

Energy and Energy Policy

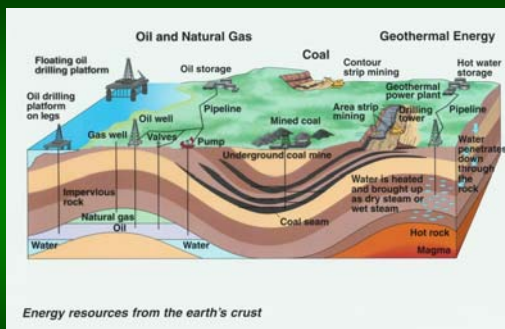
- The developed world uses most of world energy
 - U.S. has 4.4% of world population – uses 24% of the energy
 - India has 17% of world population – uses 3% of the energy
- Energy use in U.S. and Canada is 2x of Japan
 - 100x of China and India

Problems

- Depletion of Fossil Fuels
 - What do we do next
- Pollution
 - Air Pollution
 - Hazardous waste
- Environmental Impact of fuel extraction
 - Mining
 - Hydropower

Fossil Fuels

- Oil
- Natural Gas
- Coal



Oil

- Great Fuel
- We are using it up
 - 53 years of supply at current usage rates
 - Will use up 80% of known and projected supplies in 42 to 92 years
 - Peak production of oil could occur in 2004 (the Hubbert Peak)
- Problems of foreign sources
 - Year 2000 57% came from abroad
 - Easy to get sources in US are used up
- We will have to figure out another source of fuel

Natural Gas

- Even better fuel than oil
- Found with oil
- Low pollution
- Often just flared off at oil well
- Pipelines, Liquefied Petroleum Gas (LPG)
- 125 years of consumption for the world

Flaring off Natural Gas



LNG Ship



The Good News – Coal – There is lots of it

- Provides 22% of world's energy
- 225 years of proven coal reserves
- Could last 900-1,125 years depending of rate of use
- Illinois is the Saudi Arabia of Coal



Longwall Mining
80% recovery



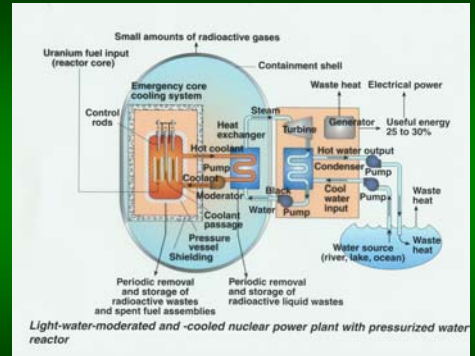
Surface Mining
Environmental Problems

The Bad News - Coal

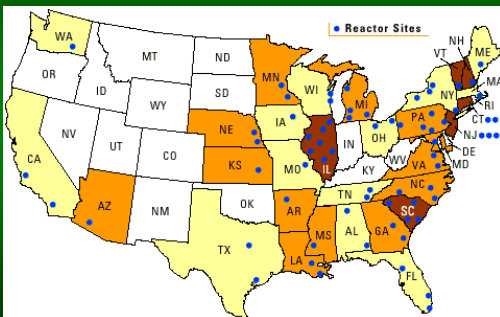
- Highly Polluting
 - Air Pollutants
 - Sulfur
 - Particulates
 - Land disturbance from mining
 - Surface Mining
 - Shaft Mining
 - Illinois is the Saudi Arabia of High Sulfur Coal
- These problems are not insurmountable
But, Its Gonna Cost ‘Ya
 - Stack Scrubbers
 - Reclamation

The REALLY Bad News - Nuclear

- Nuclear Fission
 - How does it work?
- 6% of world's commercial energy (16% of electricity)
 - Prediction in 1950 was that we would have 21% of world's commercial energy
- What happened?



Energy Generated by Nuclear Power: 1995
Roll over a state to view a list of its reactors
Source: DOE/EIA Electric Power Monthly



Problems with Nuclear

- Safety
 - Chernobyl
 - Three Mile Island
- What to do with Waste
 - High level waste
 - Lethally radioactive
 - Keep from groundwater
 - Store for thousands of years



In the End, There are Better Alternatives than Nuclear Energy

But, what do we do as the fossil fuel runs out?

Alternatives

- Conservation
- Hydropower
- Geothermal
 - Wind
- Biomass

Conservation

- The estimate is that 41% of Energy used in US is wasted
- How to solve the problem
 - Hybrid Cars
 - Better Energy Usage in Homes

Hydropower

- Wow! Safe, non-polluting power from rivers – What could be better???
- There is not much more hydropower to be had
 - Most rivers that can be dammed in the US have been
 - Immense ecological damage to the stream that is dammed
 - Migratory fishes - salmon

Geothermal

- Hot rocks in volcanic areas
- Good source of power when it is available
 - Some locations in California
 - Iceland



(Data from Canadian Geothermal Resources Council)

Major deposits of geothermal resources

Biomass



National Corn to Ethanol Pilot plant located on the SIUE Campus

- Another Illinois favorite
- Use corn to make ethanol – gasohol
- In development stage
- At least it can replace MTBE
- Does it really yield more energy than it takes to make it?

Wind

- Lots of Potential
 - Now supplies only 1% of the Energy in the US
 - 13% of electricity in Denmark
- Problem that you need steady winds



Solar

- Solar heating of houses
- Photovoltaics
- Solar thermal plants
- Solar energy and the hydrogen economy

Photovoltaic Cells



Nuclear Fusion

- Great idea
- No success yet – maybe never

Sustainable Energy Supply

- Ultimately, we will use up the fossil fuels
- We will need a sustainable energy supply to continue
- Miller's ideas
 - There will be a shift from large, centralized power systems to local systems
 - Improve energy efficiency and use natural gas to transition to renewable energy sources
 - Over the next 50 years we are fated to continue to use fossil fuels
 - We will need to reduce the environmental problems from fossil fuels
 - We need to improve energy efficiency and bring renewable energy sources on line