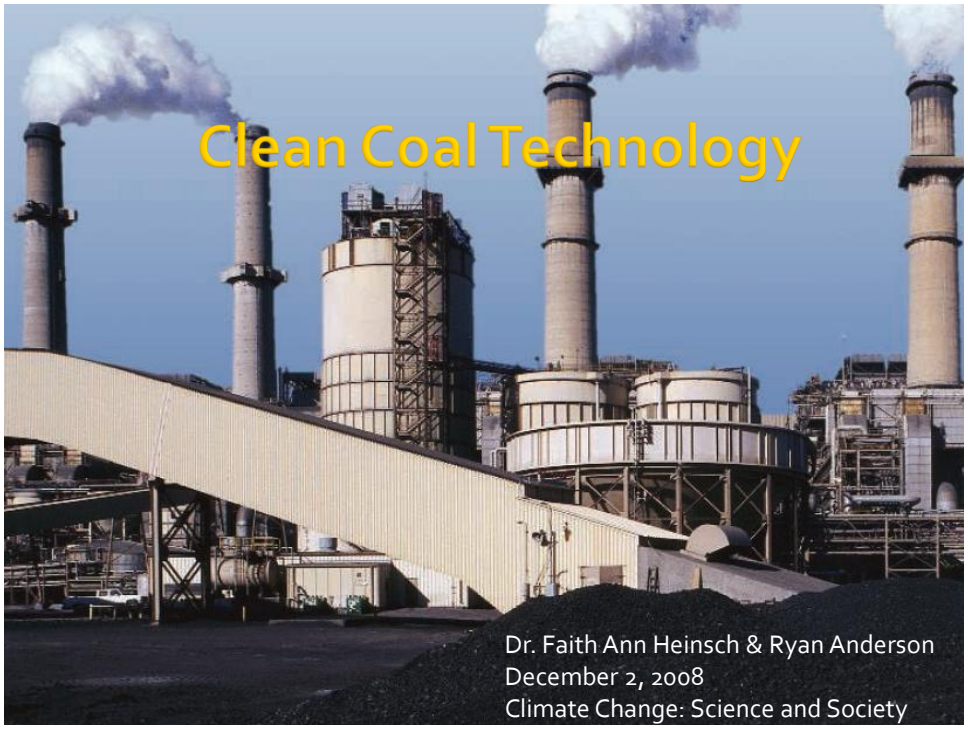


Fuel needed to run a 100-W light bulb for one year (876 kWh, or 3153.6 MJ)

(The fuel quantities below assume 100% conversion efficiency. As most power generation/distribution systems only achieve 30% - 35% efficiency, the actual quantity of fuel used to power a 100 W light bulb in your home will be about three times the quantity shown.)

- 166 kg of wood
- 117 to 210 kg (257 to 462 lb) of coal
- 73.34 kg (161.6 lb) of kerosene
- 78.8m³, of natural gas
- 58 kg of Methane
- .006 kg (.014 lb) of uranium

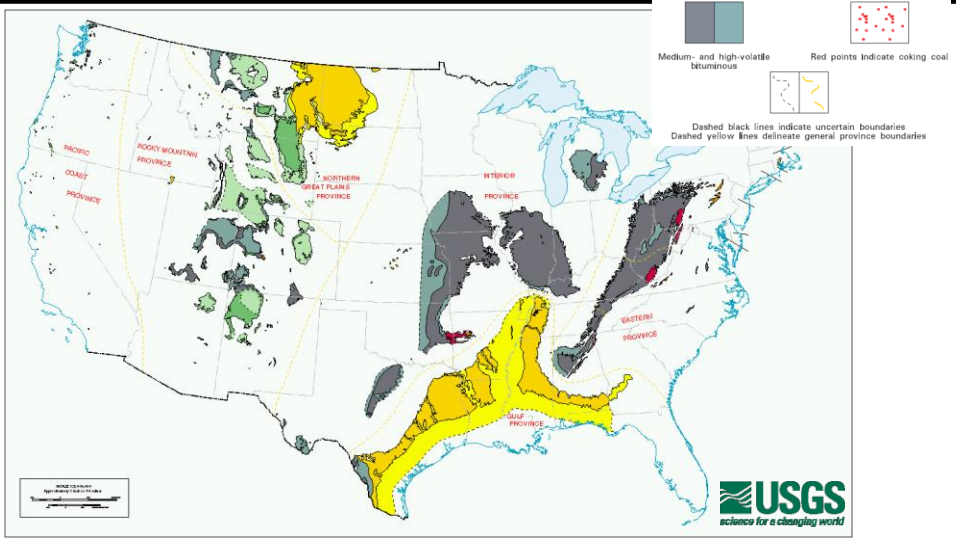
Types of Coal (in order of C Content)

