

Topic 3.5: How can electrical energy be generated and used sustainably?

- Sustainable use of electrical energy begins with understanding how its use is measured.
- Making informed choices helps you use electrical energy sustainably.
- Renewable energy sources provide sustainable options for generating electrical energy.



Concept 1: 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)
- $1 \text{ kW} = 1000 \text{ watts}$
- This means it uses 1000 units of energy per second

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

Mr. Spanis's BC Hydro account page – made possible by Smart Meters



1555 ROCKCRESS DR, KAMLOOPS #10095

MANAGE ACCOUNT

SHOW ALL

Move my service

Account settings

My bill amount for Apr 05, 2019

\$290.77

Payment received: \$290.77

Balance: \$0.00

Make a payment

View my bill

Learn more about your rate.

MANAGE ACCOUNT

SHOW ALL

Move my service

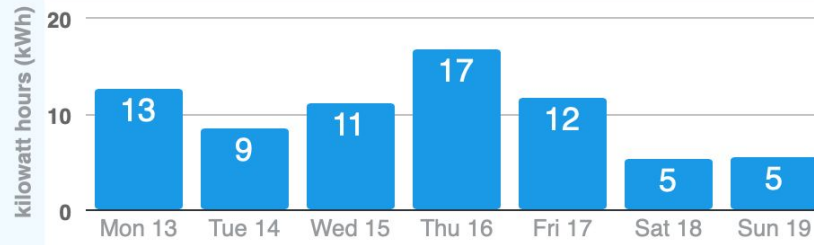
Defer a payment

Report a payment

Pre-authorized payments

Equal payment plan

Consumption for the last 7 days



View detailed consumption

Learn when you're using the most electricity and find ways to save.

Current billing period

Apr 4 - Jun 4, 2019

Cost to date (46 days):

\$76* or 704kWh*

Projected cost: **\$103***

*This is an estimate. Consumption costs don't include taxes and other fees which appear on your bill.

Consumption alerts

Step 2 price alert

Manage alerts

Start a Challenge

Join Team Power
Smart and you could
earn \$50.

\$50

Join the Team

Wish you had a smarter home?



Try a free app to track electricity usage, control devices and more.

Learn more

Power outages



Find current power outages, report an outage & more.

Find out more

Mr. Spanis's BC Hydro account page



Consumption data

Current billing period: Apr 4 to Jun 4, 2019

[+ Add an alert](#)

