

# Energy



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# Some Questions

- Why do we need energy?
- Where do we get it from?
- What are the good and bad things about each type of energy?
- Where will it come from in future?

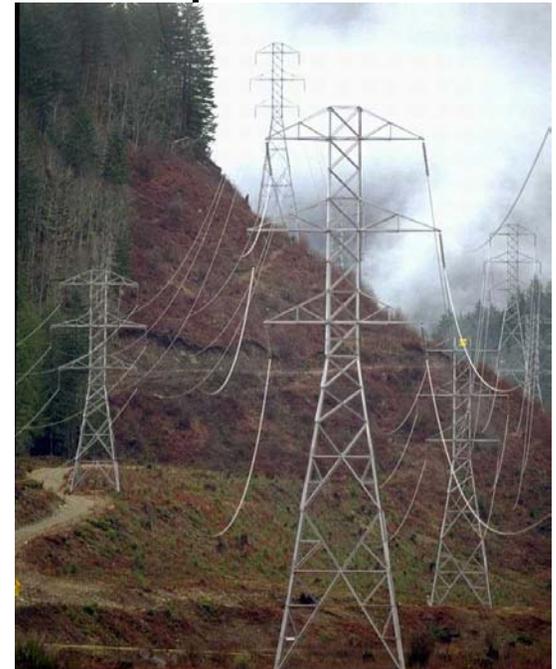


# How We Use Energy

- Heating & cooling our houses
- Getting around - cars, trains, planes
- Making things like TVs, iPods, houses, food
- .....

# Electricity

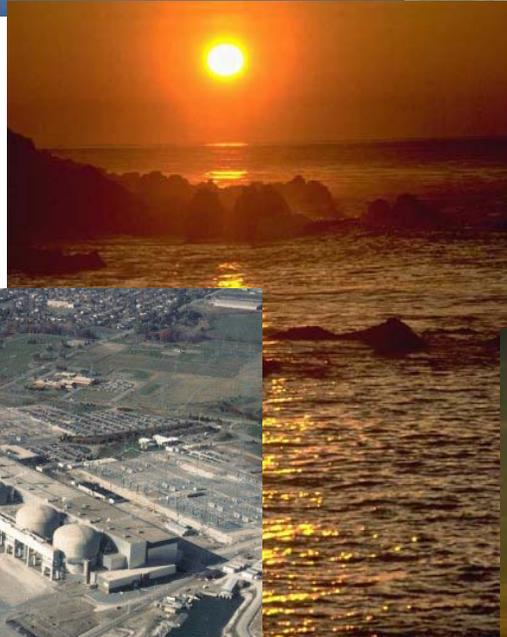
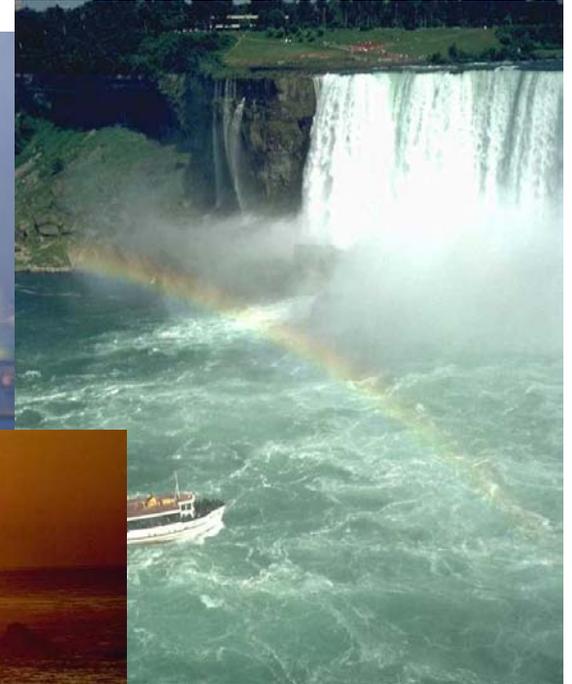
- Electricity is a special form of energy
- We have to make it from other types of energy
- We can easily move it from place to place
- All of us use it every day
  - Television, movies, lights
  - Hospitals
  - Computers, Internet
  - Telephones
  - .....





