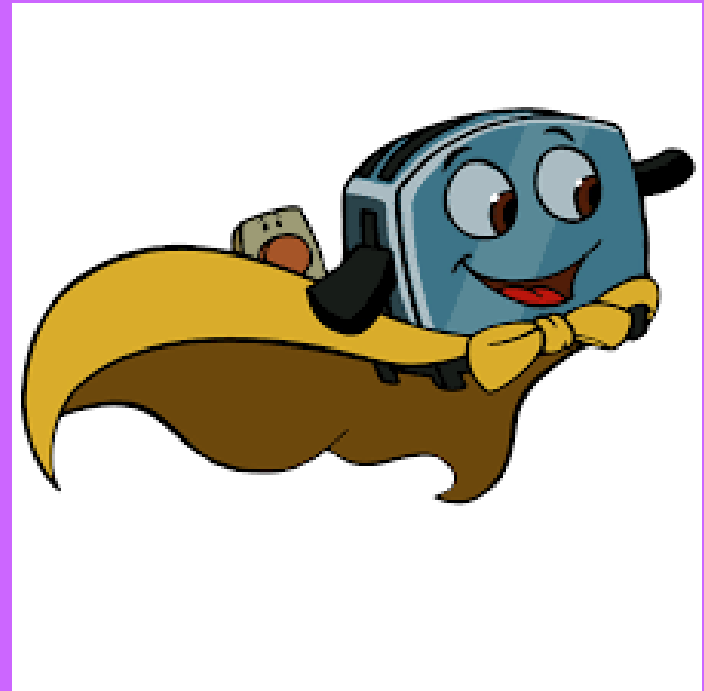


# Sustainable Energy



# Toaster vs Washing machine

- In pairs, from the list given try to determine which appliances use electrical energy at a faster rate



# **Sustainable use of electrical energy begins with understanding how its use is measured.**

Electrical energy is measured in two main ways:

- Watts and Kilowatts
- Kilowatt-Hours



# Electrical Power: Watts and Kilowatts

**Electrical power:** The rate at which electrical energy is used by a load

- Load: Usually an appliance (washing machine, TV)
- Measured in watts (W) or kilowatts (kW)
- $1 \text{ kW} = 1000 \text{ watts}$

# Power Ratings of Appliances

Appliances are labelled with a *power rating* (the rate they use energy)

- Light bulb: 100 W
- Iron: 1000 W
- If light bulb and iron are on for the same length of time, the iron uses 10 times more energy

**Table 3.2** Typical Power Ratings of Appliances

Appliance	Typical Power Rating (kW)
Clock	0.0050
Clothes dryer	5.0
Washing machine	0.50
Coffee maker	1.0
Computer	0.20
Dishwasher	1.8
Freezer	0.34
Microwave oven	1.5
Toaster	1.1
Vacuum (portable)	1.6

# Kilowatt-Hours

Electrical energy used by an appliance over time is measured in kilowatt-hours (kWh)

- kWh: Combines the units for power and time
- If you use an appliance rated at 1 kW for one hour, you will have used 1 kWh of electrical energy



# Measuring Electrical Energy Use in Homes and Businesses

**Smart meter:** An electrical energy meter that measures how energy use changes in a building over the course of the day

- Data is sent to the utility company wirelessly
- Can encourage “smart” behaviour since it allows consumers to track their electrical energy usage



Figure 3.29

## Discussion Questions

1. What is electrical power and how is it measured?
2. Describe one benefit of smart meters.



# **Making informed choices helps you use electrical energy sustainably**

- Some appliances use more electrical energy than others
- Appliances have labels that tell you how much energy they use.

