14**

ACCOUNT SUMMARY FOR FEBRUARY 2017

BALANCE BROUGHT FORWARD (Due Date 2017-02-20)		R	12,871.14
PAYMENT(S) RECEIVED	Direct Deposit - 2017-02-07	R	-6,306.54
PAYMENT(S) RECEIVED	Direct Deposit - 2017-02-08	R	-6,564.60
INTEREST ON OVERDUE ACCOUNT		R	93.73
TOTAL CHARGES FOR BILLING PERIOD		R	6,116.14
VAT RAISED ON ITEMS AT 14%		R	856.26

ARREARS					
>90 DAYS	61-90 DAYS	31-60 DAYS	CURRENT	TOTAL AMOUNT DUE	R 7,066.13
0.00	0.00	0.00	7,066.13		

ACCOUNT NO / REFERENCE NO [redacted]
NAME [redacted]
FAX NUMBER [redacted]

Post Office 0934 8509858694

11341 8509858694 >>>> 9207 1850 9858 6944

pay@ your payment partner

EasyPay

TOTAL AMOUNT DUE
7,066.10

PAYMENT ARRANGEMENT
INSTALMENT 0.00
ARREARS 0.00
DUE DATE 2017-03-22
AMOUNT PAID

LATE PAYMENT CHARGES WILL BE ADDED TO OVERDUE ACCOUNTS

Message
Eskom will move towards quarterly meter readings from 1 April 2014. We encourage all customers who have access to their meter boxes to submit their meter reads by calling the Eskom Contact Centre 086 003 7566 or submitting it on the Eskom website

PAGE RUN NO	EE 3377
BILL GROUP	
BILL PAGE	1 OF 1

Figure 5: Example of an Eskom bill for a business

READING TYPE: ESTIMATE	READING DATES: 2017/01/23 - 2017/02/22	NO OF DAYS: 30	SEASON:

Your next actual reading will be on 22/03/2017

CONSUMPTION SUMMARY FOR BILLING PERIOD

METER NUMBER	PREV. READING	CURR. READING	DIFFERENCE	CONSTANT	CONSUMPTION
00000113425	60422.0000	62066.0000	1644.0000	1.0000	1,644.0000
00000113400	42590.0000	44276.0000	1686.0000	1.0000	1,686.0000
00000113392 C (C) - Cycled Meter	99736.0000	1144.0000	1408.0000	1.0000	1,408.0000
TOTAL ENERGY CONSUMED FOR BILLING PERIOD (kWh)					4,738.00

PREMISE ID NUMBER [redacted] TARIFF NAME: Businessrate 1,2,3

LANSDOWNE & CEKECA RD,SHOPRITE CENTRE,UNIT 8,ERF 59034, MAKHAZA, ERF 35933

Service and Administration Charge @ R16.33 per day for 30 days	R	489.90
Network Capacity Charge @ R18.90 per day for 30 days	R	567.00
Network Demand Charge 4,738 kWh @ R0.1317 /kWh	R	623.99
Ancillary service charge 4,738 kWh @ R0.0036 /kWh	R	17.06
Energy Charge 4,738 kWh @ R0.9325 /kWh	R	4,418.19
The energy rate includes the 3.5 c/kWh cost of the environmental levy	R	0.00

Figure 6: Detail on billing

The energy use charges on this bill are energy charge and ancillary service charge.

- The ancillary service charge is a reliability charge that includes services, such as frequency control, voltage control, generation standby plant and generation of emergency reserves and black-start capability.

The demand changes on this bill are network capacity charge and network demand charge.

- The network capacity charge is the rand per kilovolt-ampere (R/kVA) fixed network charge raised to recover network costs. Depending on the tariff, your business may be charged on the annual utilised capacity or maximum export capacity. Maximum demand may be measured or your business may have to nominate a notified maximum demand if your utility does not measure demand. If your notified maximum demand is exceeded, your business may have to pay penalties.

There are no reactive energy charges on this bill.

The service charges on this bill are service and administration charge.

PLEASE ALSO NOTE THE ENVIRONMENTAL LEVY OF 3,5 c/kWh, INTRODUCED BECAUSE ELECTRICITY GENERATION IN SOUTH AFRICA IS PREDOMINANTLY COAL-FIRED AND DETRIMENTAL TO THE ENVIRONMENT. THIS AMOUNT IS A GOVERNMENT LEVY CHARGED ON ELECTRICITY PRODUCED BY NON-RENEWABLE GENERATORS OF ELECTRICITY.

Other energy sources – point-of-use costs

While electricity is the most commonly used energy source, many businesses – especially those with heating requirements – will use coal, natural gas, biomass, heavy fuel oil, petrol, diesel and/or other energy sources. Often heating equipment or boilers could use a number of different fuels, and as such, especially when buying new equipment, the fuel source, cost and efficiency of using the energy source should be considered. However, fuels are often sold in different units, eg per litre, per tonne or per m^3, which could make comparison of different energy sources and costs challenging. Thus, an outline guide to selecting fuels and working out comparative costs is below.

TO WORK OUT THE POINT-OF-USE ENERGY COST, USE THE FOLLOWING EQUATIONS:

IF YOU HAVE A CHOICE OF USING COAL, GAS, DIESEL, OR ELECTRICITY FOR A HEATING APPLICATION, DETERMINE THE HEATING EFFICIENCY OF EACH FUEL AND THE ENERGY CONTENT OF THE FUEL FROM YOUR SUPPLIER. THEN WORK OUT THE COST OF USING EACH FUEL IN THE SAME UNIT TO HELP MAKE THE DECISION.

Coal: $\frac{R1\,500}{tonne} \times \frac{kg}{25\,MJ} \times \frac{1\,tonne}{1\,000\,kg} \times \frac{1\,000\,MJ}{1\,GJ} = \frac{R60}{GJ} \times \frac{1}{0,3} = R200/GJ$

Gas: $\frac{R20}{kg} \times \frac{kg}{45\,MJ} \times \frac{1\,000\,MJ}{1\,GJ} = \frac{R444}{GJ} \times \frac{1}{0,75} = R593/GJ$

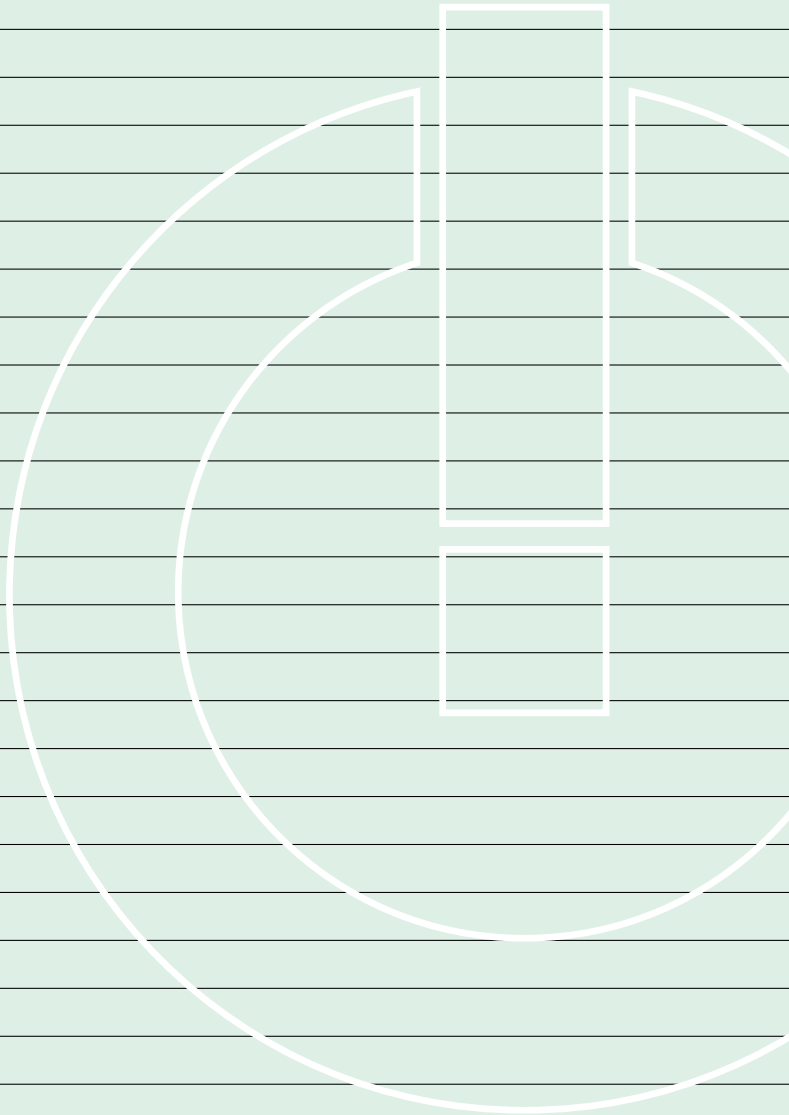
Diesel: $\frac{R15}{\ell} \times \frac{k\ell}{40\,GJ} \times \frac{1\,000\,\ell}{1\,k\ell} = \frac{R375}{GJ} \times \frac{1}{0,7} = R535/GJ$

Electricity: $\frac{R1,25}{kWh} \times \frac{kWh}{3,6\,MJ} \times \frac{1\,000\,MJ}{1\,GJ} = \frac{R347}{GJ} \times \frac{1}{0,9} = R386/GJ$

In this example we have used a 30% heating efficiency for coal, 75% for gas, 70% for diesel and 90% for electricity. The price costs are assumptions for illustration purposes only.

Therefore, in the example above, if energy cost were the only factor in the decision, it would be best to choose the equipment that uses coal. Other factors, such as gaseous emissions, particulates, spent-fuel handling and CO_2 emissions, should also be considered in your decisionmaking process. Further, there is a worldwide switch from coal to cleaner burning fuels, such as gas, to manage emissions and environmental impact.

However, as the purchase costs of the fuels are all in different units, without the conversion to point-of-use cost it is difficult to tell which is the best fuel to use.



05

THIS SECTION DISCUSSES RELEVANT MANAGEMENT PROCESSES YOU CAN IMPLEMENT TO IMPROVE ENERGY MANAGEMENT IN YOUR BUSINESS.

Focused energy savings – energy management systems

05

Focused energy savings – energy management systems

Due to rising energy costs worldwide, energy management and energy efficiency are growing in prominence. The leading standard for energy management is ISO 50001: Energy Management System. Implementation and certification should be considered for large businesses with significant energy use, eg those with energy costs greater than R5 million, but use of the principles of the standard can drive energy savings within businesses of all sizes.

What is an energy management system?

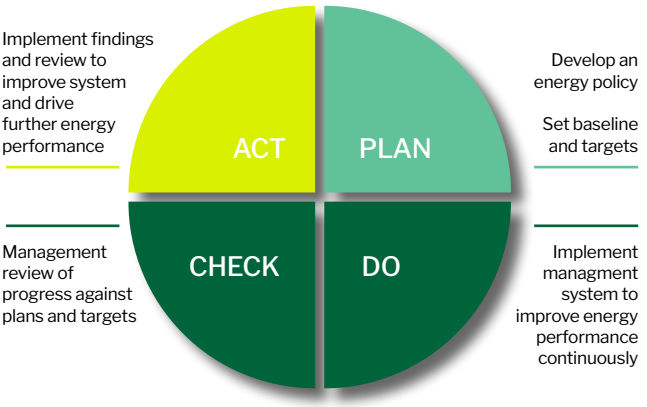
An energy management system is the process and tools used to monitor, control, and conserve energy in a building or company. It refers to all sources of energy (electricity, diesel, gas and so on) and helps to ensure operational energy costs are optimised or minimised by providing regular, accurate information on consumption to decisionmakers to enable appropriate action. Energy management is applicable to all types of companies, regardless of the size of the company. Smaller companies will not require complex metering or building management systems; however, a regular (eg monthly) evaluation of energy costs should be done to manage energy use proactively. More detail on energy management systems can be found at **http://www.nbi.org.za/focus-areas/environmental-sustainability/energy/private-sector-energy-efficiency-programme/.**

Following the approach of systems, such as ISO 50001, will allow your business to focus on areas that will deliver significant energy savings. It provides a structured approach to managing your overall energy consumption. According to the standard you should get top management buy-in for energy management projects – this is important as energy management might not always require investments, but changes will be required even to remind staff regularly to switch off anything not in use. Top management should then sign and support an energy policy that commits to continual improvement in energy performance, complies with legal requirements, sets clear targets and objectives for the organisation and promotes the consideration of energy in purchasing decisions. This policy must be communicated to all levels of the business and be reviewed and updated regularly.

A key component of ISO 50001 is energy review and planning; this will provide a picture of what energy your business currently consumes to set a baseline.