- Anthracite
  - Carbon content (86-98%); Heat value = 15,000 BTUs/lb
  - Most frequently associated with home heating
  - 7.3 billion tons of reserves in the U.S.; mostly in 11 northeastern PA counties
- Bituminous
  - Carbon content = 45-86%; Heat value = 10,500 – 15,500 BTUs/lb
  - Most frequently used to generate electricity and make coke for steel industry
  - Most plentiful form of coal in U.S.
- Sub-bituminous
  - Carbon content = 35-45%; Heat value = 8,300 – 13,000 BTUs/lb
  - Lower sulfur content than other types = cleaner burning
  - Reserves in half-dozen Western US states and Alaska
- Lignite
  - Carbon content = 25-35%; Heat value = 4,000-8,300 BTUs/lb
  - Mainly used for electric power generation
  - Sometimes called brown coal; Geologically young

U.S. Coal Regions

U.S. Proved recoverable coal reserves at the end of 2006

- 111,338 million tonnes of Bituminous & Anthracite
- 135,035 million tonnes of Sub-Bituminous & lignite



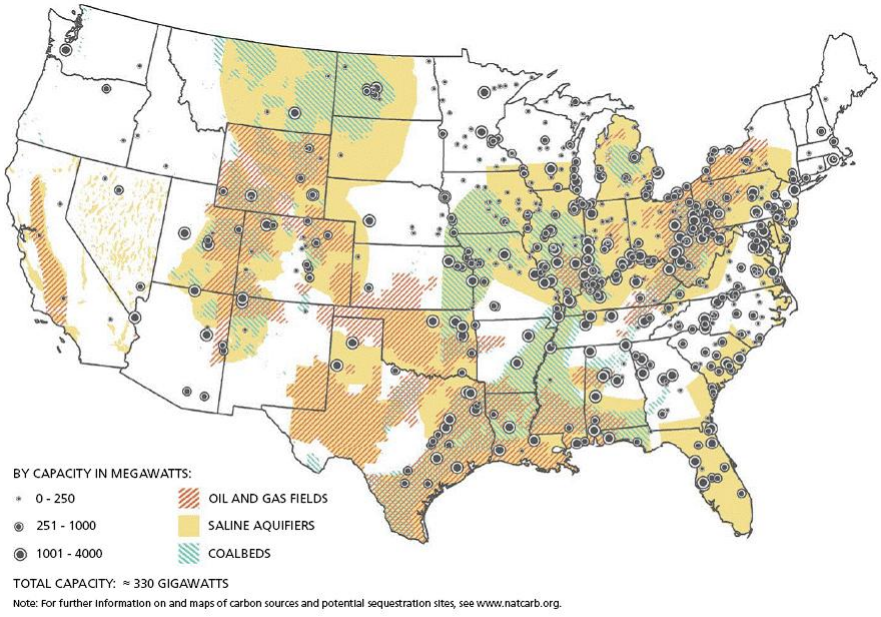
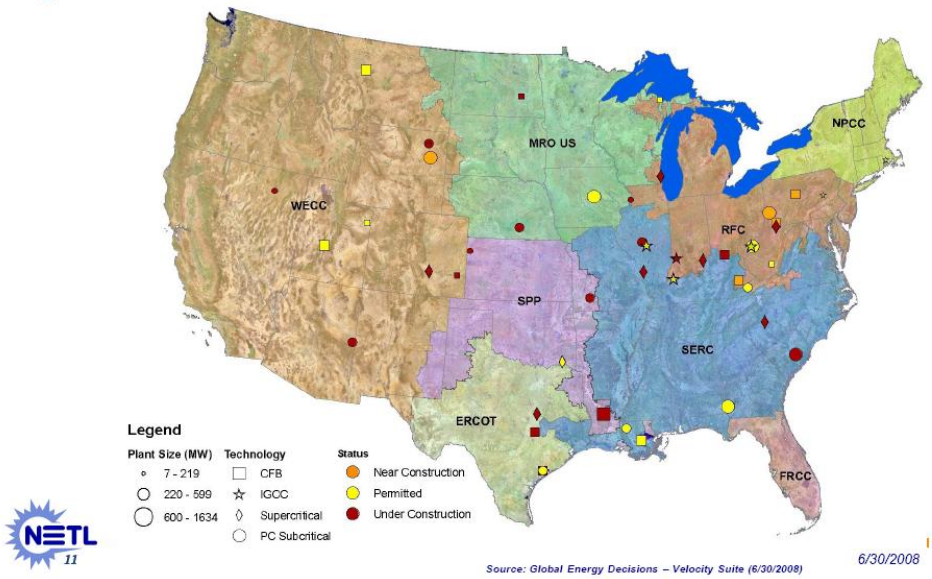