Cost to date ⓘ

\$76*



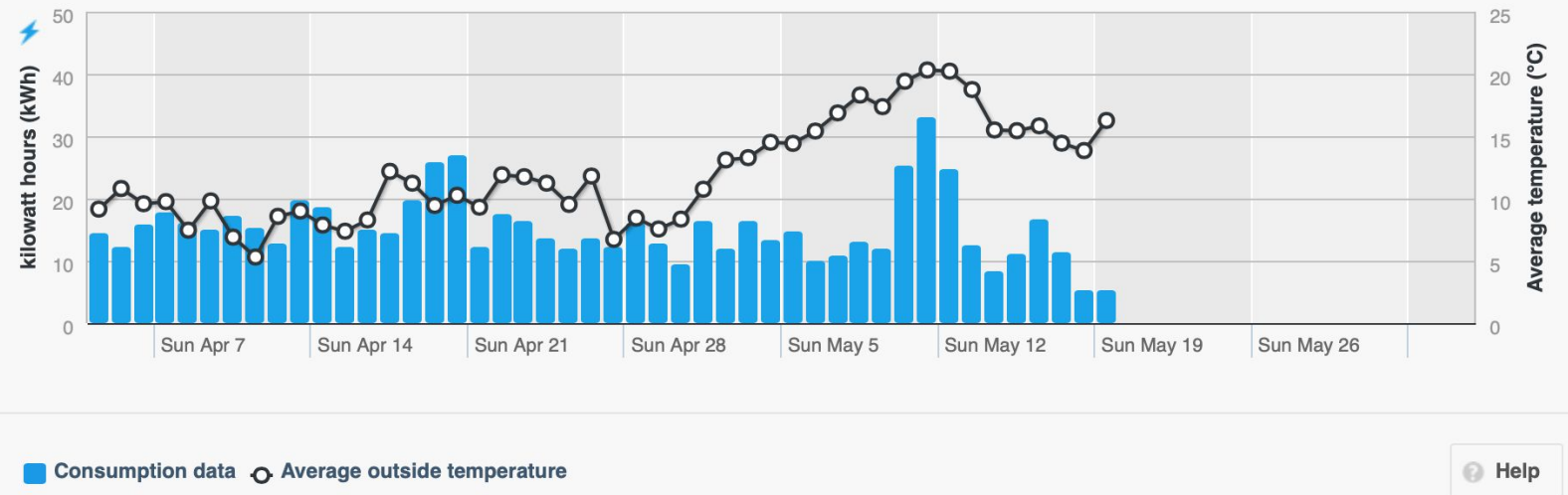
Projected cost at Jun 4 ⓘ

\$103*

ⓘ

 ⓘ

Daily consumption for Apr 4 – Jun 4, 2019



- **What do you notice about the relationship between energy usage and outside temperature?**
- **What caused energy use to go up when the average temperature got above 15°C?**
- **Mr. Spanis's family decided to save electrical energy; instead of running the air conditioning to cool the house before bedtime, they open all the doors and windows after the outside temperature drops below the inside temperature.**

Check out his energy usage compared to his neighbours:

Mr. Spanis's BC Hydro account page



Consumption data

Current billing period: Apr 4 to Jun 4, 2019

+ Add an alert

Cost to date ⓘ

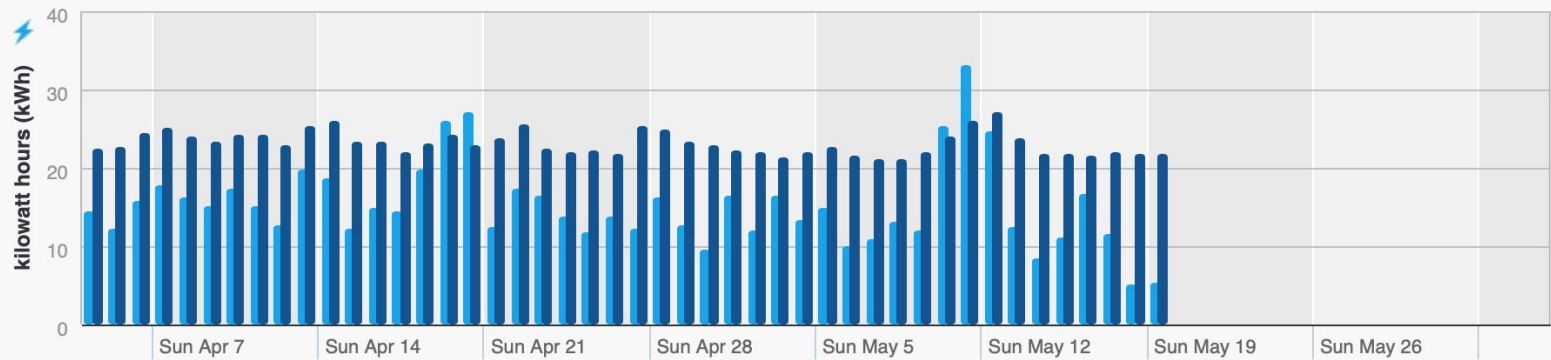
\$76*



Projected cost at Jun 4 ⓘ

\$103*

Daily consumption for Apr 4 – Jun 4, 2019



Consumption data
 Similar homes nearby

Help

Mr. Spanis's Hydro bill is lower than his neighbours. What other behaviours might save energy?

Discussion Questions

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

Concept 2: Making informed choices helps you use electrical energy sustainably.

Appliances have labels that tell you how much energy they use.