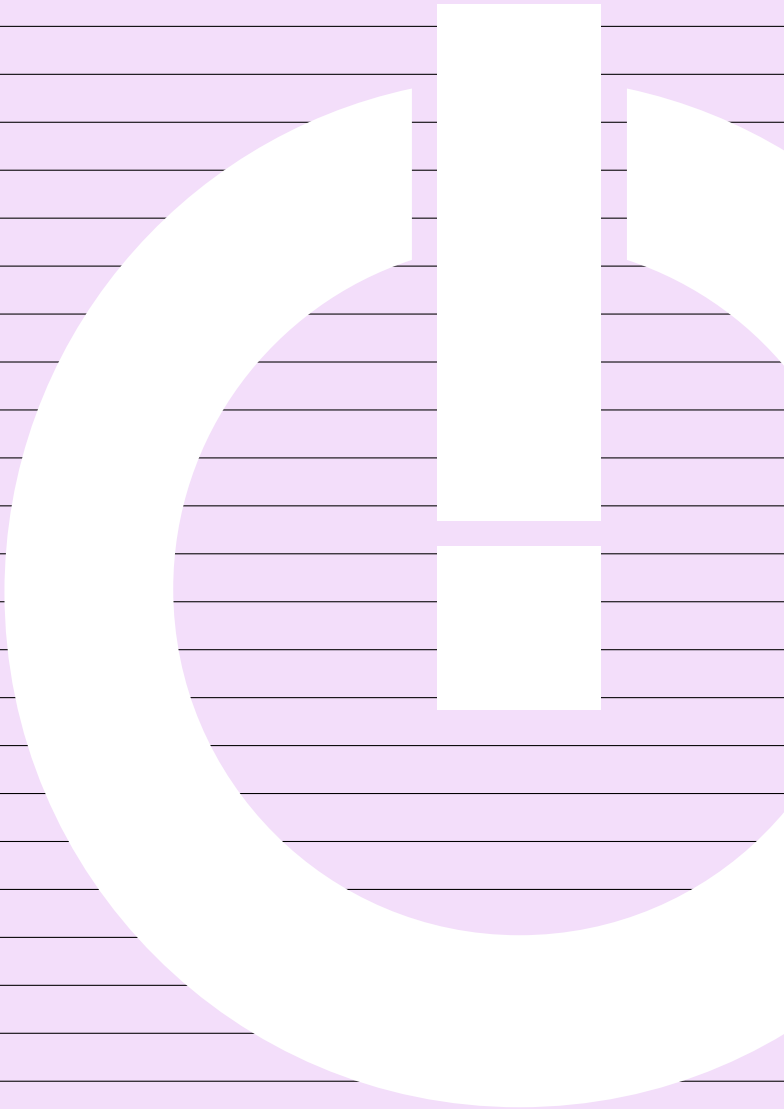
A baseline is usually a year's data on the full consumption of all energy forms that your business uses, and baselines are often set per energy form. Targets should be set against the baseline year. A useful tool in tracking energy performance can be the use of energy performance indicators (EnPIs). An EnPI is your energy consumption per unit of production, square metre or any appropriate indicator that is related to energy consumption in your business.

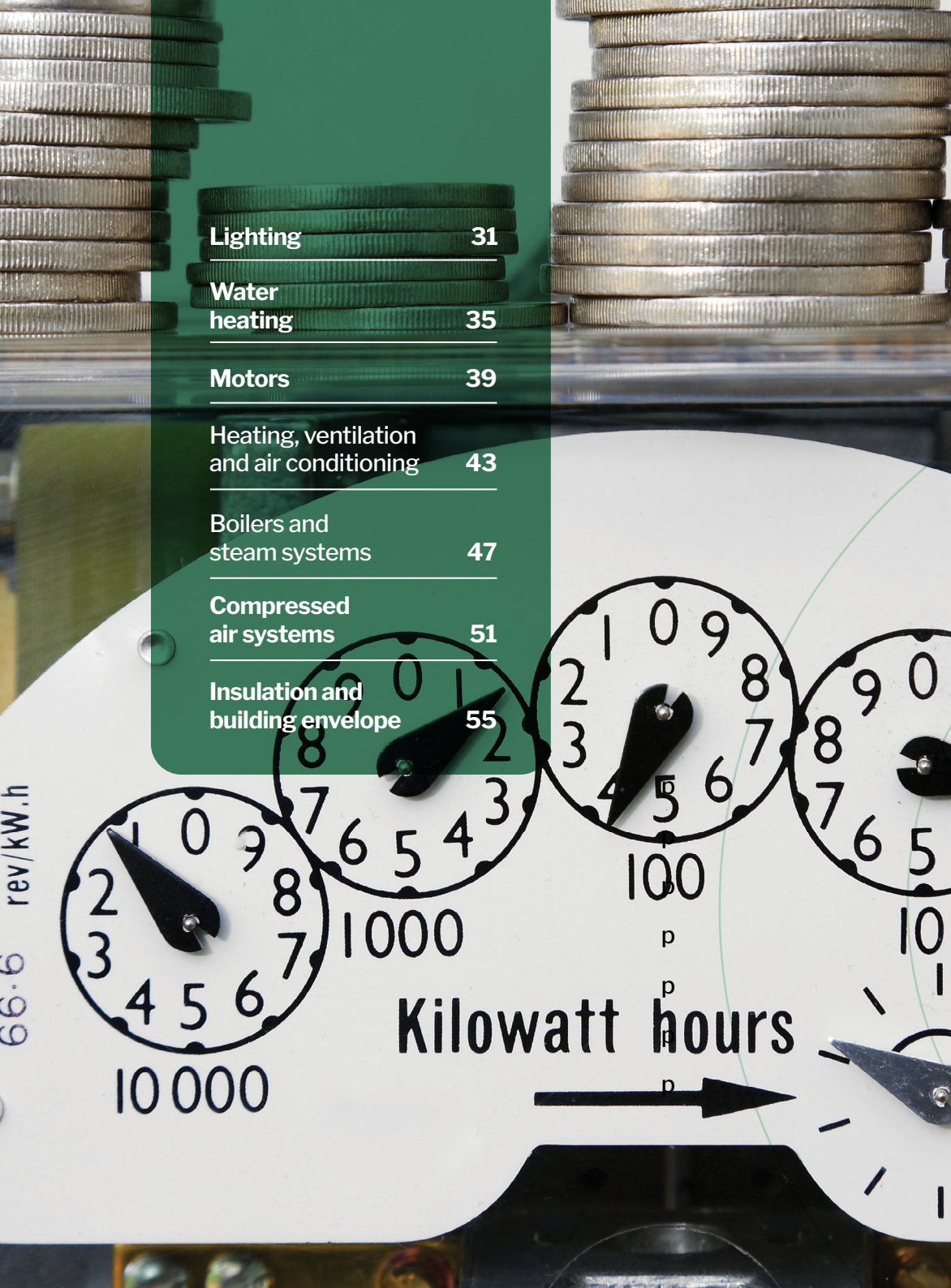
ISO 50001 also requires organisations to consider energy use in both the design of new products or services, and in the procurement of new products or services.



OTHER COMPONENTS OF THE MANAGEMENT SYSTEMS INCLUDE APPROPRIATE DOCUMENTATION AND PROCEDURES TO ENSURE THAT THE CYCLE OF PLAN, DO, CHECK, ACT CAN BE FOLLOWED. THIS IS HIGHLIGHTED IN FIGURE 7.

Figure 7: Plan, do, check, act cycle of ISO 50001





06

THIS SECTION INCLUDES INFORMATION ON HOW THESE TECHNOLOGIES WORK, WHAT ENERGY-EFFICIENT ALTERNATIVES EXIST AND/OR HOW TO OPERATE AND MAINTAIN EQUIPMENT TO ENSURE REDUCED ENERGY CONSUMPTION.

Prominent technologies and energy-efficient options

LIGHTING

Lighting is provided by the conversion of electrical energy into light, and often heat. Older incandescent bulbs provide light from a thin wire with high electrical current resistance that glows after becoming incredibly hot. A result of this is that most of the energy supplied to the light bulb is lost as heat energy, and less than 10% is converted into light.

Another lighting technology is fluorescent lights, such as the compact fluorescent light (CFL). The principle of this technology is to transfer electrical energy into the gas in the tube until ultraviolet light is radiated by the gas. This is then converted into visible light through the fluorescent coating on the glass tube. Fluorescent lighting can be five times more efficient than incandescent lighting and good-quality bulbs will last longer. Fluorescent lights have ballasts to regulate current and provide sufficient voltage to start the lights. An energy efficiency opportunity in fluorescent lighting is to change from older, higher power-consuming magnetic ballasts to electronic ballasts.

The lighting technology that is expected to grow the quickest in the next few years due to energy efficiency and long lifetimes is the LED. LEDs are light-emitting diodes that convert electrical energy directly into photons, instead of using thermal resistance or chemical fluorescence, etc. LEDs are up to 80% more efficient than incandescent lights.

LIGHT IS MEASURED IN LUMENS, AND THE AMOUNT OF LUMENS PER m^2 IS CALLED LUX. LIGHTING STANDARDS WILL SET OUT THE LUX LEVELS REQUIRED FOR SPECIFIC TASKS, AND YOUR BUSINESS MUST ENSURE THAT AT LEAST THIS LEVEL OF LIGHTING IS AVAILABLE FOR ALL EMPLOYEES.

OTHER IMPORTANT CONSIDERATIONS IN LIGHTING INCLUDE THE COLOUR OF THE LIGHT, AND HOW OTHER COLOURS APPEAR UNDER THE ARTIFICIAL LIGHTING.

Energy efficiency opportunities

If you have inefficient lights in your business, you should carefully consider replacing them with lights that will have the same lux output and the same lighting properties. Relevant occupational health and safety lighting regulations must be complied with, and businesses that work in industries that need true colours to be clearly visible, such as interior designers or car spray painters, should get professional lighting consultants for significant retrofits.

One of the most common lighting energy efficiency projects is the switch from older T12 lighting to newer T8 or T5 lights. These are all fluorescent lights and therefore have the same light quality, but the newer lights are more efficiently designed with electronic ballasts instead of magnetic ballasts. The lowest number is the most efficient and newest light, and the numbers refer to the diameter of the tube, which has become smaller with advancements in technology.

Lighting projects have a payback period of between 1,5 and 3 years depending on the extent of replacement required. Although lighting is the most noticeable and common element to change in any environment, it does not give the highest savings. Depending on your type of business, it could, however, be one of the lowest risk energy efficiency projects to implement successfully.

Table 2: Lighting good practice and bad practice

Lighting good practice	Lighting bad practice
Lights managed through good operating behaviour, motion sensors and/or automatic dimming.	Lights left on when not needed.
Using natural light and switching off/dimming artificial lights when natural light is sufficient.	Keeping blinds/curtains shut and only using artificial light.
Light switches for each area and effective control to ensure lights are not on when not needed.	Lights wired with few off switches so unnecessary lights need to remain on even when those areas are not in use.
Safe and compliant level of general illumination with task lighting for areas that require high light-levels.	Poor/Dim non-compliant general light, or high-light areas used throughout the business irrespective of task lighting needs.
Use of modern efficient lighting with low energy-use and high levels of control.	Old, inefficient lighting operated without appropriate controls.

FROM THE PSEE PROGRAMME DATA FIGURE 8 SHOWS THE AVERAGE SAVINGS, COSTS AND PAYBACK PERIOD FOR RECOMMENDATIONS TO IMPROVE LIGHTING SYSTEMS.

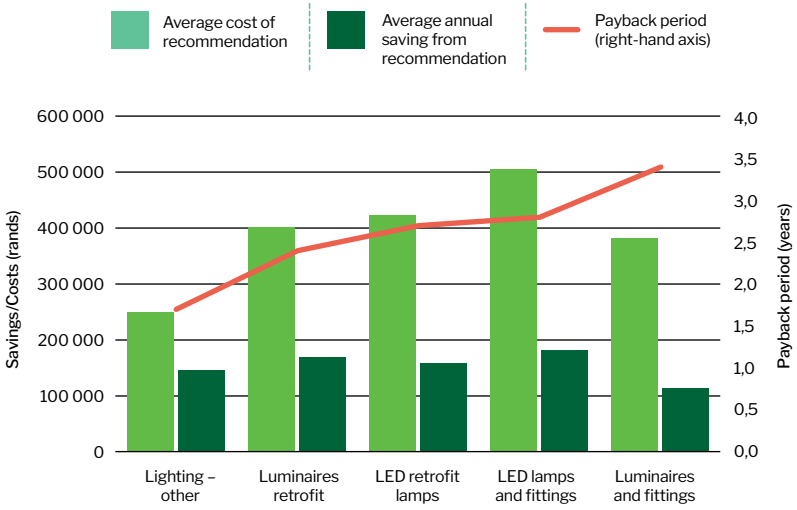


Figure 8: Lighting energy efficiency recommendations

TYPES OF RECOMMENDATIONS PER CATEGORY

LIGHTING – OTHER
Recommendations relating to switching off lighting and making more use of natural lighting, through installing skylights or polycarbonate sheets.

LUMINAIRES RETROFIT
Replacing the lighting system to optimise lighting from existing lighting.

LED RETROFIT LAMPS
Retrofitting an LED lamp into an existing light, which helps to distribute the light evenly.

LED LAMPS AND FITTING
Replacing the existing lighting with an LED lamp and a better designed light fixture.

LUMINAIRES AND FITTINGS
Replacing components of the lighting system to optimise existing lighting, as well as changing the fittings.
For fluorescent lighting, this would include replacing magnetic ballasts with electronic ballasts.