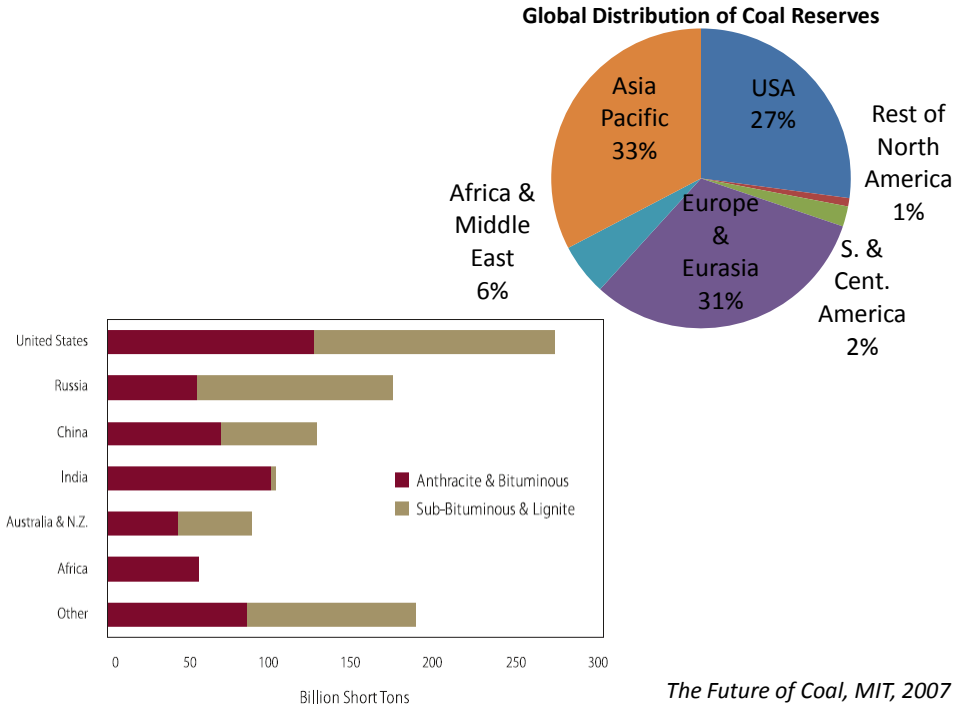
FIGURE 5-3. *U.S. Coal-Fired Power Plants (2000) and Potential Sequestration Sites*