Two types of labels used in Canada are:

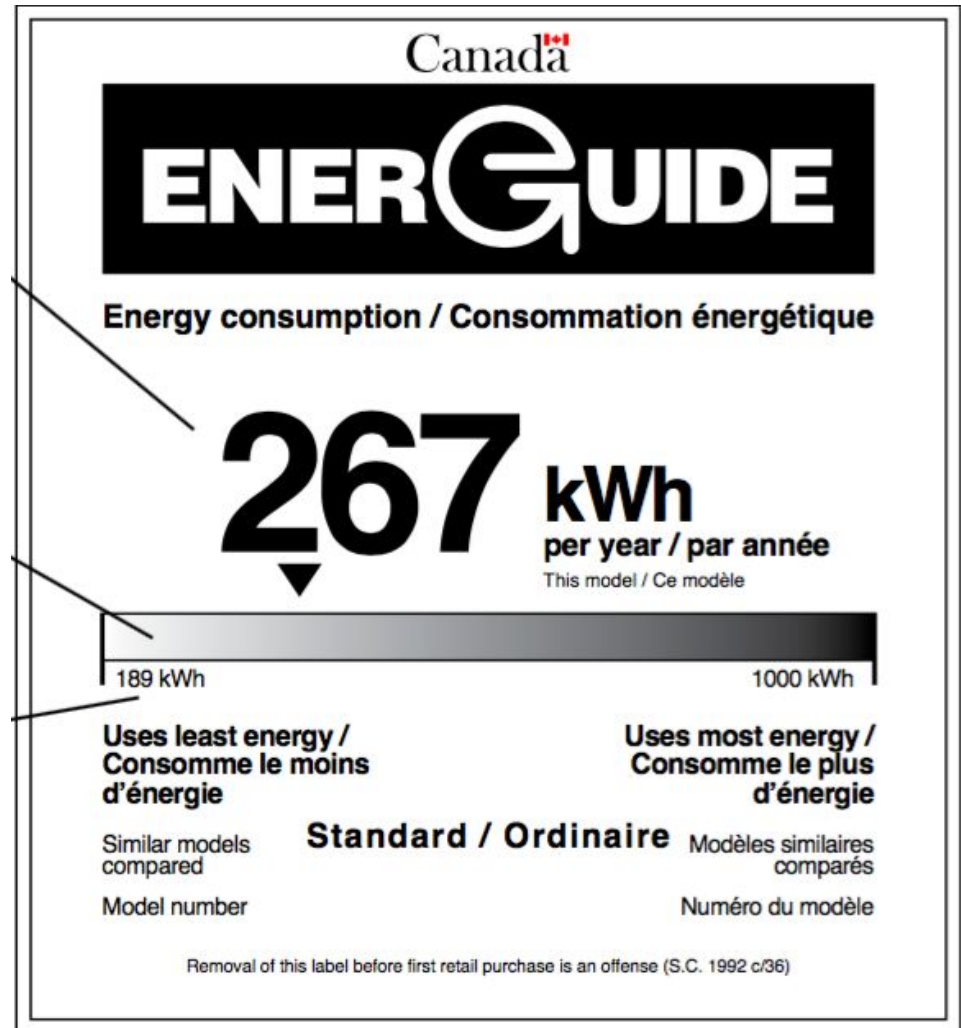
- EnerGuide labels
- ENERGY STAR® labels