The PSEE lighting publication *Bright Ideas for Efficient Illumination* can be found at **http://www.nbi.org.za/focus-areas/environmental-sustainability/energy private-sector-energy-efficiency-programme/.**

WATER HEATING

Water heating in most household geysers, and in some commercial buildings, is still done with elements that use electrical resistance heating. Similar to the conversion to light, electricity is sent through a resistor that gets warm and transfers the heat to water.

Heat pumps are two to three times more efficient at water heating than electricity and work on the principle of transferring heat from one source to another through compressed gas that transfers heat to water. It is more efficient as more heating energy can be produced from the same amount of electrical energy due to the different technology.

Energy efficiency opportunities

Businesses should consider reducing the set point temperature of the thermostat that controls the water heater, as this will also control the heat losses; insulating the water heater if the water vessel feels warm; and installing timers to switch off the water heater when it is not needed.

Other retrofit opportunities could include solar water heaters and heat pumps.

Table 3: Water heating good practice and bad practice

Water heating good practice	Water heating bad practice
Water heated to temperature of use, in a well-insulated vessel with insulated pipework, and water is not heated when it is not required.	Water heated to a high temperature, in a metal vessel with no insulation, pipe runs have no insulation and water is heated year-round, irrespective of demand for warm water.
Where water heating is a large component of a company's energy consumption, for example hotels, a well-designed heat pump or solar water heating solution should be used to reduce energy consumption.	Large, electrical resistance element heating boilers, with high temperature set points and long uninsulated pipe runs.

FROM THE PSEE PROGRAMME DATA FIGURE 9 SHOWS THE AVERAGE SAVINGS, COSTS AND PAYBACK PERIOD FOR RECOMMENDATIONS TO IMPROVE WATER HEATING SYSTEMS.

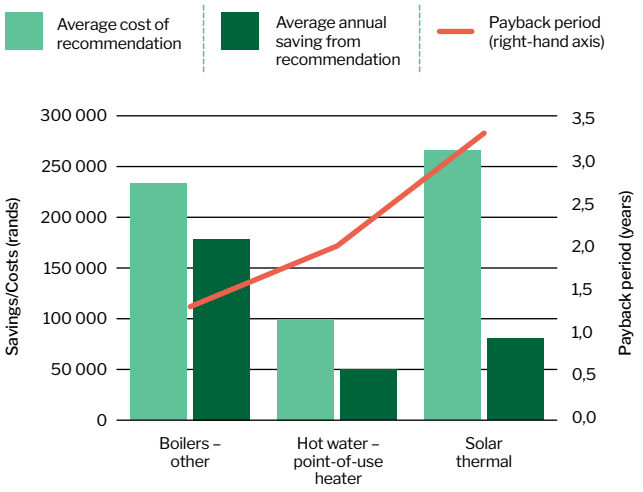


Figure 9: Water heating energy efficiency recommendations

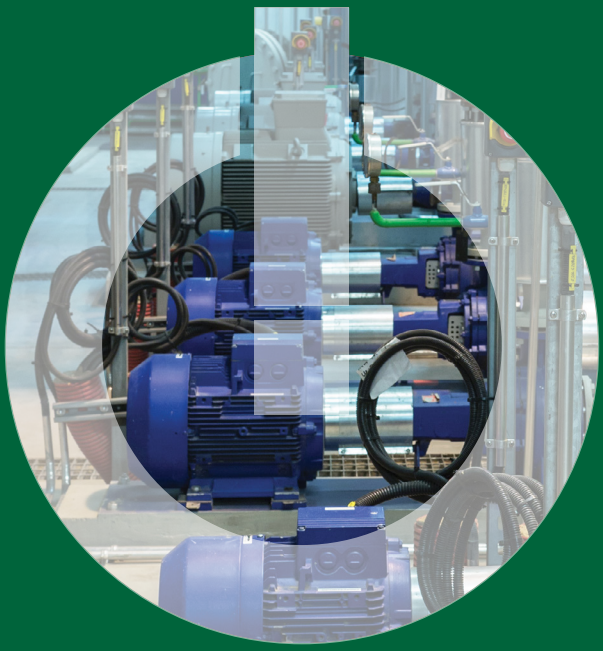
The highest savings in water heating systems are possible where boiler optimisation is not practised regularly. Solar thermal solutions have the highest simple payback period of over three years without a rebate, but over time with greater adoption in the South African market the costs will decrease and the efficiency of these systems will increase.

TYPES OF RECOMMENDATIONS PER CATEGORY

BOILERS – OTHER
Recommendations relating to optimising the performance of a boiler used for water heating or producing steam. These include better insulation, adjusting controls to optimise the fuel/air ratio and heat recovery from boiler blowdown.

HOT WATER – POINT-OF-USE HEATER
Recommendations relating to installing heat pumps and other localised heating systems, eg Kwikboil systems for kitchens.

SOLAR THERMAL
Recommendations relating to replacing an electric geyser for water heating with a solar water heating system. These are typically roof-mounted geysers with an evacuated tube design.



MOTORS

Motors convert electrical energy to rotational force that is used to drive equipment, such as pumps, stirrers and fans. Motors generate the rotational force by using the magnetic force that electricity produces in an outer coil to turn an inside coil that then drives the rotating shaft. The need to generate magnetic force to start the motor often means that motors have a high starting current, and phased starting of large motors should be implemented to manage energy-demand costs in business.

IMPORTANT ENERGY EFFICIENCY CONSIDERATIONS IN MOTORS INCLUDE RIGHT-SIZING THE MOTOR FOR THE APPLICATION. THIS IS ILLUSTRATED IN FIGURE 10.

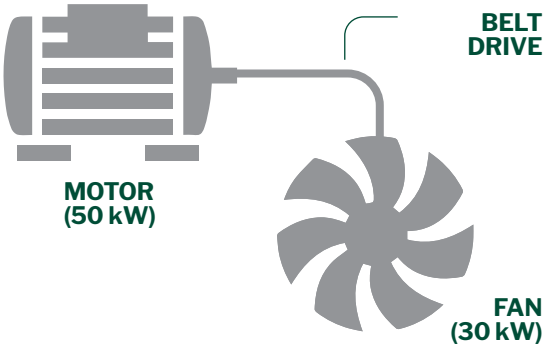


Figure 10: Motor connected to a fan showing mechanical loading and motor electrical nameplate capacity

In this illustration the nameplate capacity of the motor is 50 kW, but the mechanical load of the fan is only 30 kW. If the fan is highly efficient (90%), the electrical power use will be:

$$\frac{30\ \text{kW}}{0{,}9} = 33\ \text{kW}$$

However, if the fan belt is poorly maintained, or the fan blades are degraded, the electrical power use will be (efficiency = 60%):

$$\frac{30\ \text{kW}}{0{,}6} = 50\ \text{kW}$$

It is important to note that the motor will draw electrical current related to the mechanical loading (30 kW) not the nameplate capacity (50 kW).

The system efficiency of the fan and the belt should be taken into account and optimised, because efficiency differences in the equipment the motor is driving will have a significant impact on the power consumption of the motors, ie the difference between 50 kW and 33 kW for differing system efficiencies, as in the above example.

Energy efficiency opportunities

One of the most used energy efficiency applications with motors that service variable demand requirements, such as changing airflow or waterflow, is the installation of variable-speed drives (VSDs). VSDs alter the rotational speed of the motor to meet the required demand of airflow or waterflow, etc. As the power consumption is related to the mechanical power, reducing the speed of rotation reduces the electrical consumption.

Another energy efficiency advancement in motors is the development of high-efficiency motors that have lower internal losses. High-efficiency motors should be considered for large motors that run regularly.

While not part of the motor, the area of the most losses is generally in the transfer of the mechanical power through belt drives. All belts driving equipment should be appropriately tensioned as slippage or loose belts will be the highest contributor to low system efficiencies.

Table 4: Motor good practice and bad practice

Motor good practice	Motor bad practice
Motors are sized to correct mechanical power requirements.	Motors are oversized.
Motors are run only when required.	Motors are left running even when not needed.
Motor inventory is developed and motors are managed.	Management of motor inventory is not active.
High-efficiency motors and VSDs are used.	Older inefficient motors are used with no VSD control.
Maintenance and drives of motors are planned.	Maintenance of motors and drives are not planned.
High-efficiency motors are purchased when the business case demonstrates long-term energy savings pay off additional purchase cost.	Failed motors are always repaired and no business case for replacement is developed.
A systems approach is taken where the end equipment and drive are considered to determine motor efficiency.	The nameplate capacity of the motor is used to calculate the energy consumption of the motor, drive and end equipment power consumption.

FROM THE PSEE PROGRAMME DATA FIGURE 11 SHOWS THE AVERAGE SAVINGS, COSTS AND PAYBACK PERIOD FOR RECOMMENDATIONS TO IMPROVE MOTOR SYSTEMS.

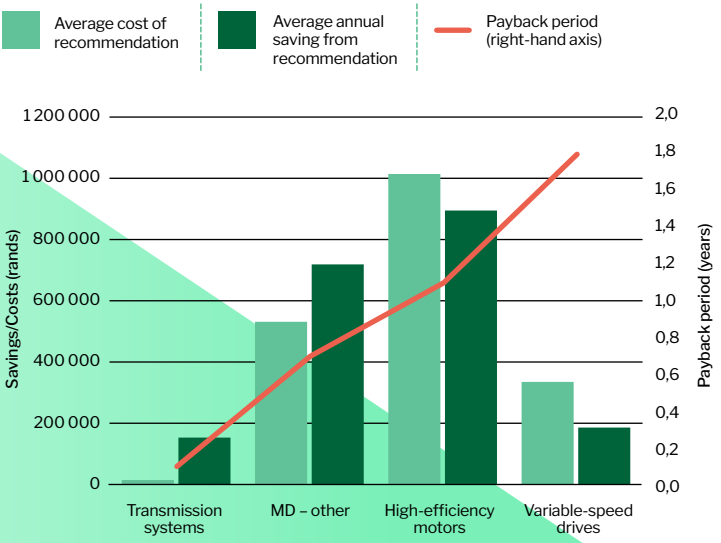


Figure 11: Motor energy efficiency recommendations

Replacing motors and drives can be an expensive option but the payback period is typically less than two years. The greatest savings potential comes from replacing motors with high-efficiency motors once they need to be rewound. At a minimum, your business should not rewind motors more than three times, as after this point the cost savings from reduced capital expenditure are outweighed by the energy inefficiencies introduced during rewinding. Your motor energy efficiency programme should always start with the largest motors in your business, as the management time spent optimising these motors will have the best payback.

TYPES OF RECOMMENDATIONS PER CATEGORY

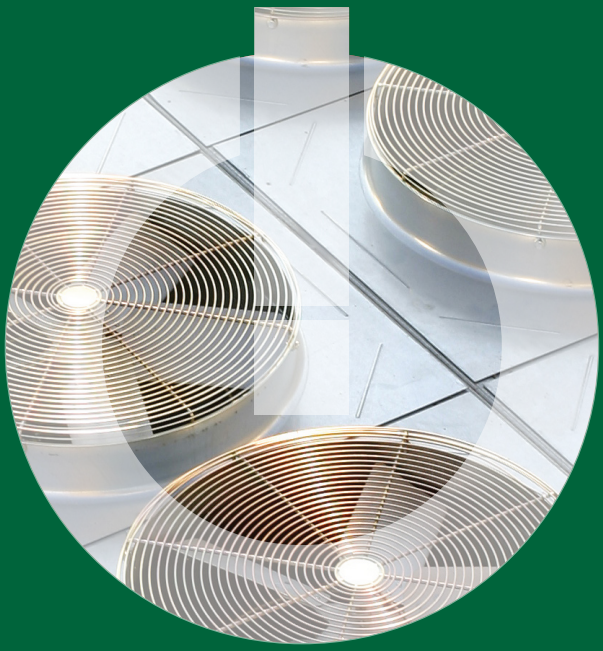
TRANSMISSION SYSTEMS
Recommendations relating to optimising conveying systems, such as proper maintenance and tensioning of v-belts, and use of better lubricating fluids.

HIGH-EFFICIENCY MOTORS
Recommendations relating to replacing existing motors that have reached end of life or require rewinding with higher-efficiency motors that consume less energy.

MD (MOTORS AND DRIVES) – OTHER
Recommendations relating to other equipment to reduce energy, such as power factor correction, voltage regulation and torque controllers on motors.

VARIABLE-SPEED DRIVES
Recommendations relating to installation of VSDs to adjust the speed of the motor or driven equipment (pump/compressor/fan/conveyor belt) based on the load/flow experienced in real time.

Further information on motors and drives can be found at **http://www.nbi.org.za/focus-areas/environmental-sustainability/energy/private-sector-energy-efficiency-programme/.**



HEATING, VENTILATION AND AIR CONDITIONING

Heating, ventilation and air conditioning (HVAC) systems remove heat from air and manage internal building temperature through heat removal or building heating. The heat removal is often done with a refrigerant gas, and sometimes through the evaporation of water. Large systems often have components that involve both. Further, with the distribution of air in ducting, there is sometimes electrical resistance heating to increase the temperature of building air when it is too cold to be comfortable. HVAC systems are designed to maintain building occupant comfort and manage fresh air intake.