Geographical Map by NERC Regions: Coal-Fired Plants

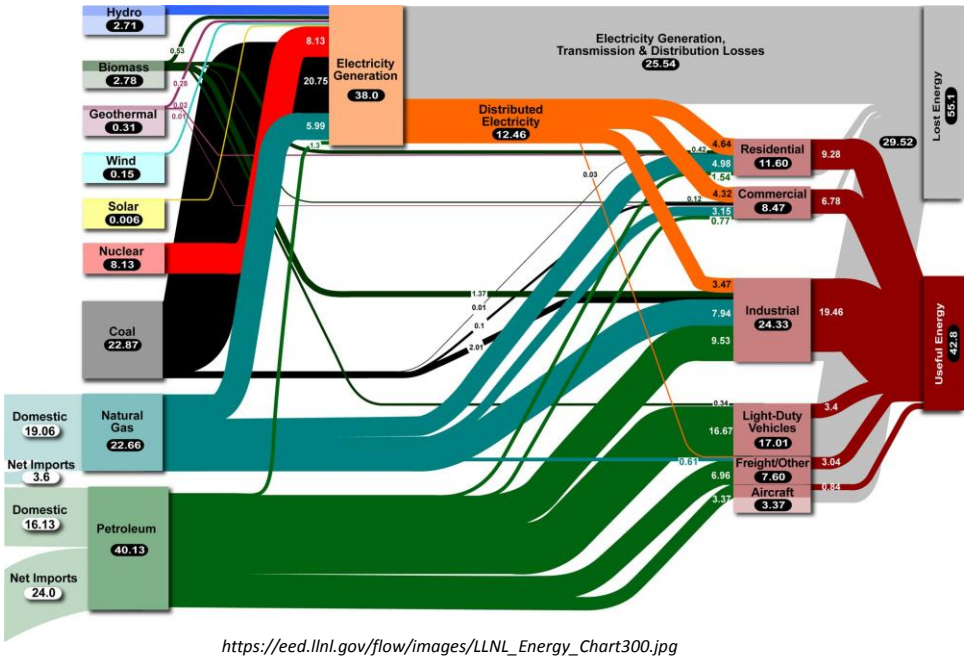
(Permitted, Near Construction, and Under Construction)

