



Energy Efficiency



RENEWABLE & SUSTAINABLE
ENERGY STUDIES

Energy Efficiency

What we can do:

- ***Be the change*** – energy efficiency starts with the **decisions we each make.**
- ***All hands on deck*** – energy efficiency is for **everyone.**
- ***Make a world of difference*** – energy efficiency is not just about saving money. It is about **living within Nature's ability to provide** for our energy needs and to absorb the impacts of these. **Reducing** our energy demand and switching to renewables will make a world of difference.

Energy Efficiency can be achieved through

- **behavioural changes** and
- new **energy-efficient technologies.**

Energy Efficiency

Energy Audit

Measure energy use to manage it!

- Do an **energy audit** of your home to find out **what activities** and **appliances use the most electricity** and what changes you can make to reduce consumption.
- To do this you need to record the wattage of the appliances and multiply this by the hours that the appliance is running actively – i.e. is not in standby mode.

Electrical Appliance	Qty	Power		Usage time per day in hour (h)	Energy consumption per day in kWh	No. of days	Total Energy consumption in kWh
		Watt (W)	Kilowatt (kW)				
Light bulb	1	100	$\frac{100}{1000} = 0,1$	$\frac{30\text{min}}{60\text{min}} = 0,5 \text{ h}$	$0,1 \text{ kW} \times 0,5 \text{ h} = 0,05 \text{ kWh}$	5	$0,05 \text{ kWh} \times 5 \text{ days} = 0,25 \text{ kWh}$
Kettle	1	1600	$\frac{1600}{1000} = 1,6$	$\frac{48\text{min}}{60\text{min}} = 0,8 \text{ h}$	$1,6 \text{ kW} \times 0,8 \text{ h} = 1,28 \text{ kWh}$	5	$1,28 \text{ kWh} \times 5 \text{ days} = 6,4 \text{ kWh}$

Energy Efficiency

Challenges

We are **challenged** by:

- increasing electricity prices and
- new technology

We need **to be creative** and develop a range of appropriate solutions for

- **lighting,**
 - **water heating** and
 - **cooking**
-
- **New technologies** are designed to **use as little energy** as possible
 - **Domestic appliances** - know the **energy rating** of the appliance you choose to buy



Energy		Washing machine
Manufacturer		
Model		
More efficient		
A		A
B		
C		
D		
E		
F		
G		
Less efficient		
Energy consumption kWh/cycle (based on standard test results for 90°C cotton cycle)		0.95
<small>Actual energy consumption will depend on how the appliance is used</small>		
Washing performance	A B C D E F G	
<small>A: higher G: lower</small>		
Spin drying performance	A B C D E F G	
<small>A: higher G: lower</small>		
Spin speed (rpm)		1400
Capacity (cotton) kg		5.0
Water consumption l		55
Noise (dB(A) re 1 pW)	Washing	5.2
	Spinning	7.0
<small>Further information is contained in product brochures</small>		

Energy Efficiency

What can we do to reduce the use of appliances that use a lot of energy?



- **Clothes irons:** Dry shirts on hangers to reduce ironing
- **Tumble drier :** Use a washing line
- **Kettle:** Boil what you need, do not fill the kettle each time you boil.
- **Electric oven and grill:** Rather cook with a Wonderbag or do quick stir fries.
- **Electric heaters:** Warm yourself with warm clothes and a microwave bean bag instead of heating the whole room.
- **Air conditioners for cooling:** These use between 1.5 and 2 kW per hour. Rather use an electric fan, which uses between 50 and 100 W per hour.
- **Electric hot water geyser :** Take short showers and also save water.
- **High power security lights:** Use either a motion detector or a day night time switch

Energy Efficiency

Solar Chargers

Lighting



A small photovoltaic(PV) panel is used to charge a light for a standard single room and it can charge most brands of mobile phones

Laptop charger



Solar charger that charges a laptop via two PV (photovoltaic) solar panels, which generate electric current when they are exposed to light

New Technology

We need to take into consideration the

- **costs** and **environmental impact** of staying with old technology vs
- **return on investment** of new efficient technology

Solar Geyser



A solar geyser can save up to a quarter of a household's electricity bill

Lighting

CFL



Compact fluorescent lights (CFL's) are more energy efficient than incandescent bulbs, but contain mercury.

LED



Light emitting diodes (LEDs) the future of lighting

Energy Efficiency

Lighting

Consol Solar Jar



Ref. solar-jar.com

The Consol Solar Jar™ stores energy during the day in a small photovoltaic panel on the lid and releases light at night.

Skylight: Solar Bottle Bulb



A solar bottle bulb is a cheap skylight alternative. It consists of a 2 liter plastic bottle, which equals a 50 W light bulb.