**33 % of the world lacks electricity**

# Where Does Energy Come From?



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# A “Law” on energy

- You can't create or destroy energy – you can only change it from one form to another

# We can make electricity from....

- Coal
- Oil
- Natural Gas

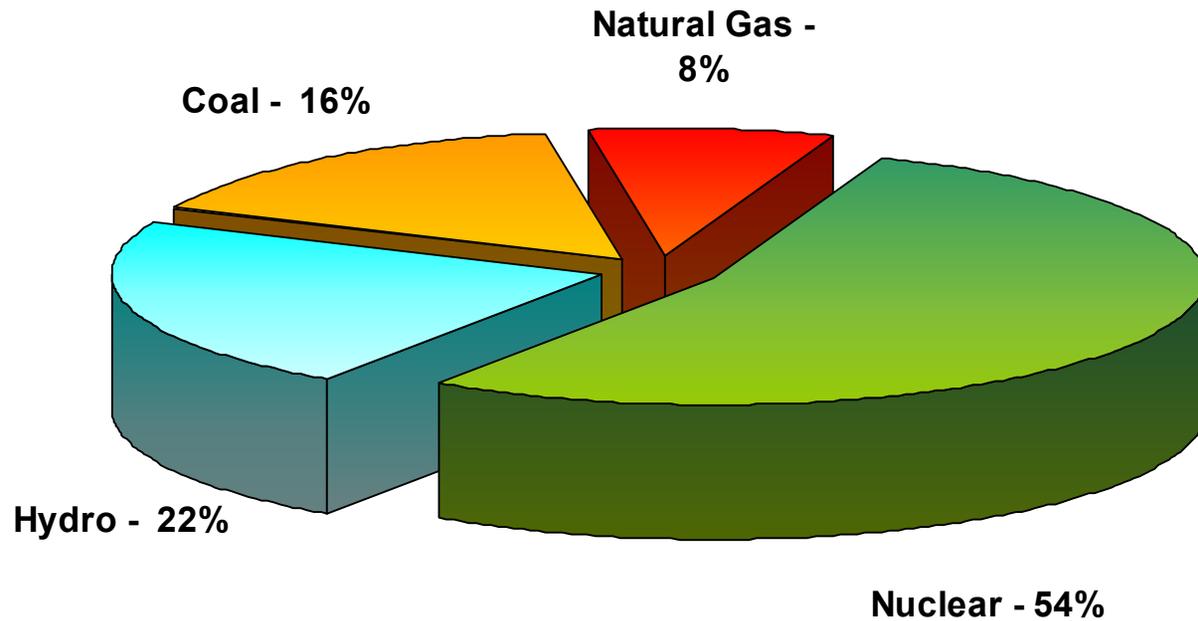
By burning them to make steam and turn a “wheel”

- Nuclear – uranium gets hot & makes steam
- Sun – use the heat to make steam/electricity

- Wind
- Water

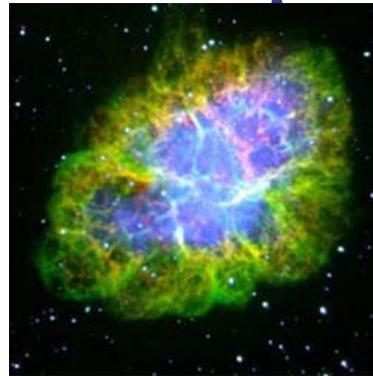
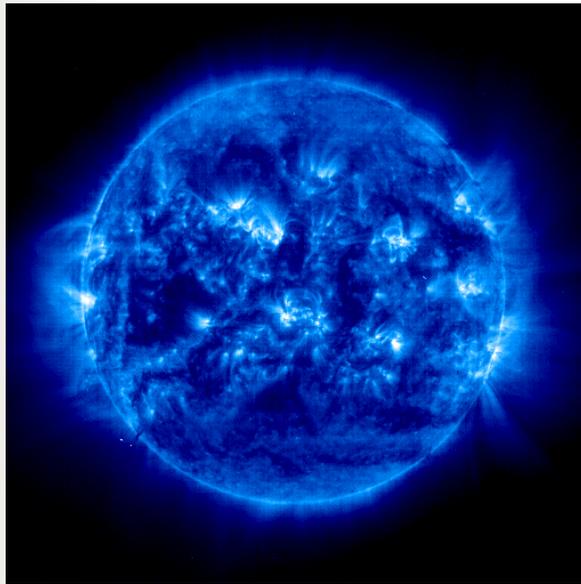
By making them turn a wheel

