Energy Efficiency

Slide 2: ***Energy efficiency***

What we can do:

- ***Be the change:*** Energy efficiency starts with the decisions we each make, such as taking shorter showers, switching off lights and appliances when not in use, dressing warmly instead of switching on the heater or walking instead of driving short distances.
- ***All hands on deck:*** Energy efficiency is for everyone. Each small energy-saving action saves watts, which collectively adds up to megawatts of electricity saved.
- ***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 needs to be achieved through behavioural changes as well as through new energy-efficient technology. For example, a solar geyser with electrical back-up will not save much electricity if people drain all the stored hot water by taking long showers or if they all shower at night when the sun is not shining.

Slide 3: ***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.

Energy consumption in the home:

- Because we use so many electrical appliances in our homes every day, a large amount of electrical energy is consumed. For practical reasons we measure the **power (W)** of appliances in **kilowatt (kW)** and the time for which they are used in **hours (h)**. Therefore, the amount of energy consumed is measured in **kilowatt-hour (kWh).**
- Municipalities measure and sell our electrical energy consumption in kilowatt-hour (kWh). **1 kWh** is often referred to as **1 'unit'** and costs approximately R1.80.
- In other words, for every 1 hour I use my 1 000-W toaster or other appliance, it costs me R1.80.

Practical assignment:

- Electricity generated by burning coal causes almost 0.915 kg of CO_2 /kWh to be released.
- In other words, for every 1 hour I use my 1 000-W toaster, almost 1 kg of CO_2 is being released into the atmosphere.
- Select any 10 electrical appliances in your home and complete the table over a period of five days.

Slide 4: ***Energy Efficiency: Challenges***

- People are being challenged by increasing electricity prices and by new technology to be creative and develop a range of appropriate solutions for cooking, water heating and lighting.
- Most modern appliances and machines, ranging from cars to kettles, are much more energy-efficient than their older counterparts.
- Domestic appliances such as kettles and washing machines use large amounts of electricity.
- Energy-efficient appliances are designed to waste as little energy as possible.
- For example, an energy-efficient refrigerator will be better insulated, be less noisy, have no ice on the inside or condensation on the outside, will probably last longer and will use less electricity.
- Energy-efficient appliances actually amount to 'more with less'.

Slide 5

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; it also saves water.
- High-power security lights: Use either a motion detector or a day/night switch.

Slide 6: *Energy Efficiency: New Technology*

We need to take into consideration the costs and environmental impact of staying with old technology versus the return on investment of new, efficient technology.

Examples

Solar energy:

- PV panels can be used for charging lights, laptops and cell phones.
- Solar geysers can be used for heating water through an evacuated tube or flat panel system.

Lighting:

- LEDs are the future of lighting.
- CFLs are more energy-efficient than incandescent bulbs, but contain mercury.

Slide 7: Low Technology: 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.

Lighting

- The Consol Solar Jar™ stores energy during the day in a small PV panel on the lid and releases light at night.
- The solar bottle bulb is a cheap skylight alternative. It consists of a 2-litre plastic bottle, which equals a 50-W light bulb.

Water heating

- The portable Tshisa Box solar water suitcase can heat 10 litres of water in four hours – so twice a day in summer.
- The black pipe solar heater absorbs the heat of the sun and the length of the pipe forms the storage for the heated water.

Slide 8: *Energy Efficiency: Low-technology options for cooking*

Solar ovens and solar cookers can be used to: cook food, pasteurise water, dry fruit or vegetables and sterilise utensils.

Solar cooking

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

Efficient cooking

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

- Fuel-efficient wood/charcoal stove: These stoves use less wood, cook food faster and produce less smoke and greenhouse gases than open fires.

Slide 9: *Energy Efficiency: Passive Solar Energy*

- This type of energy can be used for providing heat in winter and cooling down in summer.
- Buildings can be designed to keep energy in during winter times and keep heat out during summer times.
- Insulation can help regulate a home's temperature.
- A well-insulated house will be warmer in winter and cooler in summer, creating a healthier living environment.
- Block all draughts to keep your house warm in winter.
- Thick curtains also trap heat inside in winter and outside in summer.
- Deciduous trees can be planted in front of windows to keep the hot summer sun out and allow the warm winter sun in.

Slide 10*: Conserve Energy: Reuse and Recycle*

- Energy has been used for everything that has been made; it is therefore called 'embedded energy'.
- These manufacturing processes use large amounts of energy.
- If we throw things away after we have used them, this energy is wasted.
- We can save energy by reusing and recycling things.

Slide 11: *Energy transition*

- The world is in an energy transition from dependence on fossil fuel to harvesting renewable energy sources.
- We need to look at the history of our energy choices and our future choices and ask what ethical energy choices are.
- This is also happening in South Africa, as home owners, big businesses and the Department of Energy invest in more wind power, PV power and CSP to generate more of our electricity from renewables.
- The ability to store energy is the biggest challenge in this transition. CSP, biogas, hydroelectricity and new battery technology are storage options.
- Options for affordable energy storage are a research priority.
- Hugely expensive and environmentally damaging coal and nuclear power stations can now be replaced by smaller, locally produced renewable power generation.
- Many opportunities for green jobs are being created through renewable energy generation and energy-efficient appliances.

To transition in a way that ensures we all enjoy a fair share of renewable energy, we need to understand the following:

- **How our local energy is produced:** Is it wind, hydro, PV, CSP or a combination with coal and gas back-up?
- **How to use energy conservatively:** Cost-effective storage of electricity is still an economic and technological challenge.

- **When to use it:** Shifting our consumption patterns to use electricity when the sun is shining and the wind is blowing will become part of our future energy systems.

Slide 12: *Energy-innovation era*

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

New technology: e.g.

- Helio 100
- Elan Musk's Tesla first-generation Powerwall
- Lithium ion batteries
- Electric bikes and cars
- Solar laptop chargers, etc.