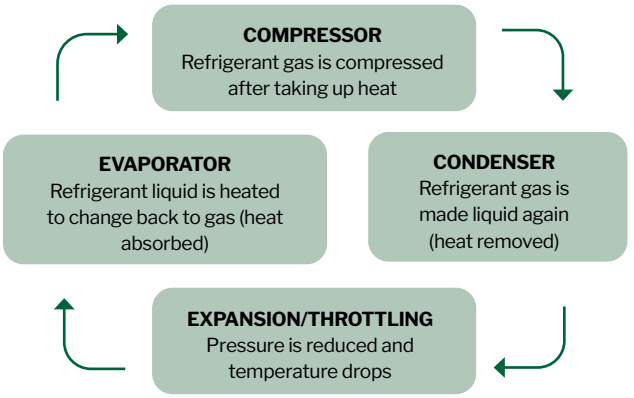


Figure 12: Refrigeration gas cooling cycle

Refrigerant cooling works as shown in Figure 12. You will see that the gas moves from liquid to gas state twice in the cycle, as the difference between the temperatures at each state is used for heat removal.

Common types of HVAC systems

CHILLERS, COOLING TOWERS, AND AIR HANDLING UNITS

This is a large system containing a number of components used to cool very large spaces. The chillers contain the refrigerant and transfer cooling to chilled water, the cooling towers help keep the chillers cool through heat removal, and the air handling units blow air over coils of the chilled water to cool air temperatures.

SPLIT UNIT AIR CONDITIONING

Split unit air conditioners have separate inside and outside components. The inside components are the evaporator, cooling coil and fan. The outside components are the compressor, condenser and expansion valve.

DIRECT EXPANSION AIR COOLING

In direct expansion cooling, air is cooled directly with heat transfer to the refrigerant gas and chilled water is not used.

VARIABLE REFRIGERANT VOLUME

This is often a more efficient type of HVAC system as the refrigerant required is varied according to the demand on the system by reducing the flow of refrigerant in the building. In variable refrigerant volume systems direct air heating is also used.

Energy efficiency opportunities

If your climate is suitable for free cooling/economy cycles, your building system can be set to take cold air from outside and circulate it into your building to reduce all electricity consumption needed in your HVAC system. This requires your air handling units or fresh air intake fans to have access to outside air. Other opportunities are in Table 5 overleaf.

Table 5: HVAC good practice and bad practice

HVAC good practice	HVAC bad practice
Switch it off when building is empty.	Automated scheduled, leading to running HVAC for an empty building.
Change set point temperatures for summer and winter to avoid extra cooling/heating.	The same set points are being used year-round.
Create multiple heating zones to allow flexibility in heating for occupant comfort.	Single heating zones wasting energy because unused spaces may be heated.
Allow variable speed control of motors driving chilled water pumps.	Chilled water pumps running fullspeed constantly irrespective of demand.
Control fan speeds in cooling towers, air intakes and air extraction with variable-speed drives.	Fans in cooling towers, air intakes and air extraction running constantly.
Ensure that condenser is well-ventilated and free of debris, and air intake areas are clear of other heat-producing equipment.	Condenser fins damaged and air intakes blocked or situated next to other equipment that rejects/ produces heat.
Avoid simultaneous heating and cooling.	Heating and cooling at the same time in close proximity.

FROM THE PSEE PROGRAMME DATA FIGURE 13 SHOWS THE AVERAGE SAVINGS, COSTS AND PAYBACK PERIOD FOR RECOMMENDATIONS TO IMPROVE HVAC SYSTEMS.

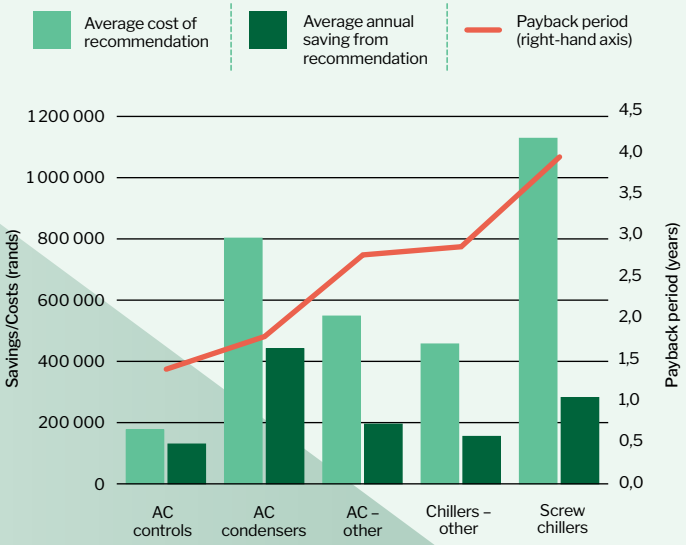


Figure 13: HVAC energy efficiency recommendations

Replacement of HVAC equipment (compressors/condensers) typically has a three- to four-year simple payback period, hence it is important to install efficient HVAC systems in new buildings and to optimise existing HVAC systems. Changing hours of operations or optimising controls have a short payback period and realise tangible savings.

TYPES OF RECOMMENDATIONS PER CATEGORY

AIR CONDITIONING (AC) CONTROLS: Recommendations relating to adjusting the controls of the system (changing temperature set point, installing occupancy sensors with a feedback loop so system operates when occupants in space only). Raising the set point by one degree will reduce the energy consumption by approximately 3%.

AC CONDENSERS: Recommendations relating to upgrading or replacing the condenser component of the HVAC system.

AC – OTHER: Recommendations relating to installing or optimising equipment in the HVAC system besides the chiller unit or condenser, eg changing refrigerant gas used (R22 gas is currently being phased out), installing air curtains or replacing split units with more energy-efficient systems.

CHILLERS – OTHER: Recommendations relating to upgrading or replacing the chiller component of the HVAC system. These also include changing the operating times when these chillers are switched on.

SCREW CHILLERS: Recommendations relating to upgrading or replacing screw chillers. These also include installing variable speed or frequency drives.

Important note: International agreement was recently reached on the phasing out of refrigerants such as R22 and other hydroflourocarbons (HFCs) due to the link between these gases and increased greenhouse gas effects. Timelines and targets for developed and developing countries are different, but over the long term an 80% or greater reduction in use of HFCs should be achieved by 2050.

Further information on heating, ventilation and air conditioning can be found at **http://www.nbi.org.za/focus-areas/environmental-sustainability/energy/private-sector-energy-efficiency-programme/.**

BOILERS AND STEAM SYSTEMS

Boilers provide steam that is usually used in heating and sometimes used to drive equipment.

Steam is used to heat materials/products in industrial processes as it contains large volumes of energy that can be controlled to remain at consistent temperatures. It therefore works well for food processing requirements, where consistent heating and temperatures are required for food safety.

Boilers have an energy source that could be coal, gas, liquid fuels, electricity and/or biomass. Energy is released through burning the energy source and transferring heat into water to generate steam. Boilers have tubes and outer shells, and the fire or water will be in one or the other. As a rule small boilers will have fire/hot air in the tubes and water in the outer shell, while large boilers on power stations or feeding turbines will have water in the tubes. The water is boiled and steam is generated at a specific temperature and pressure, as needed by the applicable process.

Table 6: Steam systems good practice and bad practice

Irrespective of whether the fuel source is coal, gas, oil, liquid fuels or wood, the combustion reaction that releases heat will be as follows:

$$C_xH_y + (x+\frac{y}{4})\,O_2 \longrightarrow xCO_2 + \frac{y}{2}H_2O$$

Note: x and y above will be determined by the fuel choice.

This reaction releases large quantities of heat, and the heat is transferred into water as a carrier of heat for the applicable processes.

An important note here is that CO_2 released through fossil fuel combustion contributes to the greenhouse effect and climate change. Energy efficiency reduces these emissions without changing processes and production, and thus should seriously be considered to mitigate climate change.

Energy efficiency opportunities

The majority of the energy loss in boilers is in the boiler stack. To burn any of the fuels mentioned above oxygen is needed for the chemical reaction. Air is, however, only around one-fifth oxygen and the balance is mostly nitrogen, which is an unreactive gas. Therefore, a lot of heat from the combustion escapes in the warm nitrogen-rich gas leaving the boiler. Thus, one of the most relevant energy efficiency opportunities for boilers is control of excess air. Excess air is needed to ensure that there is complete combustion of fuels, but it should be kept to levels below 5% excess volume to the oxygen required for combustion to avoid unnecessary energy losses. The exact volume required will be determined by our fuel of choice and the combustion reaction. Excess air can also be determined by stack gas testing to determine oxygen levels in the boiler stack gas.

Another important energy efficiency opportunity for boilers is to check for unburnt carbon in the fuel ash or fuel/ carbon monoxide in the stack. This will provide an indication of the combustion. Incomplete combustion means that fuel is being wasted; and could occur when the flow rate of fuel into the boiler is incorrect or not enough oxygen is present in the boiler for complete combustion.

Steam systems good practice	Steam systems bad practice
Regular checking of pipes, joins and steam traps for leaks, especially with the use of thermal cameras for health and safety.	System is not checked for leaks, operation of steam traps is not understood and water and steam is regularly lost to surroundings.
Insulation on all hot surfaces.	Tanks, pipework, valves and other system components open to surrounding air.
Dry insulation.	Wet insulation.
Burner services annually, or twice annually.	No services of burners.
Regular analysis of stack gases.	Boiler stack never checked for carbon monoxide, carbon dioxide or excess oxygen/air.
Condensate is recovered and used to heat incoming water.	No condensate recovery.
Stack economisers to recover waste heat from the combustion to preheat incoming water or air.	No waste heat recovery.

FROM THE PSEE PROGRAMME DATA FIGURE 14 SHOWS THE AVERAGE SAVINGS, COSTS AND PAYBACK PERIOD FOR RECOMMENDATIONS TO IMPROVE STEAM SYSTEMS.

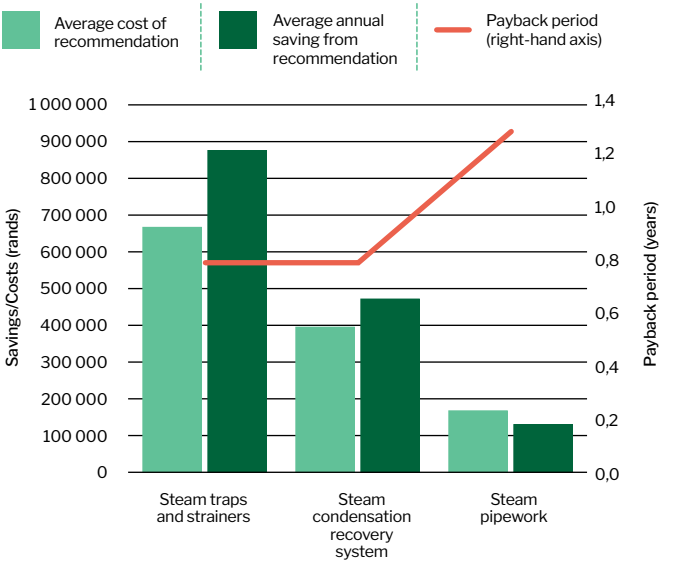


Figure 14: Steam systems energy efficiency recommendations

Improving energy efficiency of steam systems has a very short payback period. The highest potential savings are from proper, regular maintenance of steam traps and strainers to reduce losses.

TYPES OF RECOMMENDATIONS PER CATEGORY

STEAM TRAPS AND STRAINERS: Recommendations relating to proper maintenance and installation of steam traps to reduce steam losses in the system.

STEAM CONDENSATION RECOVERY: Recommendations relating to optimising or improving the condensate return to the boiler and reducing blowdown losses.

STEAM PIPEWORK: Recommendations relating to the maintenance of steam piping systems by insulating pipes and repairing steam leaks.

COMPRESSED AIR SYSTEMS

Compressed air is used to drive pneumatic systems and tools and in some specialist applications, such as plastic injection moulding or tyre manufacture.

It is a very expensive energy source, as 95% of the energy that goes into compressors leaves as heat, and only around 5% of the energy goes into the compressed air. Further, when compressed air is used it is often wasted as the perception is that it is just air. The true value of and energy spent on compressing air is not fully appreciated.

Energy efficiency opportunities

The main energy efficiency opportunity in compressed air systems is leak detection and management of appropriate use. If staff can be educated on the true cost of compressed air, misuse of air on the demand side could be reduced. A regular leak identification and repair programme should be started for all compressed air systems.

Depending on the type of compressor in your business VSDs can also be installed to improve energy consumption. If your business is a large user of compressed air, you should appoint a responsible consultant or contact the original equipment manufacturer for your compressor to determine if your machine is suitable for a VSD. An external expert should be consulted as installing VSDs on compressors can be more complex than doing so for pump or fan motors.