# Where does Ontario's electricity come from?



Source: Independent Electricity System Operator (IESO), 2007

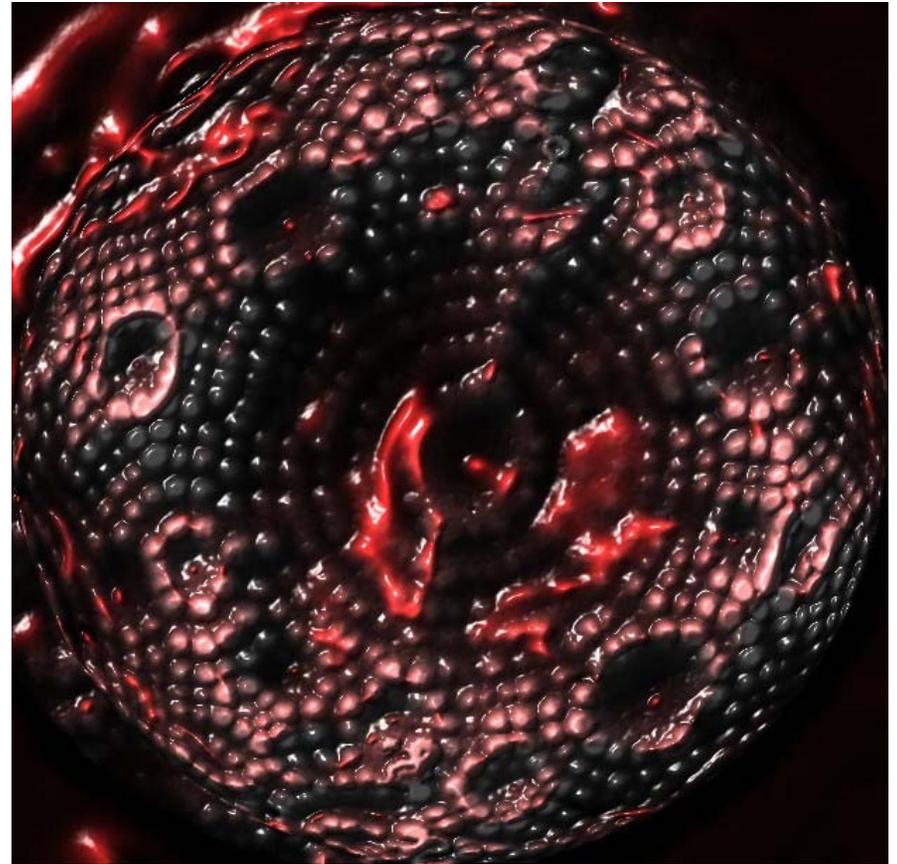
# How does nuclear power work?