Ref. www.isanglitrongliwanag.org

What are the Low Technology Options?

Far from being a '*poor man's choice*' appropriate **low technology energy-efficient appliances:**

- make home owners **resilient** to high energy prices and
- give them a level of **energy independence**

Water Heating

Black Pipe solar heater



The black pipe absorbs the heat of the sun and the length of the pipe forms the storage for the heated water.

Tshisa Box



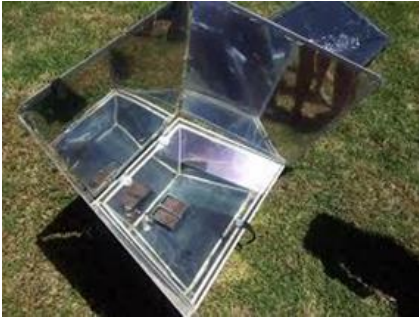
Ref. greenaudits.co.za

The portable Tshisa Box solar water suitcase can heat 10 litres of water in 4 hours – so twice a day in summer.

Energy Efficiency

Solar cooking

Solar oven



A solar oven is a box made of insulating material with one face of the box fitted with a transparent medium such as glass or plastic to trap the heat.

Solar cooker



A solar cooker is characterised by a large reflective surface that focuses the solar energy on a pot to produce a relatively high temperature.

Solar cooking

Solar ovens and **solar cookers** can be used to:

- cook food,
- pasteurise water,
- dry fruit or vegetables and
- sterilise utensils.

Energy Efficiency

Wonderbag



Ref. wonderbag.co.za

The Wonderbag is a slow cooker that retains heat to continue cooking.

Fuel efficient wood stove



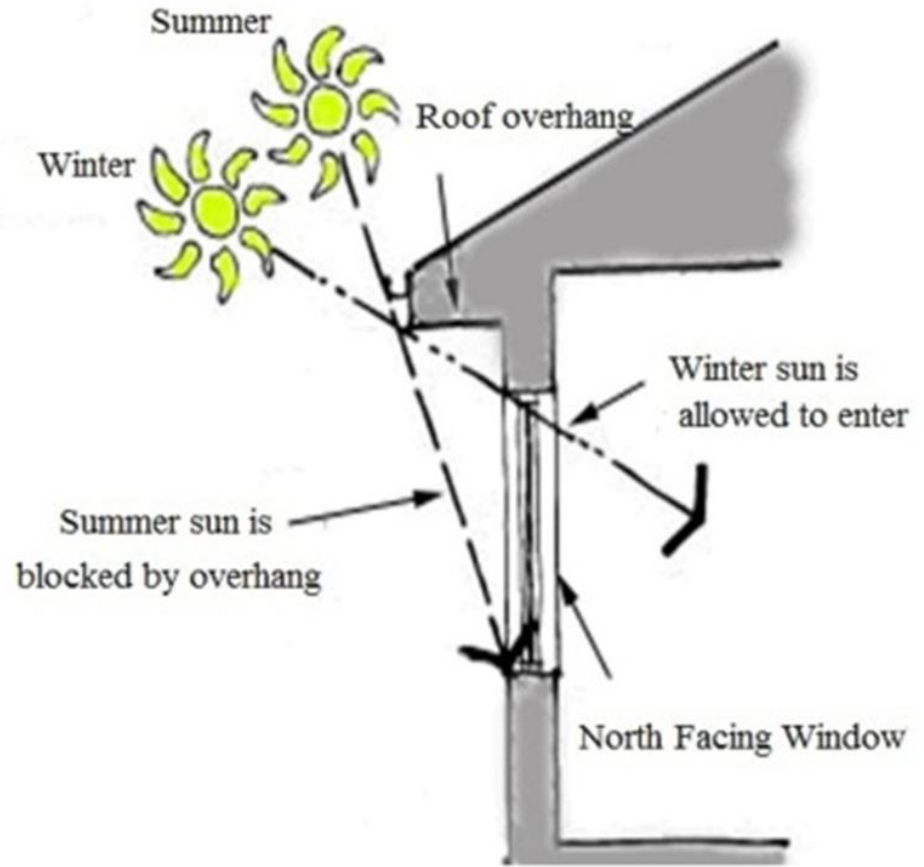
Ref. grenaudits.co.za

These stoves use less wood, cook food faster and produce less smoke and greenhouse gases than open fires

Energy Efficiency

Passive Solar Energy

- **Buildings** can be **designed** to **keep energy in** during winter and **keep heat out** during summer
- **Insulation** can help regulate a home's **temperature**
- Block all **draughts** to keep your house warm in winter
- **Thick curtains** also trap heat inside in winter and keep it out in summer
- **Deciduous trees** can be planted in front of window to keep the **hot summer sun out** and **allow** the **warm winter sun in**