Table 7: Compressed air systems good practice and bad practice

Compressed air good practice	Compressed air bad practice
Regular leak detection and repair, resulting in the pressure drop across the distribution system being less than 0,2 bar from point of supply to point of use.	Additional compressor capacity is added to manage falling pressure with no leak repair or demand management.
Air filters of the correct size are well maintained and clean, with low air intake pressure drop.	Undersized or blocked air intake filters.
Compressors are well controlled and correctly sized for compressed air demand to prevent blowoff at the compressor.	Compressors operating in the range where they regularly blow off to manage overpressure.
Compressors are well controlled, with a VSD if appropriate, and do not cycle more than twice a minute.	Compressors cycle on and off load regularly.
Compressors are controlled to lead and lag compressor, especially when a VSD compressor can be used to manage fluctuating demand. In this case the lead compressor supplies baseload air and the lag compressor caters for variance in air demand.	Multiple compressors running with no control.
Compressed air network pressure is as close as possible to end point-of-use demand, or local compressed air boosters are installed for minimal equipment that needs higher pressures.	System running at high pressure for a few small users of compressed air.
Adequately sized compressed air receivers to separate demand from generation of compressed air.	No buffer in system capacity resulting in compressor cycling.
Compressed air ring main with hard pipe drops to all machines, and flexible hosing only used in final runs.	Sprawling distribution system with no ring main and extensive use of flexible tubing.

FROM THE PSEE PROGRAMME DATA FIGURE 15 SHOWS THE AVERAGE SAVINGS, COSTS AND PAYBACK PERIOD FOR RECOMMENDATIONS TO IMPROVE COMPRESSED AIR SYSTEMS.

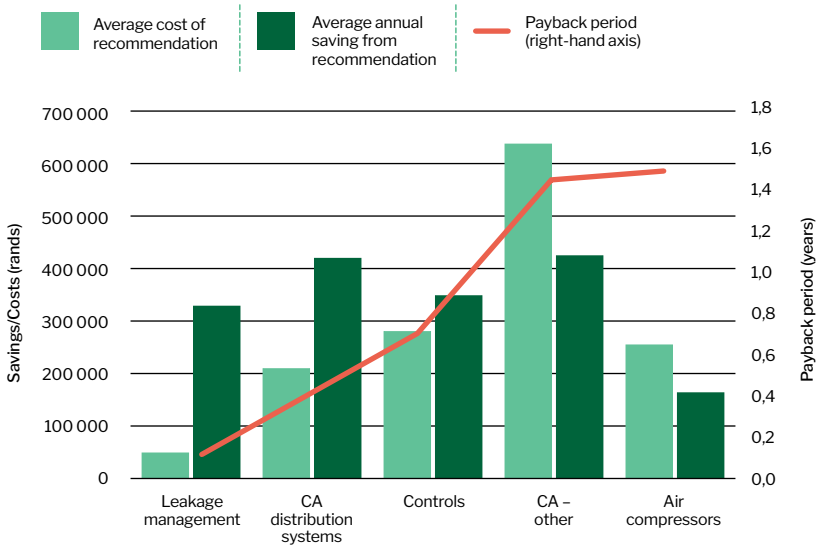


Figure 15: Compressed air energy efficiency recommendations

The quick win with improving compressed air systems is to repair leaks as soon as possible to reduce pressure losses in the system. Reviewing the piping design and distribution system can provide the highest potential savings through reducing friction losses. A more efficient and shorter distribution system also means less pipework to inspect and maintain, therefore reducing leaks.

TYPES OF RECOMMENDATIONS PER CATEGORY

LEAKAGE MANAGEMENT: Recommendations relating to fixing air leaks in the piping system. Typically leaks must be tagged when detected through regular maintenance checks and then repaired at the first available opportunity.

COMPRESSED AIR (CA) DISTRIBUTION SYSTEMS: Recommendations relating to evaluating and redesigning the piping configuration to minimise losses.

CONTROLS: Recommendations relating to installing better control systems to optimise compressor efficiency, for example better feedback loops to control operations.

CA – OTHER: Recommendations relating to optimising other areas of the compressor system, including better maintenance, installing VSDs and using vacuum blowers instead of compressed air for certain applications.

AIR COMPRESSORS: Recommendations relating to optimising the air compressor unit, either through resizing the unit or reducing the hours of operation to align with requirements.

Further information on compressed air energy-saving opportunities can be found at **http://www.nbi.org.za/focus-areas/environmental-sustainability/energy/private-sector-energy-efficiency-programme/.**

INSULATION AND BUILDING ENVELOPE

There are a number of energy efficiency opportunities in reducing heat loss and heat gain from buildings. Heat gain in the South African climate is more of a concern, but all insulation will improve heat loss and heat gain, while shading might reduce only heat gain to buildings.

When retrofitting or designing buildings for external shading the amount of time that the building is exposed to the sun should be considered, as per Figure 16.

EAST FAÇADE – morning sun, building still cool so little heat gain. **1**

ROOF AREA – commercial buildings are often well insulated due to structural support for mechanical plants. This, however, is a consideration for factories and roof sheeting as the sun shines directly on the roof for many hours. **2**

WEST FAÇADE – afternoon sun, building warm so large heat gain. **3**

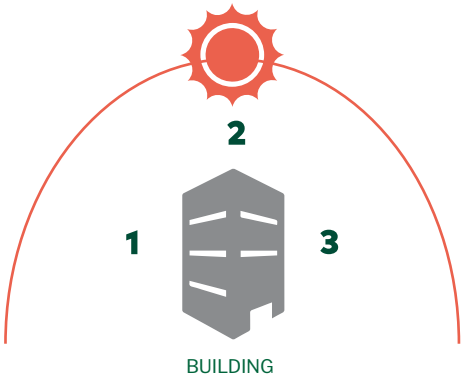


Figure 16: Solar heat gain through building envelopes

Energy efficiency opportunities

The main energy efficiency opportunity in building insulation and shading occurs in the design phase when choices can be made to reduce the amount of surface area of the building with poor insulation. For example, the amount of glass could be reduced, or double glazing considered for any glass that will be installed. Some companies have even opted for triple glazing as the savings from the HVAC system for a well-insulated building could justify upfront spend on a better building envelope.

The Green Building Council South Africa (GBCSA) also has a number of tools that can be used to improve the environmental performance of your building in design, construction and operations phases. The variety of tools and benchmarks available from the GBCSA can be accessed at **https://www.gbcsa.org.za/green-star-rating-tools/green-star-sa-rating-tools/.**

Tools to benchmark and compare your building's performance with other buildings in South Africa can also be found here.

Table 8: Insulation and building envelope good practice and bad practice

Insulation and building envelope good practice	Insulation and building envelope bad practice
External shading/internal blinds to minimise heat gain through windows.	Large single-glazed windows with no shading, insulation or blinds.
Consideration of heat transfer through building walls, especially with composite materials and using this to inform insulation material choice.	No insulation considerations in the building.

FROM THE PSEE PROGRAMME DATA FIGURE 17 SHOWS THE AVERAGE SAVINGS, COSTS AND PAYBACK PERIOD FOR RECOMMENDATIONS TO IMPROVE INSULATION.

Insulation is a relatively low-cost option to achieve energy savings. It can, however, have a high-payback period as, depending on the difference in temperatures between the insulated surface and the environment, the energy savings could be large or small.

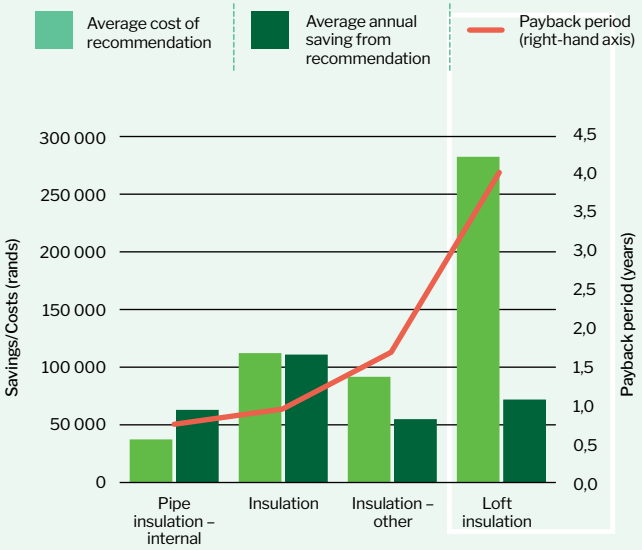


Figure 17: Insulation and building envelope energy efficiency recommendations

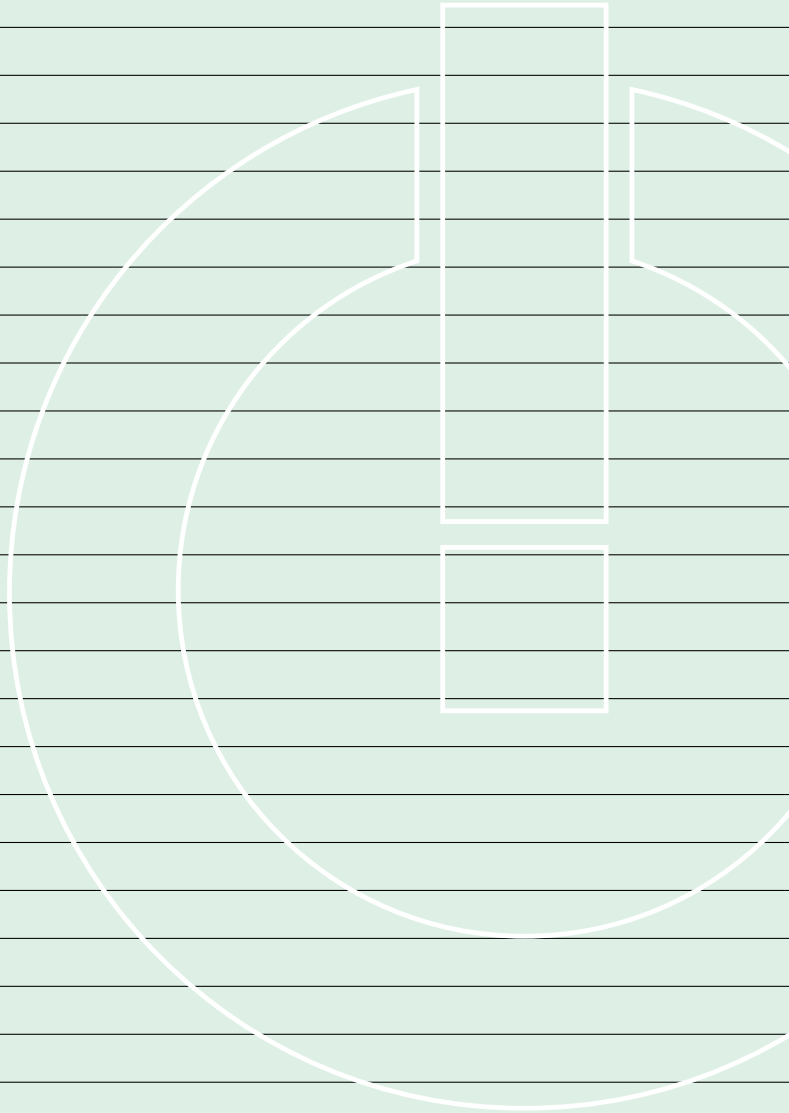
TYPES OF RECOMMENDATIONS PER CATEGORY

PIPE INSULATION – INTERNAL
Recommendations relating to insulating piping for chilled water systems, steam systems and hot-water systems.

INSULATION
Recommendations relating to insulation, such as geyser blankets in commercial buildings, as well as insulation for industrial equipment, such as injection moulding machines.

INSULATION – OTHER
Recommendations relating to other types of insulation, such as air curtains and repairing door seals in fridges and cold rooms.

LOFT INSULATION
Recommendations relating to installing insulation in the roof of buildings, such as typical polyurethane foam cladding.



07

Self-generation technologies

THIS SECTION DISCUSSES ONE OF THE FINAL ENERGY MANAGEMENT STEPS FOR A BUSINESS THAT HAS REDUCED WASTE, IMPLEMENTED ENERGY-EFFICIENT TECHNOLOGY AND NOW WANTS TO GENERATE ITS OWN POWER TO FURTHER REDUCE ITS ENERGY DEPENDENCY.

IT FOCUSES PREDOMINANTLY ON SOLAR PHOTOVOLTAIC (PV) AS THIS WAS THE MAIN TECHNOLOGY OPTION FOR SELF-GENERATION FROM THE PSEE PROGRAMME'S WORK FOR SMALL-TO-MEDIUM-SIZED BUSINESSES IN SOUTH AFRICA.

07

Self-generation technologies

Energy management and energy efficiency remain the best business case opportunities to reduce operating costs. However, after all projects have been implemented, the next opportunity for further reduction of energy costs is often generation of your own electricity. Please be mindful of the energy hierarchy before embarking on large renewable-energy investments that may be oversized for a demand that is higher than it needs to be with inefficient technology and practices.

In the past five years the technology for solar PV power has increased in capacity, availability and use in the South African market, and the prices have reduced substantially. Figure 18 shows the sharp increase in installed capacity from 2012 to date of rooftop solar PV installations. The cost of solar power is now well below R1/kWh, which is lower than many electricity tariffs. Below are some considerations for solar PV power. Other forms of self-generation are not discussed here, but it should be noted that companies with large boilers may be able to generate their own power withsteam turbines or backpressure turbines.