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



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

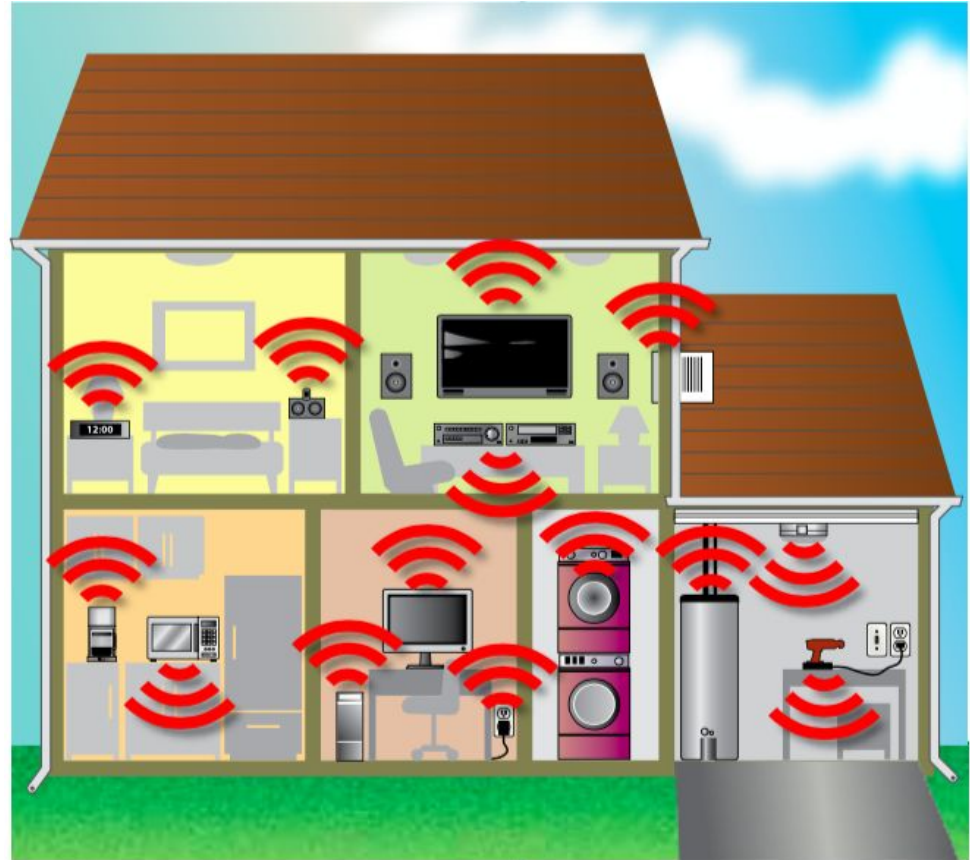


Figure 3.32: Devices with phantom loads are common in a typical home.

Discussion Questions

1. Compare the information on an EnerGuide label with the information on an ENERGY STAR® label.
2. If a family goes away on vacation, why might electrical energy still be consumed in their home?

Concept 3: 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

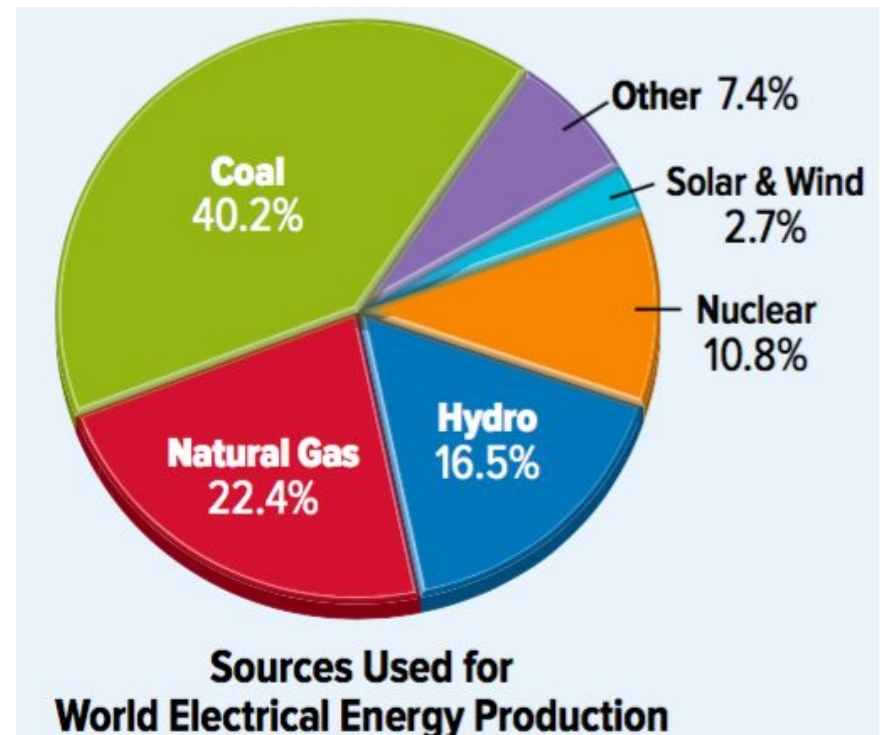
Nonrenewable and Renewable Energy Sources

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 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)

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.

Topic 3.5 Summary: How can electrical energy be generated and used sustainably?

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