Two types of labels used in Canada are:

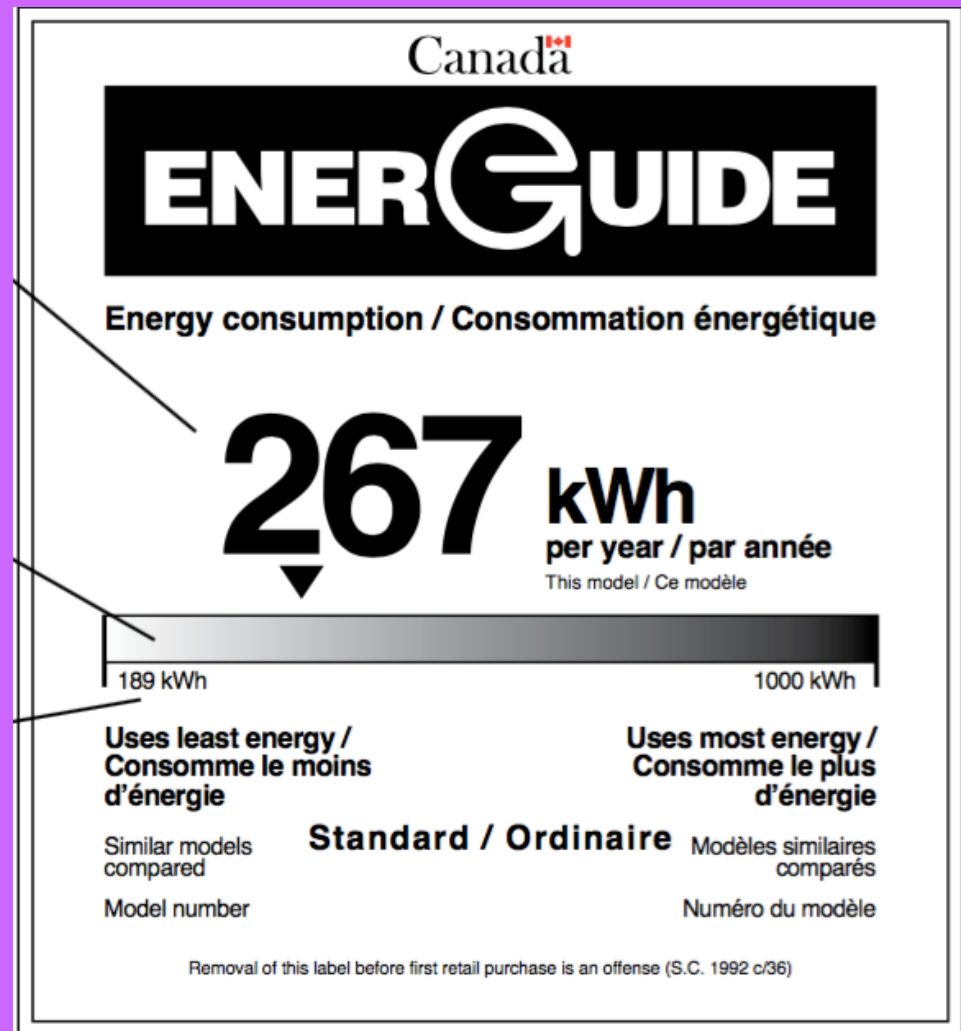
- EnerGuide labels
- ENERGY STAR® labels