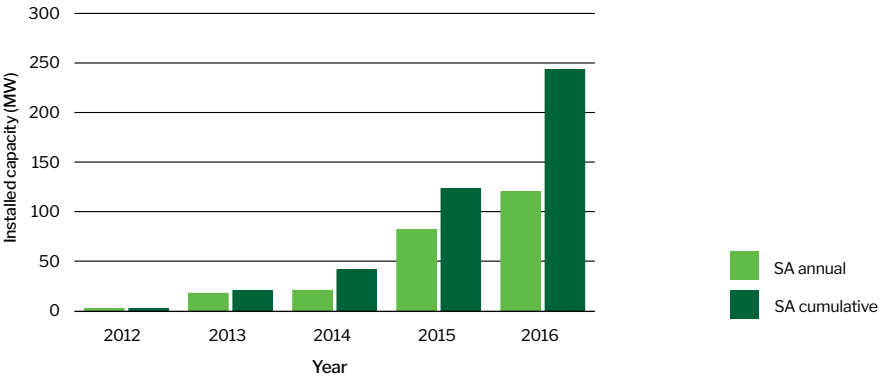


Figure 18: Growth in installed capacity of rooftop solar PV in South Africa

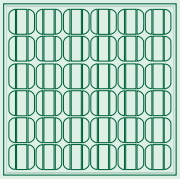
Sizing your PV system

As many municipalities in South Africa do not yet offer feed-in tariffs for any excess electricity generated, and as battery storage is currently expensive because battery technology is not yet produced in the same volume and favourable costing as solar panels, it is recommended that you size your solar PV system to be smaller than the demand of your business. This will mean that you will consume everything that you generate, and will not have excess power that cannot be used or stored.

Sizing your PV system smaller than or equal to your minimum daytime demand will add to an economical solution and more favourable business case. It should, however, be noted that municipalities are slowly including feed-in tariffs for self-generation, but these are seldom at a favourable rate. Thus it will be prudent for your solar PV system to be sized smaller than your lowest demand in daytime hours.

How your solar PV system generates power

Your PV system has the following components:



Solar panel – your system will consist of a number of solar panels, often called the solar array. The solar panel will convert energy from the sun into direct electrical current.

Cabling – your system will be connected with a number of electrical cables.

Inverter – (with or without display screen) this will convert the power from direct current to alternating current.

Other important equipment

PV panel support structures – roof clips/frame with ballast – ensures wind does not blow away panels, etc.

Lightning protection (especially for rooftop installations).

For grid-connected systems a grid tie inverter should be used that ensures the system can be completely isolated for safe maintenance onsite, and also on the power grid you are connected to.

Figure 19: PV system components and how they work

As electricity can be dangerous if not properly handled, you should get a quote for an external expert PV systems installer to construct, commission and then hand over operations, with clear training, to your business. In any proposals received from suppliers and installers, you should see solar panels, inverters, cables, support structures, lightning protection and a grid tie that prevents backfeed of electricity. In commercial building solar
PV installations it is often common to outsource the operations and maintenance to an external third party – often the company that delivered your PV system – with a clear guarantee on the power production to be issued by the solar PV company. **A further rule of thumb is to consider the following typical system component warranties:**

Solar panels: 25 years.
Inverters: five to seven years.
Balance of plant: over 25 years.

Your supplier should replace any of these components free of charge if they fail within the warranty period. Solar panels will also have a guarantee on their power production, and manufacture replacement can be requested if they are underperforming.

Your PV price should be between R15 and R25 per watt-peak (Wp). You can determine this number by dividing the total cost of the system by the installed capacity, or kWp.

To convert from kWp to Wp – multiply kWp x 1 000.

As a useful rule of thumb, the average kWh produced per day divided by the kWp of the system should not be greater than 6. If it is, then the business case may be overstated.

Table 9: Solar PV good practice and bad practice

Solar PV good practice	Solar PV bad practice
System sized for your business demand, with the potential use of battery storage if economically viable and a strong business case can be used.	Solar PV system bought with no consideration of your business's/sector's demand profile and energy charges.
Panels installed either north-facing, or in an east/west orientation to be decided by the best opportunity for power production for your business's energy requirements.	Layout and orientation not considered and the impact of the choice on power production and business case of the project not fully understood.
System well laid out to prevent shading on the panels and the subsequent reduction in power generation.	No shading considerations used in the layout of the plant.

FROM THE PSEE PROGRAMME DATA FIGURE 20 SHOWS THE AVERAGE SAVINGS, COSTS AND PAYBACK PERIOD FOR RECOMMENDATIONS FOR SELF-GENERATION.

Solar PV still has a relatively long payback period of greater than six years. However, prices are coming down and the efficiency of these systems is increasing. The PSEE Programme also identified a small number of hydropower opportunities in the agriculture sector.

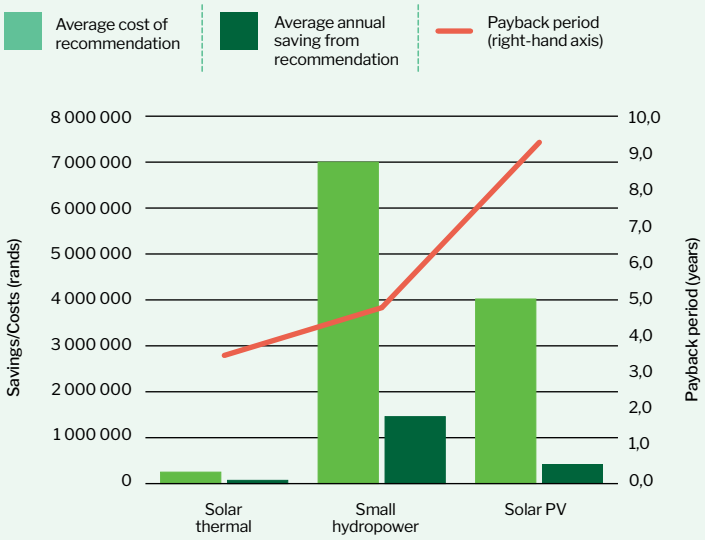


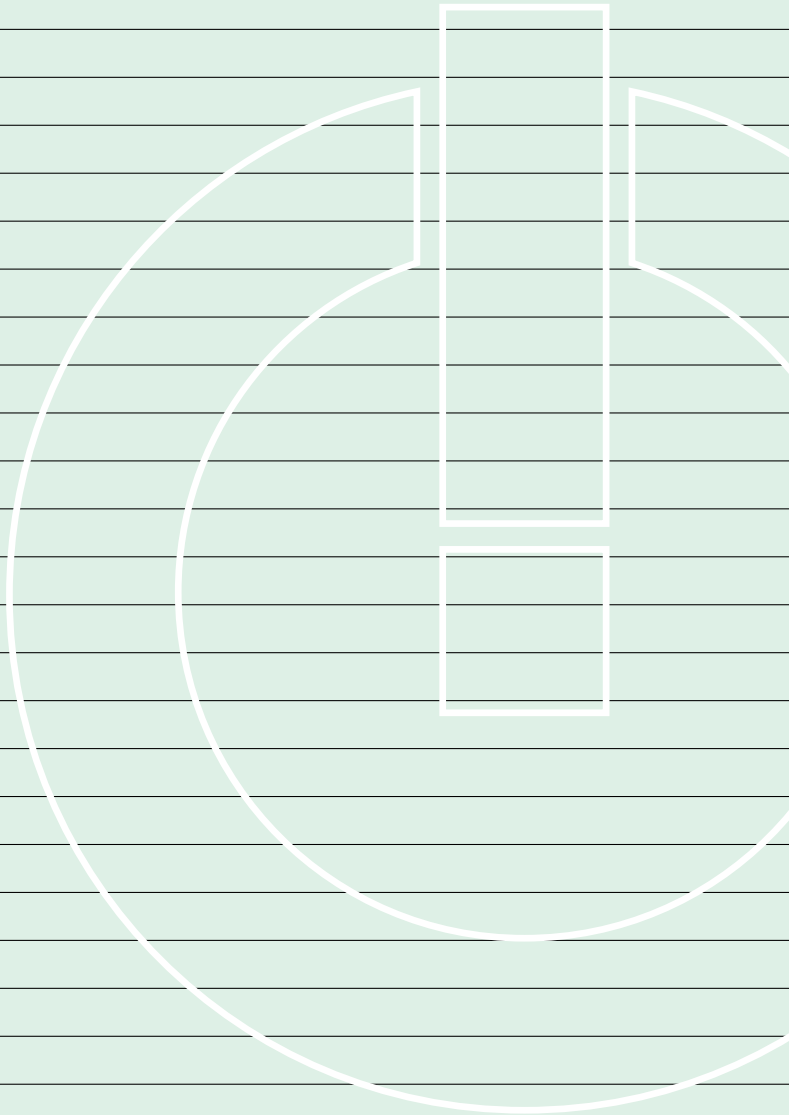
Figure 20: Self-generation recommendations

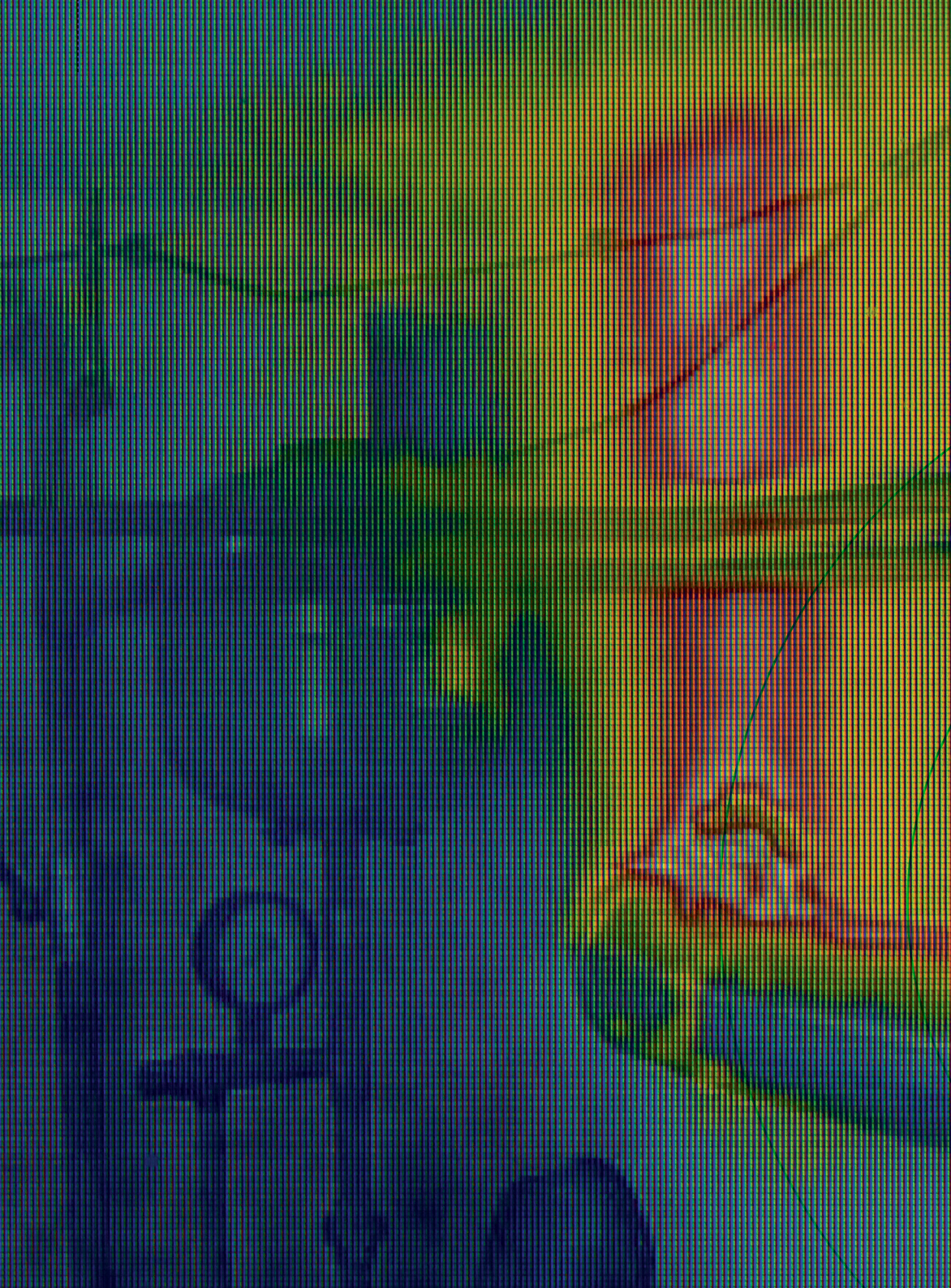
TYPES OF RECOMMENDATIONS PER CATEGORY

SOLAR THERMAL: Recommendations relating to replacing an electric geyser for water heating with a solar water heating system. These are typically roof-mounted geysers with an evacuated tube design.

SMALL HYDROPOWER: Recommendations relating to installing a small hydropower system to make use of an existing water source to power a specific process.

SOLAR PV: Recommendations relating to installing a solar PV system to reduce or eliminate reliance on the electricity grid.





08

THIS SECTION DISCUSSES HOW ENERGY SAVINGS FROM REDUCED WASTAGE, ENERGY EFFICIENCY OR SELF-GENERATION SHOULD BE MEASURED AND VERIFIED.

