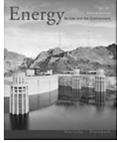


## EVSS 650: Energy Production & Resource Management



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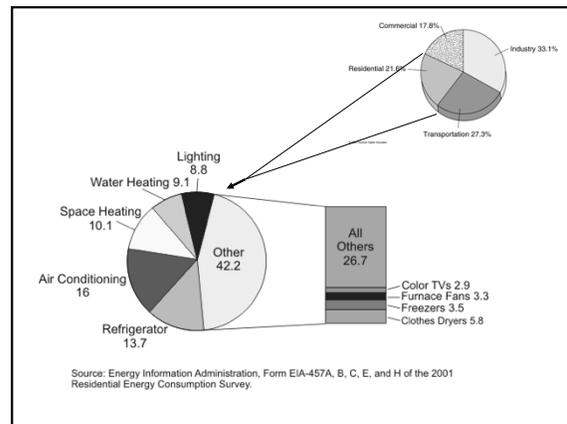
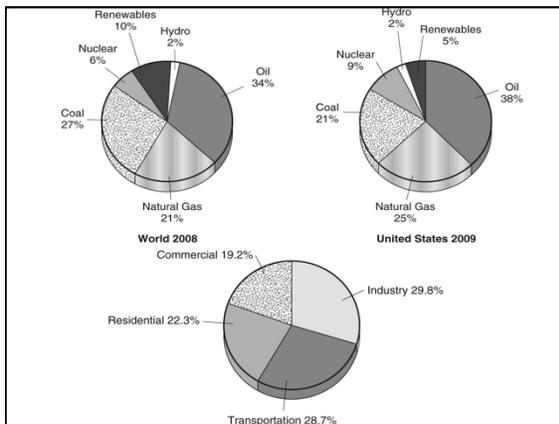
WWW: <http://neffj.people.cofc.edu/>

### Outline for Today:

- I. Why "Energy Production"? Why "Resource Management"?
- II. Why Physics? Why am I teaching this course?
- III. Why are you here? What would you like to learn?
- IV. Our Plan of Attack

## How does society USE energy?

- transportation
- artificial lighting
- indoor climate "control"
- storage and preparation of food
- production of food (agriculture)
- raw material for all manufacturing and construction
- communication & information technology
- leisure and recreation
- production and distribution of energy itself!
- others?

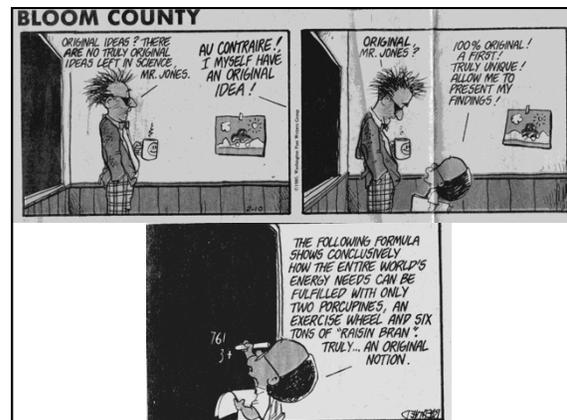


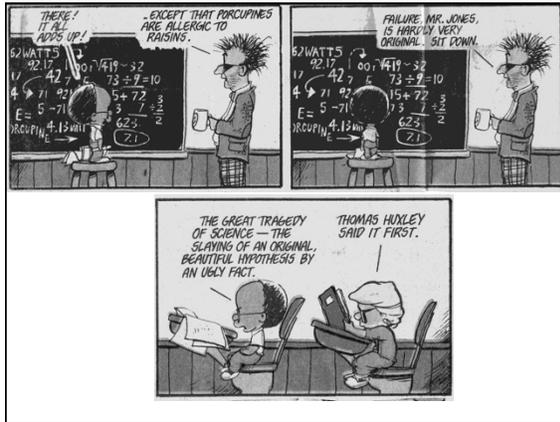
Source: Energy Information Administration, Form EIA-457A, B, C, E, and H of the 2001 Residential Energy Consumption Survey.

## What IS energy ?

or... Why is this a Physics Class?

- Not tangible; can't see, hear, feel, smell, taste, or touch it
- A measure of *ability* or *capacity* to perform "actions"
  - generally motion or heat
  - Also: a measure of how much action was performed.
- Transferred, stored, applied using electricity, machines, etc.
- Provided "free" by nature:
  - 4 "fundamental forces"
  - action at a distance: e.g. gravity, electromagnetic radiation
  - atomic (chemical) bonds, nuclear fission, nuclear fusion
  - mass-energy equivalence  $E=mc^2$
- If we are clever enough to understand the underlying physics, there is no need (or even ability) to "run out" of energy





## Energy and the Environment

- **Limiting factor** : environmental consequences
- In order to understand the environmental consequences, you will need a firm understanding of how energy is *produced, distributed, stored, and applied*
- Different mechanisms have different impact, but...
- Energy In --> Useful Work (or heat) + Waste
  - waste is always present
  - waste takes many forms
  - waste doesn't have to be harmful, but frequently it is

- Our lifestyle and economy are on a collision course with these *environmental* limitations
  - fundamental changes are needed (and soon!)
  - there is no magic cure on the production side
  - biggest needs: better understanding of physics & better accounting
  - significant changes in business, governmental, and societal practices
  - conservation and efficiency will always be critical
- We will emphasize the *methods*, but we will be mindful of the *implications*

## Some Things We'll Cover

- Physical and mathematical fundamentals
  - mathematics of exponential growth
  - force, work, power, conservation of energy
  - thermodynamics
  - electricity and magnetism; electromagnetic radiation
  - atomic and nuclear physics
  - local and global environmental impact
- Methods of Energy production, conversion, distribution, storage
- Importance of Conservation, Efficiency, Recycling
- Renewable v. Non-Renewable

## Some Important Points From Video

- The amount added in each doubling cycle is equal to the **TOTAL** of all that came before!
- Zero population growth **MUST** happen, either by human intervention or by natural processes
- Bacteria in a bottle double every minute from 11 AM to Noon. For humans, 1 “minute” ~ 35 years (2% growth rate). What do 11 AM and Noon represent?
- ~2% population growth rate --> 7% growth in energy consumption in US! (it's less now)



I'll make you the same offer. Will you accept it?