# Understanding EnerGuide Labels

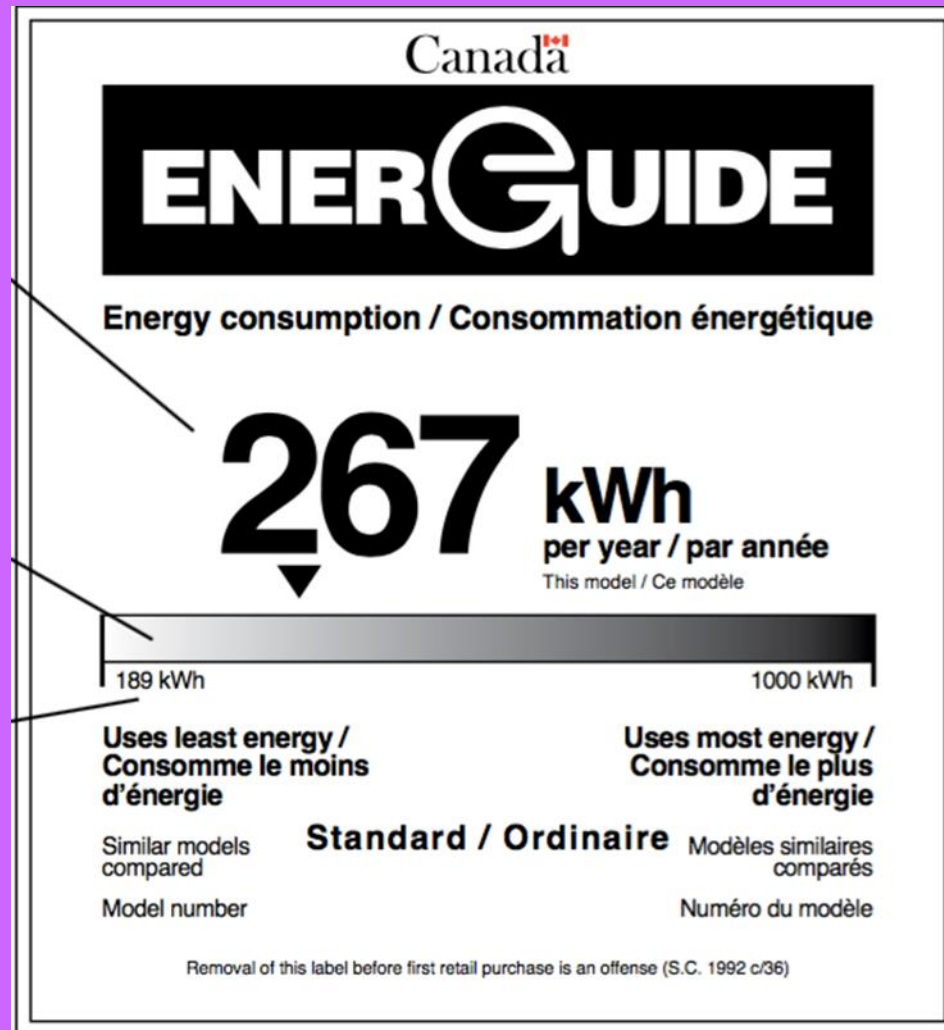
Figure 3.30

**EnerGuide label:** A label that gives details about the amount of energy that an appliance uses in one year of normal use

- Large number: Shows how much energy is used in one year of normal use
- Shaded bar: Shows how the appliance compares with similar ones on the market
- Numbers on the shaded bar: Gives a range of efficiency for yearly energy use



# Reading EnerGuide Labels



# Understanding ENERGY STAR® Labels

## ENERGY STAR®

**label:** Identifies a product as meeting or exceeding certain standards for energy efficiency

- Appliances with this label use 10-50% less energy compared with a standard product in the same category



Figure 3.31

# Phantom Loads

**Phantom load:**  
Electrical energy a device uses when it is turned off

- Appliances in stand-by mode (TVs, computers) are actually “on” and have phantom loads
- Phantom loads account for about 900 kWh of energy use each year in the average home



Figure 3.32: Devices with phantom loads are common in a typical home.

## Discussion Questions

1. If a family goes away on vacation, why might electrical energy still be consumed in their home?

# Renewable energy sources provide sustainable options for generating electrical energy

Electrical energy is always generated from another source of energy. The sources can be:

- Nonrenewable energy sources
- Renewable energy sources





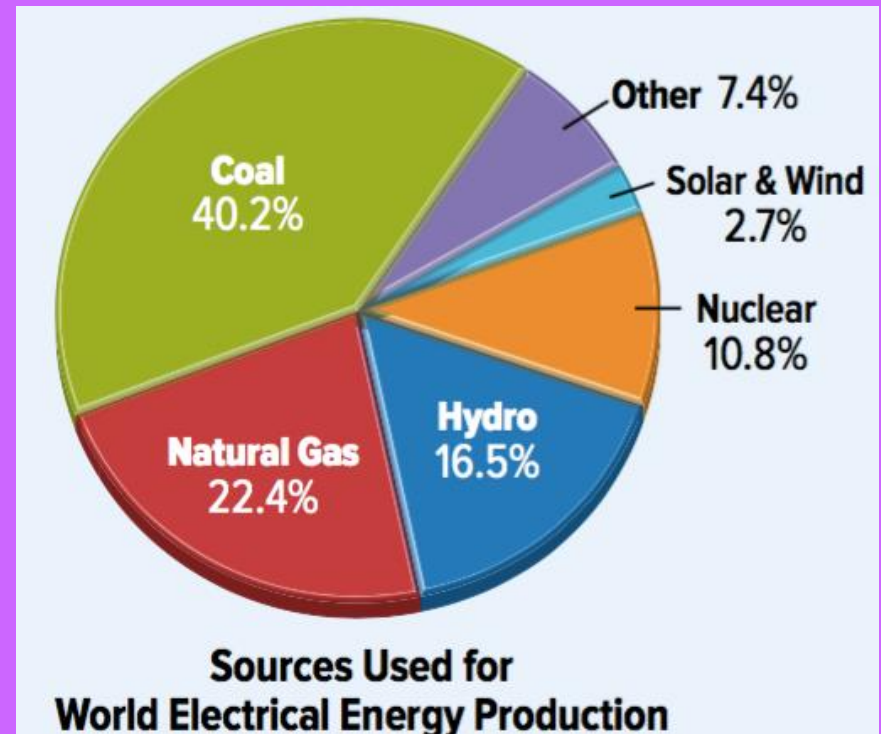
# Nonrenewable and Renewable Energy Sources

**Nonrenewable energy source:** An energy source that is non-replaceable in a human lifetime

- Examples: Coal, natural gas, uranium (nuclear reactions)

**Renewable energy sources:** An energy source that is available on a continuous basis

- Examples: Sunlight, wind, river flow, tides and waves, geothermal sources, biomass





# Renewable and Nonrenewable Energy Sources in British Columbia

## **WAC Bennett Dam (Peace River)**

- Generates 2730 MW(megawatt-1 million watts) of electrical energy
- Provides most of B.C.'s electrical energy
- Large-scale hydroelectric dam

## **Bear Mountain Wind Park (Dawson Creek)**

- Generates 144 MW of electrical energy
- 34 wind turbines



# Renewable and Nonrenewable Energy Sources in British Columbia (continued)

## The Klemtu Small-scale Hydro and Solar Project

- Hydro generates 1.7 MW of energy
- Solar generates 0.023 MW of energy
- Solar project has photovoltaic cells on the top of the Kitasoo Community School
- These projects reduce the community's reliance on diesel generators



# Moving Toward a Sustainable Future

**Sustainable energy system**: A sustainable way of perceiving, producing, and using energy

Characteristics of the system include:

- Ensuring that the extraction, production, and use of energy have limited impact on environmental and human health
- Less reliance on nonrenewable sources
- Ensuring the availability of renewable and reliable energy sources for current and future generations
- Providing access to affordable energy for Earth's entire population

# First Peoples Ecosystem Based Management

Many characteristics of a sustainable energy system are in line with First Peoples Ecosystem Based Management (EBM):

- **Respect and Responsibility** (making decisions that respect the natural world; responsible use of resources)
- **Intergenerational Knowledge** (listening to Elders and sharing knowledge between generations)
- **Balance and Interconnectedness** (balance makes sure future generations are considered; interconnectedness takes many relationships with an ecosystem into consideration)
- **Giving and Receiving** (giving thanks for natural resources recognizes their value; benefits of resources are shared in a community)

# What's in store?

- How are we moving towards sustainable energy



## Discussion Questions

1. Explain why coal is a nonrenewable energy source and why moving water is a renewable energy source.
2. Identify the four main characteristics of **a)** a sustainable energy system and **b)** First Peoples Ecosystem based Management.