Measurement and verification of savings

08

Measurement and verification of savings

It is important to track the energy savings delivered through energy-efficient technology implemented by your business, and that a predefined process exists to achieve this objective.

BENEFITS OF TRACKING SAVINGS

Better management of suppliers of technology.

Information for future decisionmaking.

Management of degradation of savings over lifetime of technology (this could also be effectively combined with your business's regular maintenance programme to save further energy and costs).

Clear information for planning and execution of new energy efficiency and energy-saving projects.

Your measurement and verification (M&V) plan should be appropriate for the size of the project that your business is undertaking. One of the key areas of consideration is the amount of energy savings of your project. Before implementation of a project you should be clear on the energy savings that will be generated and consequently the potential savings on your monthly bill. This will tell you whether you will be able to see the savings on your bill clearly. Consultants may refer to this as 'signal versus noise'. What this means is that the effect of your project, ie the signal, will be clearly distinguishable from the day-to-day (or month-to-month) variances on your energy bill, ie the noise.

Key principles of M&V include:

1 Study to determine the scope of the energy efficiency project.

2 Develop an M&V plan.

3 Set an appropriate baseline for your project.

4 Assess post-project implementation.

5 Measure savings against your baseline/ assessment of project performance.

6 Determine energy and cost savings on an ongoing basis with monthly/quarterly/ annual reporting.

These steps should be implemented to measure the change in energy consumption through energy efficiency. You will see that the difference in energy consumption from the baseline to the project implementation may be difficult to measure due to regular changes in monthly energy consumption. This is one of the factors that show the importance of M&V.

The steps discussed above are reflected on below in further detail:

1 Project scoping – the proposed energy efficiency project should be understood in detail. The savings from the different energy sources should be estimated, and a minimum of 12 months of all energy bills for your business should be collected.

2 M&V plan – an upfront plan on how the savings from the energy-reducing project will be measured going forward.

3 Baseline – an appropriate baseline should be set that may take factors into account that influence or drive your business energy consumption.

4 Implementation assessment – once the project is implemented, there should be an onsite assessment to determine that the project was implemented as planned, and the M&V plan can be followed to determine project savings.

5 Savings measurement – measurement of savings from the project implementation on an ongoing basis.

6 Savings reporting – regular reporting, especially to company management, at appropriate time intervals on the savings from the implementation of the energy efficiency project.

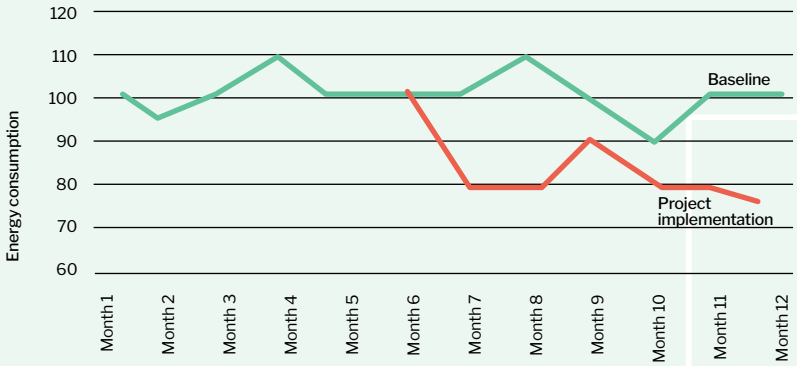


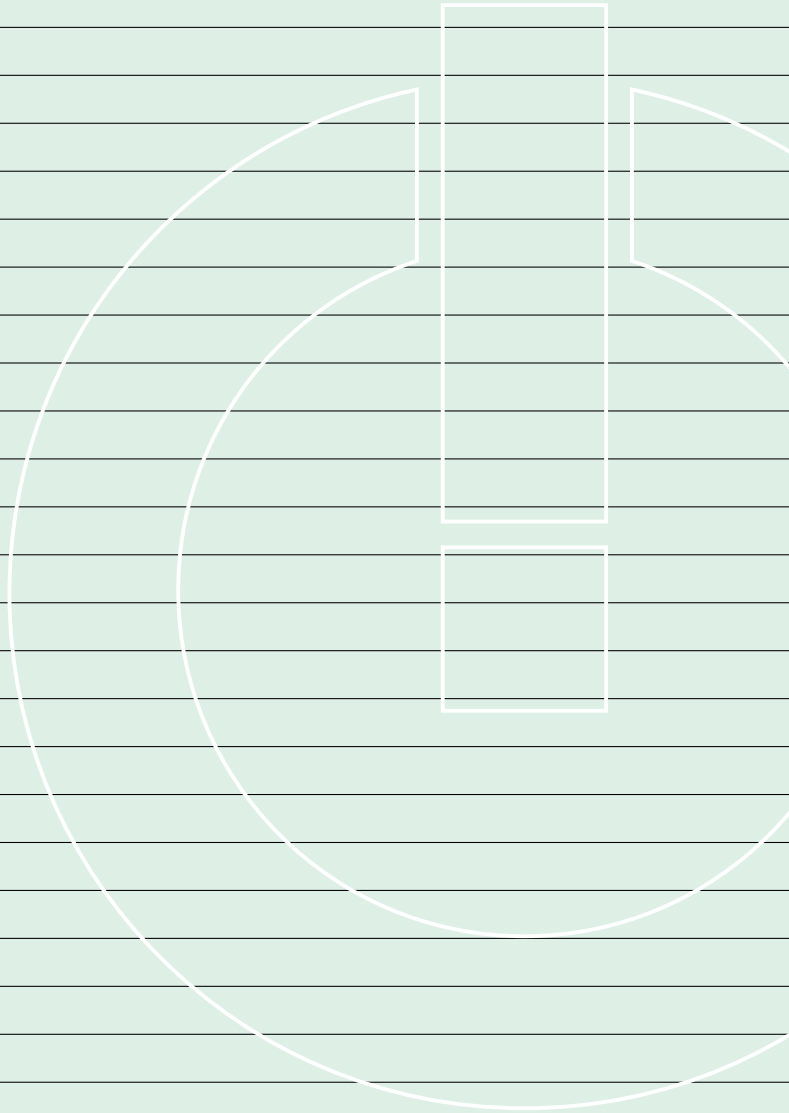
Figure 21: Reduction in energy consumption from energy efficiency

M&V is one of the areas of energy management that uses a number of abbreviations. To assist your business in working through M&V plans we have included a short list below.

Table 10: Measurement and verification abbreviation definitions

Abbreviation	Definition
CMVP	Certified measurement and verification professional
ECM	Energy conservation measure
EEM	Energy efficiency measure
IPMVP	International performance measurement and verification protocol *This is a protocol for good M&V practice. Many protocols exist, but this is the most widely used.*
M&V	Measurement and verification
SANS 50 010	South African National Standard for the measurement and verification of energy savings *This is the South African standard based on the international standard for verification of energy savings.*

Important closing note: Should you implement a section 12L energy efficiency project for your business, you will need to run a full M&V process to verify the savings.



09

THIS SECTION DISCUSSES THE FULL PSEE DATABASE OF ENERGY MANAGEMENT OPPORTUNITIES FROM OVER 5 000 SOUTH AFRICAN COMPANIES.

Lessons from the PSEE experience and database

09

Lessons from the PSEE experience and database

Within a relatively short period of two years the PSEE Programme supported 37 large companies across a variety of sectors in developing comprehensive strategic energy management plans, conducted almost 1 000 energy site surveys at medium-sized companies to identify energy-saving opportunities and their potential costs and savings, and assisted almost 4 000 small businesses through telephonic services, web-based tools and free training workshops.

The programme successfully identified over 7 000 opportunities with a potential lifetime energy savings of 24 567 GWh, of which approximately 11,6% (2 854 GWh) have been verified as implemented at the end of the programme in November 2015. The implemented savings would be approximately equivalent to reducing demand by 60 MW (1,2% of South Africa's installed generation capacity).

In terms of savings opportunities 60% of the total savings identified stemmed from management actions, heating opportunities, installing renewables (mainly solar PV) and high-efficiency motors.

Management actions alone accounted for approximately 20% of the identified savings. These management actions included aspects such as having an energy policy and targets, encouraging staff to switch off equipment that is not in use and having better reporting and measurement systems for energy consumption.

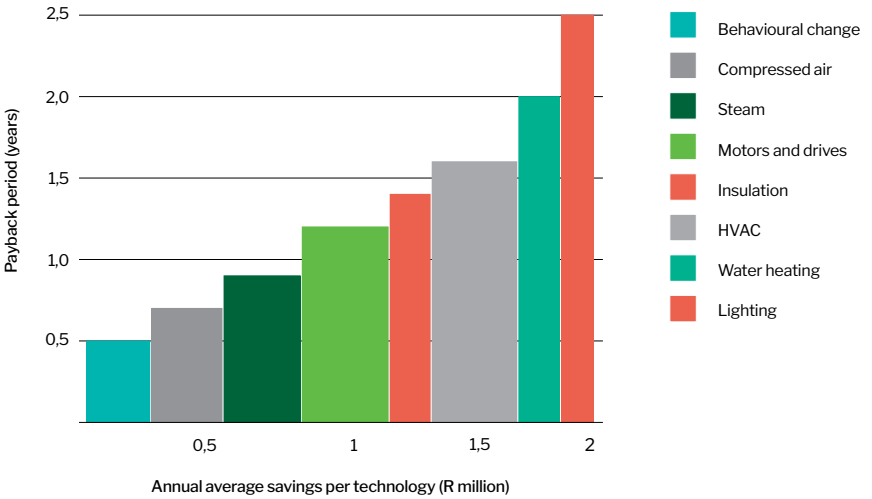


Figure 22: Energy savings, implementation costs and payback periods segmented by technology group from the PSEE Programme

FIGURE 22 PROVIDES AN OVERVIEW OF THE AVERAGE SAVINGS AND PAYBACK PERIODS FOR THE MAIN TECHNOLOGY OPPORTUNITIES CONSIDERED IN THIS GUIDE.

Based on this data the quick wins that a business should prioritise are behavioural changes, then optimising their compressed air system and steam system. The average payback across all opportunities is approximately two years, indicating that energy efficiency is the most effective means to reduce energy costs.

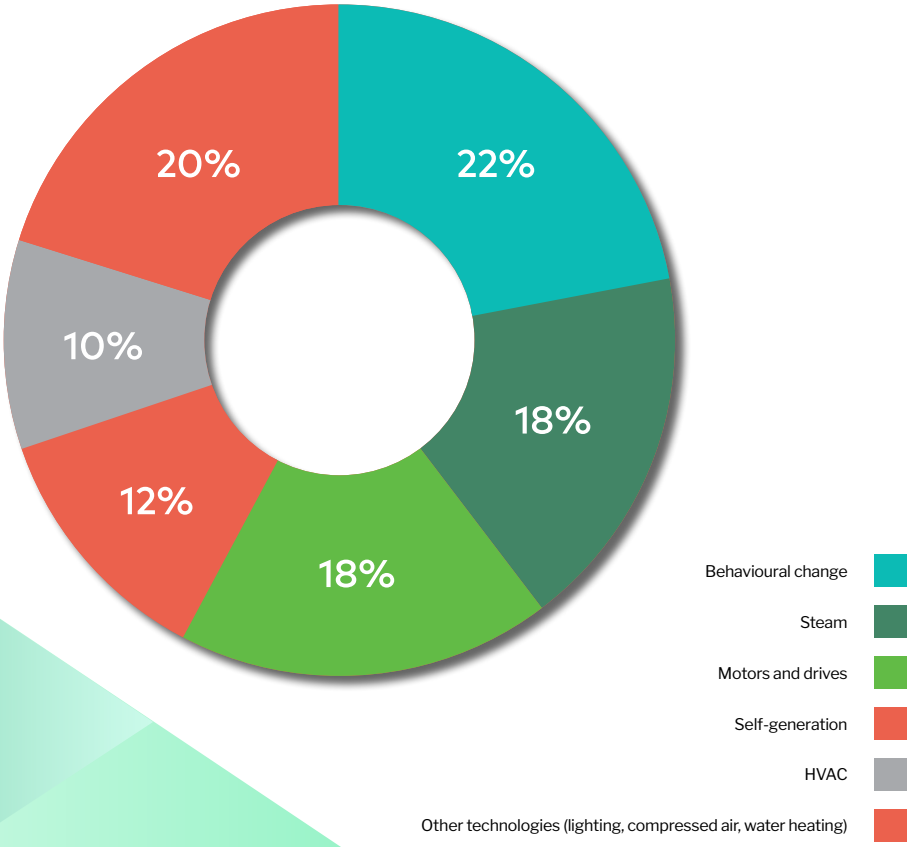


Figure 23: Breakdown of recommendations from the PSEE Programme per technology group

FIGURE 23 SHOWS THE ANNUAL ENERGY SAVINGS IDENTIFIED BY THE PSEE PROGRAMME. BEHAVIOURAL CHANGES (CARBON AND ENERGY MANAGEMENT) THAT ARE OFTEN LOW COST AND QUICK TO IMPLEMENT ACCOUNT FOR 22% OF ALL IDENTIFIED SAVINGS. SELF-GENERATION WHILE OPTIMISING STEAM SYSTEMS AND MOTORS AND DRIVES ARE THE LARGEST TECHNOLOGY RECOMMENDATIONS IDENTIFIED.