Energy Efficiency

Conserve Energy: Reuse & Recycle

- **Energy** has been used for everything which **has been made** – therefore called **embedded energy**

- **Manufacturing** processes **use** large amounts of **energy**

- If we **throw things away** after we have used them, the **energy is wasted**

- We can **save energy** by **reusing** and **recycling** things



Newspapers, magazines
cardboard boxes, phone
books, junk mail, office
paper, old letters and
egg cartons



All glass bottles and
jars. Rinse and place
in bin. (No lids please)



Juice and
milk cartons



Rinsed soft drink
bottles, plastic bottles
marked 1, 2, or R
(no lids please)



Steel and aluminium
cans, foil and
empty aerosols

Conserve Energy

Energy Transition

The world is in an **energy transition** – from dependence on **fossil fuel** to **renewable energy**

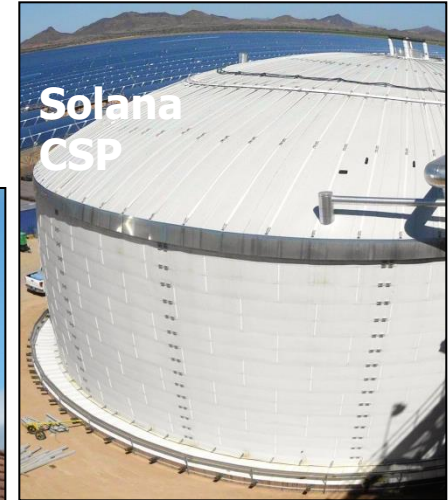
- South Africa: **home owners, big business** and the **DoE** invest in wind, PV and CSP
- The ability to **store energy** is the **biggest challenge**
- CSP, biogas, hydroelectricity and new battery technology are **storage options**
- **Opportunities** for **green jobs** are being created in renewable **energy generation** and in **energy-efficient appliances**



Storage options



Ref. greenaudits



Solana CSP



Ingula Pumped storage

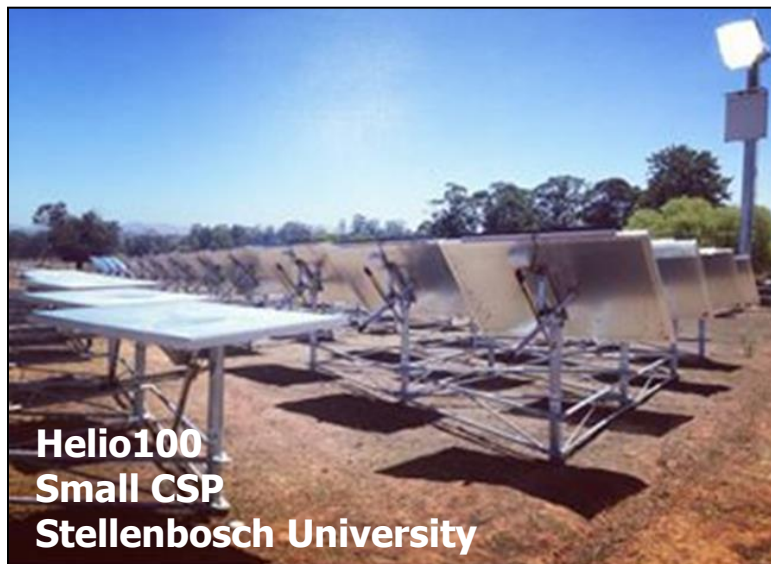
Energy Transition

Energy-Innovation Era

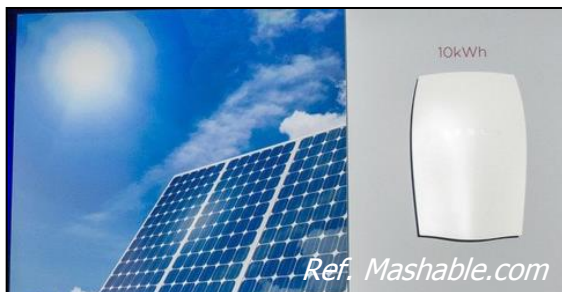
We are not in an energy crisis, but in an energy-innovation era

New technology:

- Helio100, small CSP
- Elon Musk's Tesla first-generation Powerwall
- Lithium ion batteries
- Electric bikes and cars
- Solar laptop chargers, etc.



Elon Musk's
Tesla Power Wall



Solar
Laptop
charger



Electric motorbike

Energy Innovation Era