Petroleum Exploration

Drilling, mapping, and geophysical exploration of subsurface “structure”.

Petroleum Production

Primary Recovery: Uses natural pressure in the reservoir to move oil to well. It’s a confined aquifer! Only about 25% of the oil can be recovered this way.

Enhanced Recovery: Injection of gas, water, steam to push petroleum to pumping wells. Increases recovery to 50-60%.

Coal Exploration

Coal Production

• Most of the coal in the US is currently surface mined.

• Just within the last 30 years more coal is mined from the west of Mississippi than from the east.
History of Fuel Use

Wood to Coal (steam engine)
Coal to Oil/Gas (internal combustion engine)

Whose Using It?

- Technological societies use the most energy.
- Develop countries (technological and industrial societies) make up 25% of the world's population, yet use 75% of the world's energy resources.

Supply and Demand for Oil

- 500 billion barrels of oil have been consumed worldwide.
- 200 billion barrels of oil have been produced and consumed in the US.
  - Currently using about 7 billion barrels per year.
  - 1 barrel = 42 gallons
- Recent consumption rates have rapidly increased.
- Proven reserves are estimated at 1 trillion barrels.
  - Unevenly distributed around the world.
- US has less than 23 billion barrels of proven reserves (including ANWR).
  - US production is in decline.
  - US is heavily dependent on oil imports.

Energy Fluxes in the U.S. Economy (short version)

- 90% of energy used are non-renewable fossil fuels (oil, coal, gas)
- 40% is oil and we import half of that
- 49% of energy used is lost as waste heat
Supply and Demand for Natural Gas

• About 25% of energy used in U.S. is natural gas.
  - 20 trillion cubic feet consumed most years
  - 200 trillion cubic feet or proven reserves with limited new reserves found each year.

• U.S. is a major natural gas importer.

How long will it last?

• We’ve already reached peak production... meaning we’ve already used half of what we think is there!

Coal Reserves and Resources

• Provides about 20% of U.S. energy supply
  - More than 50% of electric power generation

• Estimated world reserves of 1 trillion tons
  - Estimated 10 trillion tons in total resources

• Estimated US reserves of over 270 billion tons of recoverable coal
  - Estimated 2.7 trillion tons in total resources

<table>
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<th>Year</th>
<th>Crude Oil (billions of barrels)</th>
<th>Natural Gas (trillions of cu ft)</th>
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<tr>
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<td>28.3</td>
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Future Prospects

- What do you expect to happen to oil production?

How long will coal last?

- Coal is abundant. May be the fuel of the future...
- Undiscovered resources: Enough to last 900 years!

How will you live in the post-petroleum era?