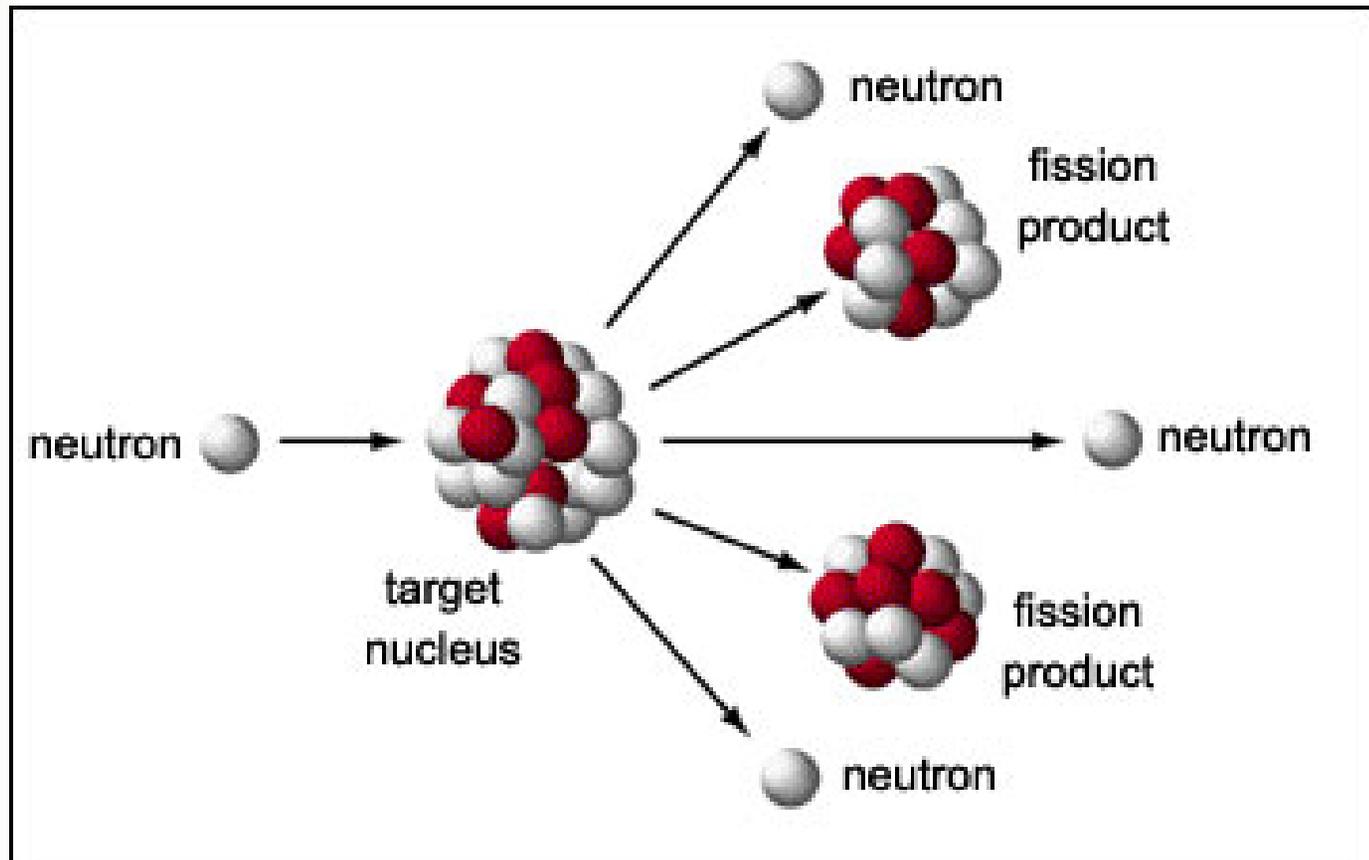
**Nuclear energy powers the universe**

# What is an Atom?

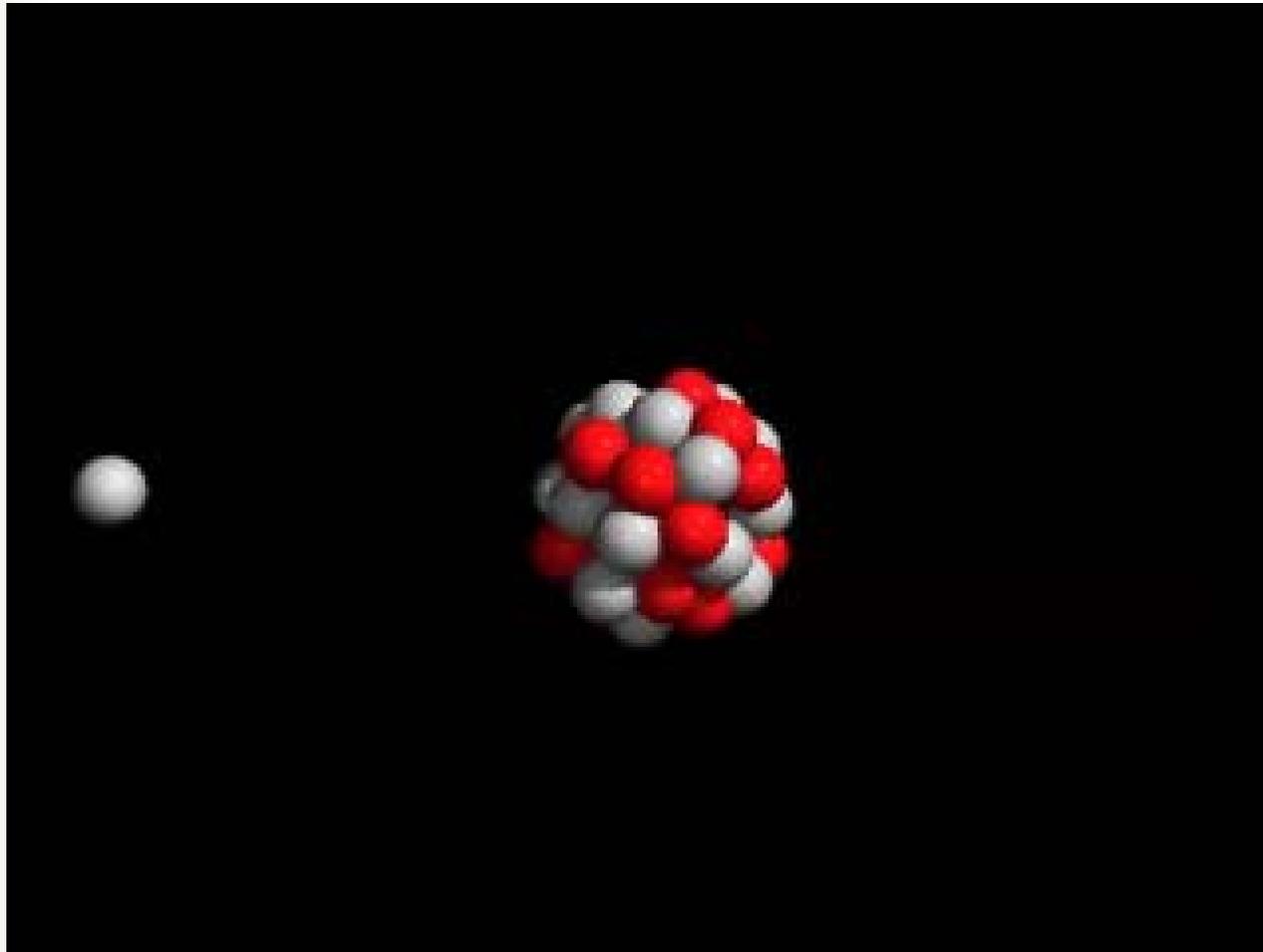
- Everything in the world is made up of tiny particles called atoms
- They are much too small to see
- These are atoms at the tip of a very sharp needle



When you split a uranium atom,  
you get energy



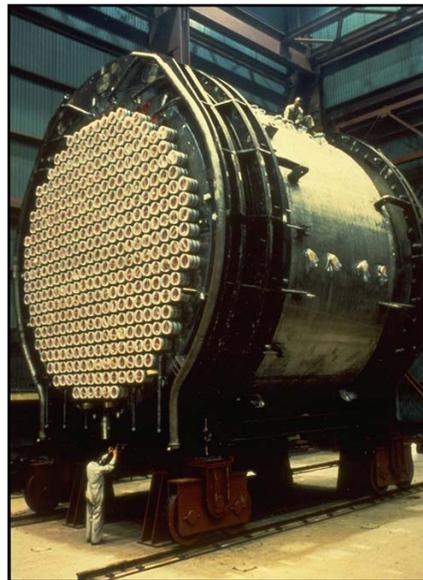
Here's how...



A CANDU nuclear reactor puts uranium and heavy water together in just the right way to keep the atoms splitting



+



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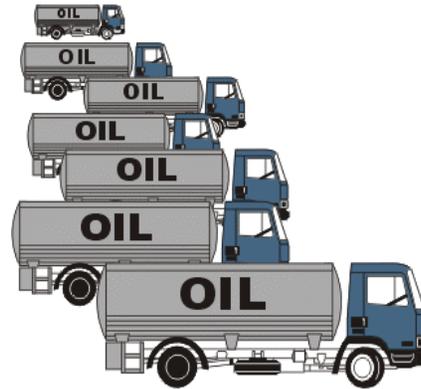




# Dilute and Concentrated

- Energy can be *dilute* or *concentrated*
- *Dilute* – spread out over a large space
  - Solar, wind
- *Concentrated* – lots of energy in a small space
  - Oil, coal, natural gas
- *Very concentrated* – nuclear

