



Energy & the Environment

Environmental Problem Sources

☐ Philosophy

- ◆ Lifestyles that emphasize consumption
- ◆ Consumption vs. Quality
 - ⇒ Yugo vs. Mercedes
 - ⇒ Disposal ball point pens
 - ⇒ Fast food packaging

Environmental Problem Sources

☐ Combustion & air pollutants

- ◆ *Incomplete* combustion
 - ⇒ Carbon monoxide
 - ⇒ Volatile hydrocarbons
 - ⇒ Soot and smoke

Environmental Problem Sources

☐ Combustion & air pollutants

- ◆ *Complete* combustion products
 - ⇒ Carbon dioxide (primary “Green house gas”)
 - ⇒ Nitrogen oxide
 - ⇒ Sulphur dioxide
 - ⇒ Heat

Environmental Problem Sources

☐ Use of Non-Renewable Resources

- ◆ Example: Lead
 - ⇒ It is a “valuable” pollutant
 - ⇒ Finite quantity in earth
 - ⇒ Dispersing of lead in air and water
 - ⇒ Contamination
 - ⇒ Unsalvageable

Environmental Problem Sources

☐ Affluence

- ◆ Use beyond needs
 - ⇒ “Why have two hats when you can wear only one at a time?”
- ◆ Wasteful of resources
- ◆ Not morally justifiable in a world of starvation

Air Pollution

- Primary pollutants
 - ◆ Discharge directly to air (SO_2)
- Secondary
 - ◆ Formed by reactions in atmosphere
 - SO_2 causes Acid Rain

Air Pollution— Three Categories

- Contamination of local air
 - ◆ Automobile exhaust
 - CO and O_3
- Regional air pollution
 - ◆ Low altitude ozone & acid rain

Air Pollution— Three Categories

- Global pollution
 - ◆ Stratospheric ozone destruction (CFCs)
 - ⇒ Fix: Fluoroflorocarbons (FFCs)?
 - ◆ Global warming

Global Warming

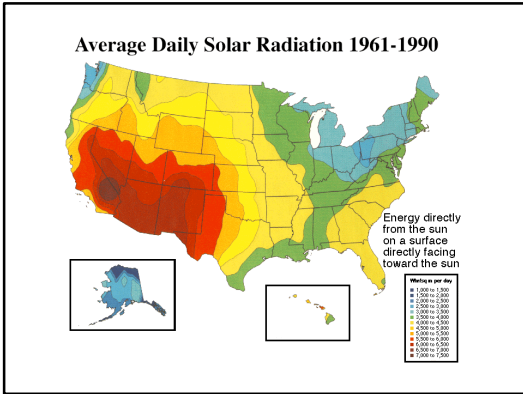
- “Greenhouse” effect
- Three major gases
 - ◆ Carbon Dioxide (CO_2)
 - ◆ Methane (CH_4)
 - ◆ Chloroflorocarbons (CFCs)
- Natural “disasters”

Heat Engines

- Thermal Efficiency
$$\eta_{\text{thermal}} = 1 - (T_L/T_H)$$
Where T_L & T_H are absolute temperatures ($0^\circ\text{K} = -273^\circ\text{C}$)
- Steam to Ice ⇨ 26.8% max.

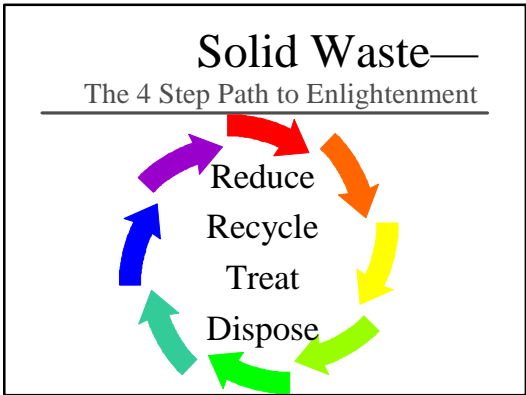
Forms of Solar Energy

- Fossil Fuels
 - ◆ Coal
 - ◆ Gas and Oil
- Biomass
- Geothermal
- Nuclear



- ## Lighting
-
- Incandescents—75 Wt bulb
 - ◆ Inexpensive—75¢ each
 - ◆ Mostly HEAT
 - ◆ 16 Lumens/watt
 - ◆ Operating life: 1000 hours
 - ◆ Total cost for 10,000 hr: \$78.89

- ## Lighting
-
- Compact Florescent—20 Wt bulb
 - ◆ Expensive—\$29 each
 - ◆ Mostly LIGHT
 - ◆ 60 Lumens/watt
 - ◆ Operating life: 10,000 hours
 - ◆ Total cost for 10,000 hr: \$48.71



- ## Hazardous Waste
-
- 300 Million tons/year in US
 - Characteristics of “Hazardous Waste”
 - ◆ Flammable
 - ◆ Corrosive
 - ◆ Reactive
 - ◆ Toxic

- ## Hazardous Waste
-
- Waste Minimization
 - ◆ High cost of disposal
 - Land Ban
 - ◆ No more “dumping”
 - Treatment
 - ◆ EPA specs (expensive)

CERCLA— “Superfund”

- ❑ Comprehensive Environmental Response, Compensation, and Liability Act
- ❑ Fixes responsibility and provides a source of funds
- ❑ Over 30,000 sites
- ❑ Estimated cost of cleanup is *over 20% value of nation*

Local Dump Sites

- ❑ Bumpass Cove
 - ◆ Embreeville
- ❑ East Tennessee Chair
 - ◆ Elizabethton
- ❑ C&C Millwrights
 - ◆ Greeneville

L U S T— East Tennessee Style

- ❑ LUST—Leaking Underground Storage Tanks
- ❑ Region: approx. 4000 sites
 - ◆ 3 to 6 tanks per site
- ❑ Avg. cleanup cost: \$125,000

Spaceship Earth. . .

It's all we have!

