### Chapter 12 – Nonrenewable Energy Resources

### Reading Guide

**Vocabulary**

Learn the definition of each term. The *italicized* words are not necessarily in the textbook (Check the lecture). The **bold** words require you to know more than just the definition. For example: Ecosystem service - you should what they are, be able to name several types and describe how we benefit from those services.

Nonrenewable fuels

**Fossil fuels**

Commercial energy sources

Subsistence energy sources

**Energy efficiency**

**EROEI**

Electricity

Turbine

Electrical grid

Combined cycle gas plant

Power plant capacity

Capacity

Capacity factor

Cogeneration

**Coal**

Peat

Lignite

Anthracite

Bituminous Coal

Sub-bituminous coal

Peat

**Petroleum**

OPEC

Crude oil

**Exxon Valdez**

**Alaska National Wildlife Refuge**

**Natural gas**

**Liquefied petroleum gas**

Oil sands

Bitumen

Coal-Liquified-Fuel

Energy intensity

Hubbert curve

Peak oil

**Nuclear fission**

Uranium-235

Fuel rods

Containment structure

Core

Generator

Cooling tower

Control rods

**Three Mile Island**

**Chernobyl**

Uranium enrichment

Reactor meltdown

**High-level radioactive waste**

**Low-level radioactive waste**

Uranium mine tailings

Nuclear fusion

**Yucca Mountain**

Phantom load

**Reading Outline**

All energy use has consequences

1. Summarize the risks associated with the following energy sources:
   1. Oil
   2. Coal
   3. Natural Gas

**12.1 Nonrenewable energy accounts for most of our energy use**

1. The 20% of the world’s people who live in developed countries use \_\_\_\_\_\_% of the world’s energy.
2. What are the differences between commercial energy sources and subsistence energy sources? Give a few examples of each.
3. List the major sources of energy in the US from highest percentage to lowest percentage.
4. What are the tradeoffs of using gasoline for cars?
5. Should you buy an electric or gas hot water heater? Why?
6. Imagine you decide to go to college in NYC. List the possible ways you can get from LA to NYC in order of decreasing energy efficiency. How would you choose go to NYC and why?

**12.2 Electricity is a convenient form of energy**

1. Put the following steps of electricity production in order:
   1. \_\_\_\_\_\_ the electrical grid distribute the electricity to homes and businesses
   2. \_\_\_\_\_\_ the electricity is transported to the electrical grid
   3. \_\_\_\_\_\_ the fuel is burned
   4. \_\_\_\_\_\_ the generator creates electricity
   5. \_\_\_\_\_\_ the heat is used to boil water
   6. \_\_\_\_\_\_ the steam is used to turn a turbine
   7. \_\_\_\_\_\_ the turbine turns the generator
2. Which of the steps above would you skip if the energy came from flowing water or wind?
3. What is cogeneration and how does it improve efficiency?

**12.3 Fossil Fuels provide most of the world’s energy**

1. List the types of coal in order highest energy content to lowest energy content. Include peat.

**12.4 Fossil fuels are a finite resource**

1. What question do we need to be asking in light of limited supplies of fossil fuels and global climate change? How might the answer to this question play out?

**12.5 Nuclear is getting a second look**

1. What is the difference between fission and fusion? Which one do we use in nuclear power plants?

**Working toward sustainability: Meet TED: The Energy Detective**

1. How might feedback change energy behavior?
2. What is a phantom load?

Additional Work:

Answer the **MC questions AND FRQ #2** at the end of the chapter.

**Chapter 13 : Achieving Energy Sustainability**

**Reading Guide**

**Vocabulary**

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Nonrenewable

Potentially renewable

Nondepletable

Energy conservation

**Tiered rate system**

Peak demand

Brownout

Blackout

**Sustainable design**

**Passive solar design**

Thermal inertia

Biofuels

**Modern carbon**

**Fossil carbon**

Carbon neutral

Net removal (forests)

**Solid biomass**

**Ethanol**

Flex-fuel vehicles

**Biodiesel**

**Hydroelectricity**

Run-of-the-river

Water impoundment

Tidal energy system

Fish Ladder

Siltation

Box cooker/solar oven

**Passive solar heating**

**Active solar energy**

Solar water heating

Photovoltaic solar cells

**Concentrated Solar Thermal**

**Geothermal energy**

**Ground source heat pump**

**Wind energy**

Wind turbine

**Fuel cell**

Hydrogen gas

Electrolysis

**Electrical grid**

**Smart Grid**

Capacity

*Cogeneration*

*Energy efficiency*

*Low E windows (*[*http://www.lowenergyhouse.com/low-E-glass.html*](http://www.lowenergyhouse.com/low-E-glass.html)*)*

*Triple Glazed windows (*[*http://www.lowenergyhouse.com/triple-glazed-windows.html*](http://www.lowenergyhouse.com/triple-glazed-windows.html)*)*

*Waste-to-energy*

**Reading Outline**

Energy from the Moon

1. How do you capture energy from the moon?
2. What are the advantages? Disadvantages?
3. Where would the use of moon energy make the most sense? Why?

**What is renewable energy?**

1. Differentiate between nonrenewable, potentially renewable and nondepletable energy sources. Include a few examples of each.
2. Which of the above categories does electricity fall into? Why?

**How can we use less energy?**

1. List some ways to conserve energy include home, transportation and devices.
2. List the benefits of energy conservation.
3. When does peak demand generally occur, and what problems does it present?
4. How can you use the albedo effect and light or dark colored surfaces to heat/cool a home? Include thermal inertia in your answer.

**Biomass is energy from the sun**

1. What is the difference between modern carbon and fossil carbon? Why is modern carbon only carbon neutral in theory?
2. How does logging impacts atmospheric CO2? Can logging be sustainable? Why or why not?
3. What are the pros and cons of charcoal as a fuel? Manure?

The kinetic energy of water can generate electricity

The Sun’s energy can be captured directly

Earth’s internal heat is a source of nondepletable energy

Wind energy is the most rapidly growing source of electricity

Hydrogen fuel cells have many potential applications

***All covered in Energy Charts- Study these charts in detail.***

**How can we plan our energy future**

1. What are the components of a sustainable energy strategy?
2. What improvements need to be made to our energy grid? How does a smart grid improve efficiency?
3. How is pumping water uphill a good use of resources?

**Working toward sustainability: Building an Alternative Energy Society in Iceland**

1. How does Iceland make use of its domestic energy sources?
2. How is Iceland planning to replace fossil fuels for transportation?

Additional Work:

Answer the MC questions.