# Nuclear vs. Coal – Oil - Gas



**1 CANDU  
fuel bundle  
(50 cm long)**

**400 tonnes  
coal**

**=**

**270,000  
litres  
oil**

**=**

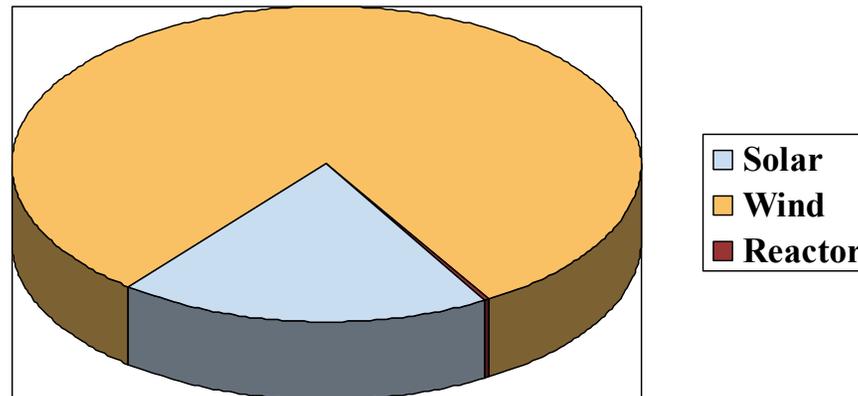
**280,000  
cubic metres  
natural gas**

How many  
windmills  
make one  
nuclear  
reactor?



# How Much Land Does It Need?

1 Pickering reactor	1 square kilometre
Wind power	420 square kilometres
Solar electric power	100 square kilometres



# Solar for Local Heating

Almost every Israeli home has a roof-top solar hot-water system made of solar panels and a hot water tank.



# What are the Advantages?

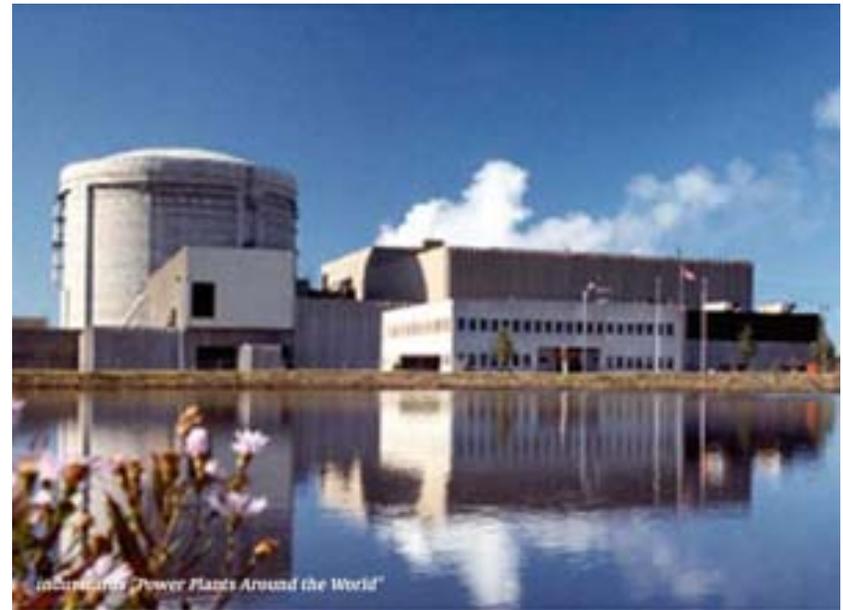
Coal, oil, gas	“Fossil fuels”: Works for cars, heating; easy to transport
Solar, wind	Renewable (fuel is “free”); does not cause global warming
Hydro (water) power	Renewable (fuel is “free”); cheap; does not cause global warming
Nuclear	Partly renewable; cheap; does not cause global warming; wastes are controlled

# What are the Disadvantages?

Coal, oil, gas	Cost; pollution; we will run out of oil/gas
Solar, wind	Cost; uses lots of land; uses lots of steel; amount changes with weather
Hydro (water) power	Takes lots of land; damages ecology; we have already used up most of it
Nuclear	Radiation in accidents & used fuel

# Radiation

- We are surrounded by natural radiation
- Small amounts are not harmful (and may be good)
- Large amounts are harmful
- Nuclear power plants are designed to prevent the escape of radiation in an accident





# My crystal ball for Ontario

- Oil & natural gas will become much more expensive as they run out
- We won't use as much coal because of pollution
- Hydro power will stay about the same
- There will be more nuclear, wind and solar
- Nuclear power will increase and provide most of our electricity

# What Do You Think?