FIGURE 24 SHOWS FURTHER DETAIL REGARDING THE MAIN AREAS IDENTIFIED AND THEIR RESPECTIVE ANNUAL ENERGY SAVINGS POTENTIAL. IT SHOWS THE DETAIL IN GWh (1 GWh = 1 000 MWh = 1 000 000 kWh) FOR THE SAVINGS FROM ENERGY EFFICIENCY AND ENERGY MANAGEMENT IDENTIFIED DURING THE PSEE PROGRAMME.

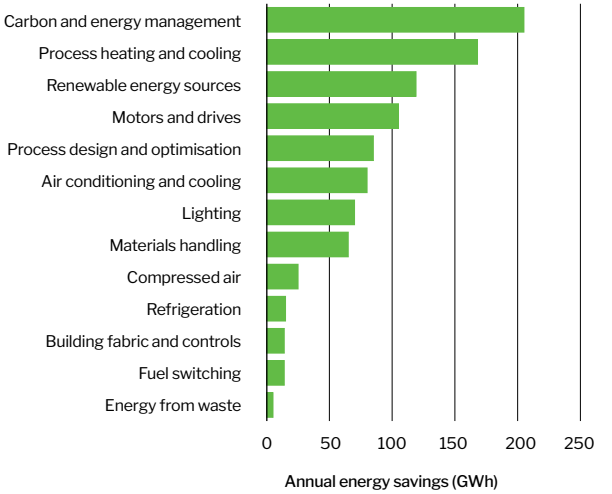


Figure 24: Annual energy savings identified by the PSEE Programme

Key lessons learnt from the programme for businesses

Businesses should take note of the following:

There is a largely untapped source of business value by implementing energy efficiency initiatives.

Significant energy cost savings have been proven by the participating businesses.

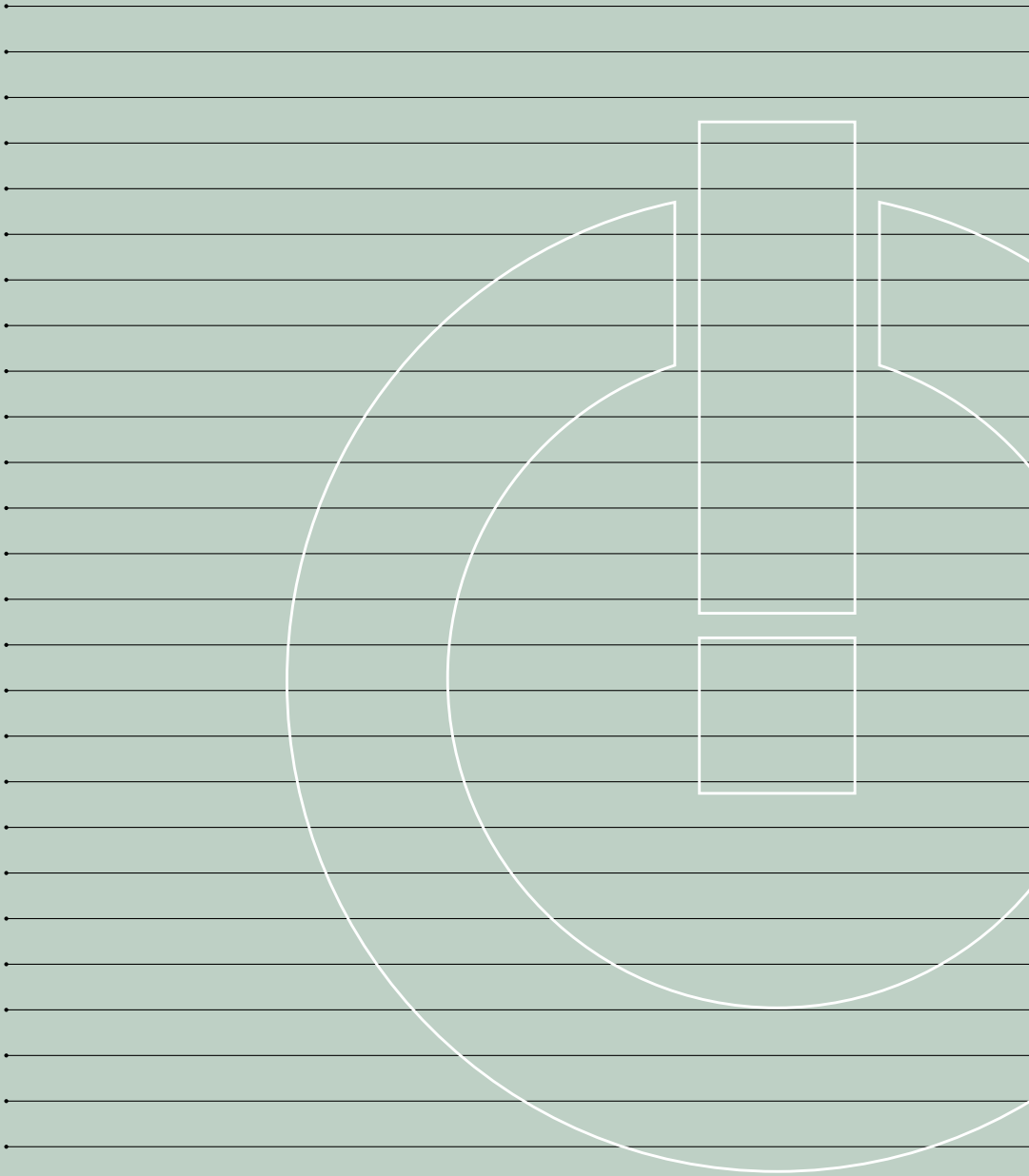
The energy service company industry in South Africa shows positive signs of improvement, with high-quality work being done in all regions by certain specialists.

There is a lack of awareness and capacity to make changes given that energy efficiency is not core business.

There is concern about technical risks (reliability and operational risks) for installing new, more efficient equipment, due to a shortage of credible and trustworthy technology suppliers with proven track records.

There is a clear need for policy direction from government as well as incentives to finance projects that are too small for financial institutions and too costly for the section 12L tax incentive scheme.

There is a clear need in South Africa for further energy efficiency programmes to reduce demand on the grid and reduce the barriers to implement energy efficiency initiatives.

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THIS SECTION DISCUSSES SENSIBLE APPROACHES TO APPOINTING AN ENERGY AUDITOR AND PROCURING ENERGY MANAGEMENT SERVICES.

Evaluation of energy-saving opportunities

10

Evaluation of energy-saving opportunities

If the guide has helped identify business energy-saving opportunities, but further information, review and/or calculations are required, an energy audit should be conducted.

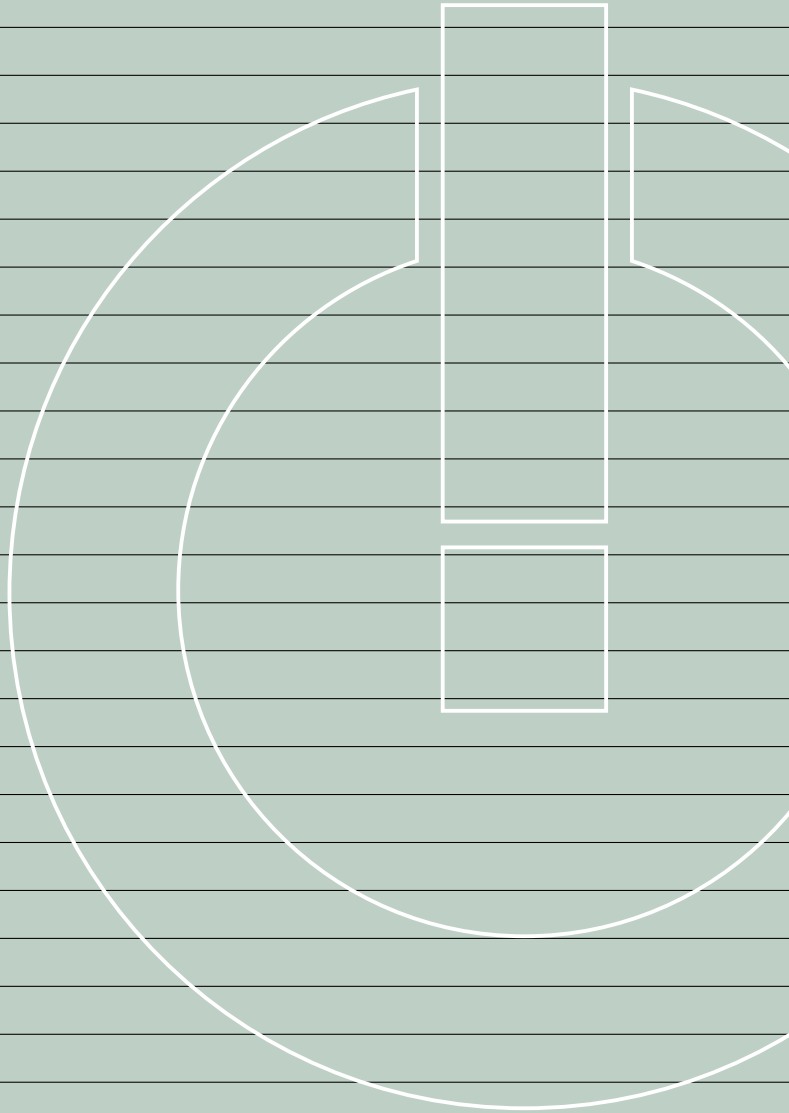
Energy audits will review your business energy consumption and spend, and identify opportunities for energy conservation, energy efficiency and sometimes renewable-energy generation.

Your business should be selective in choosing your energy auditor. You should ask for references of other business owners in your sector for whom the consultants have worked. While there are some lists of energy auditors, it is always advisable to conduct your own due diligence. In terms of procurement you should also try to get three quotes. SANEDI and/or the National Cleaner Production Centre (NCPC) Programme can also be contacted for assistance with selecting your energy auditor.

To assist with the selection of a consultant to conduct your energy audit keep in mind that outline costs for an energy audit are usually around R8 000 per day. An energy audit that will involve a site visit, a report and outline project costing and recommendations will take around four days depending on the size of your business. If more than two days of onsite work is required, the cost of the energy audit will be higher.

The decision to conduct an energy audit should be balanced with the magnitude of the energy-saving opportunities. If you estimate that there are large energy savings possible through energy management or energy efficiency for your business, it may be worth engaging a professional energy auditor.

IF YOU DO NOT HAVE BUDGET FOR AN ENERGY AUDITOR, YOU COULD CONSULT ***ENERGY SURVEYS: A PRACTICAL GUIDE TO IDENTIFY ENERGY SAVING OPPORTUNITIES*** **AVAILABLE AT http://www.nbi.org.za/focus-areas/environmental-sustainability/energy/private-sector-energy-efficiency-programme/.**

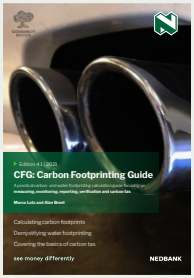


Live more sustainably with these Nedbank guides

This *Water Savings Guide* is part of a series of sustainability guides compiled by Nedbank and partners and are freely available to individuals, communities and businesses in SA. **Other guides include**:

The *Nedbank Smart Living Guide*

An A-Z handbook on how to live a more sustainable life and save money.

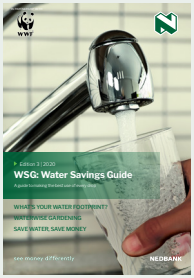


The *Nedbank Carbon Footprinting Guide*

A practical carbon and water footprinting calculation guide focusing on measuring, monitoring, reporting, verification and carbon tax. This guide is particularly useful for companies, as they need to adhere to carbon tax requirements.

The *Nedbank Food Savers' Guide*

A guide on how to get the most from your food and limit the amount you waste.



The *Nedbank Water Savings Guide*

A guide to making the best use of every drop of water, packed with tips on how to save water – and money – in your home.

The *Guide to biodiversity in your garden*

A comprehensive guide on protecting and encouraging biodiversity and water saving in your garden.

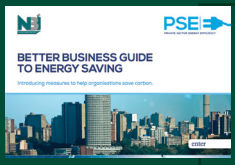
Click here to download these guides for free.

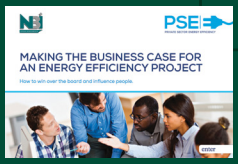
11 Conclusion

This booklet has demonstrated the scale of opportunities that exist and should be used as a high-level resource to identify opportunities for energy efficiency and energy reduction.

THIS GUIDE HAS BEEN DEVELOPED AS A PRACTICAL TOOL TO ALLOW YOUR BUSINESS TO MANAGE ITS ENERGY CONSUMPTION.

The guide should allow you to identify and implement energy management structures, processes and simple projects. It also gives you the tools required to conduct proper checking of proposals from energy management consultants to ensure maximum benefit to your business.





Further reading that can be consulted on energy management includes:

Making the Business Case for Energy Efficiency and *Better Business Guide to Energy Saving*. Both available at **http://www.nbi.org.za/focus-areas/environmental-sustainability/energy/private-sector-energy-efficiency-programme/.**

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For more information about Nedbank's approach to sustainability please visit nedbank.co.za.

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