Figure 4

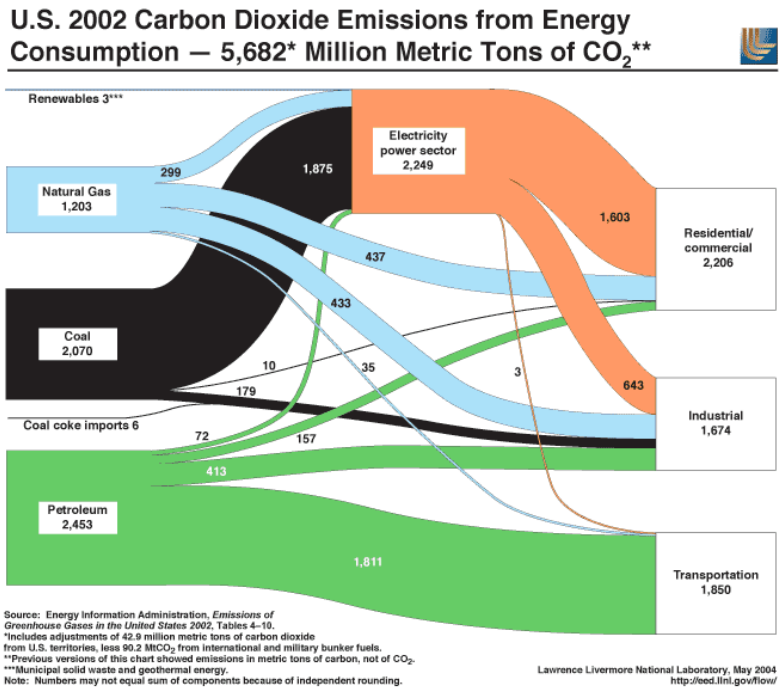


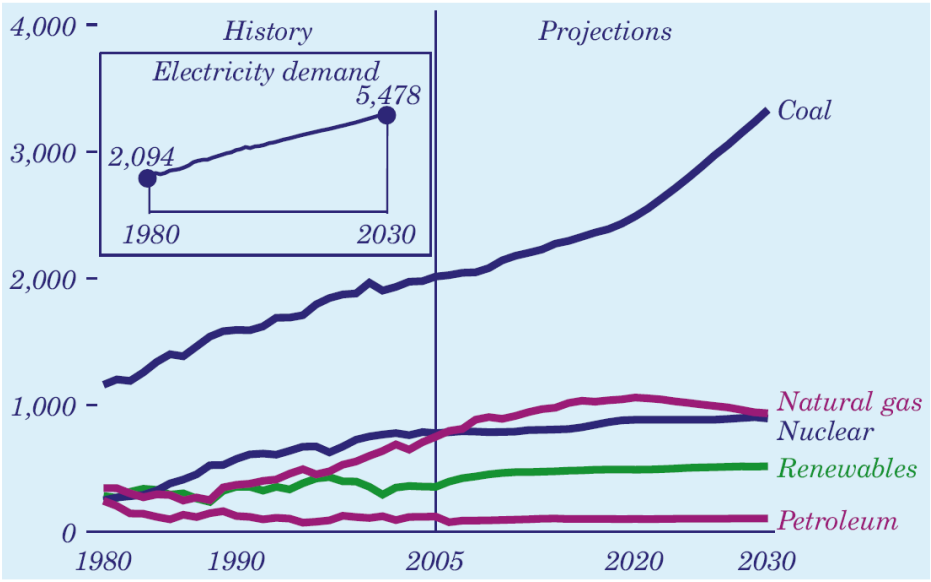


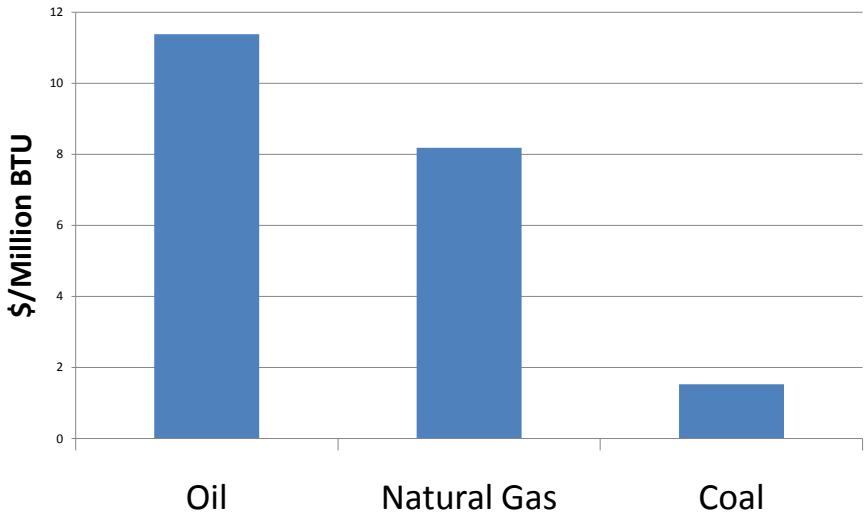
The Future of Coal, MIT, 2007



https://eed.llnl.gov/flow/images/LLNL_Energy_Chart300.jpg


U.S. 2002 Carbon Dioxide Emissions from Energy Consumption — 5,682* Million Metric Tons of CO_2**
Renewables 3***
Natural Gas 1,203
Coal 2,070
Coal coke imports 6
Petroleum 2,453
Electricity power sector 2,249
Residential/ commercial 2,206
Industrial 1,674
Transportation 1,850
299
1,875
1,603
437
433
10
179
35
3
643
72
157
413
1,811
Source: Energy Information Administration, Emissions of Greenhouse Gases in the United States 2002, Tables 4–10.
*Includes adjustments of 42.9 million metric tons of carbon dioxide from U.S. territories, less 90.2 MtCO2 from international and military bunker fuels.
**Previous versions of this chart showed emissions in metric tons of carbon, not of CO2.
***Municipal solid waste and geothermal energy.
Note: Numbers may not equal sum of components because of independent rounding.
Lawrence Livermore National Laboratory, May 2004
http://eed.llnl.gov/flow/


4,000
3,000
2,000
1,000
0
History
Projections
Electricity demand
5,478
2,094
1980
2030
Coal
Natural gas
Nuclear
Renewables
Petroleum
1980
1990
2005
2020
2030



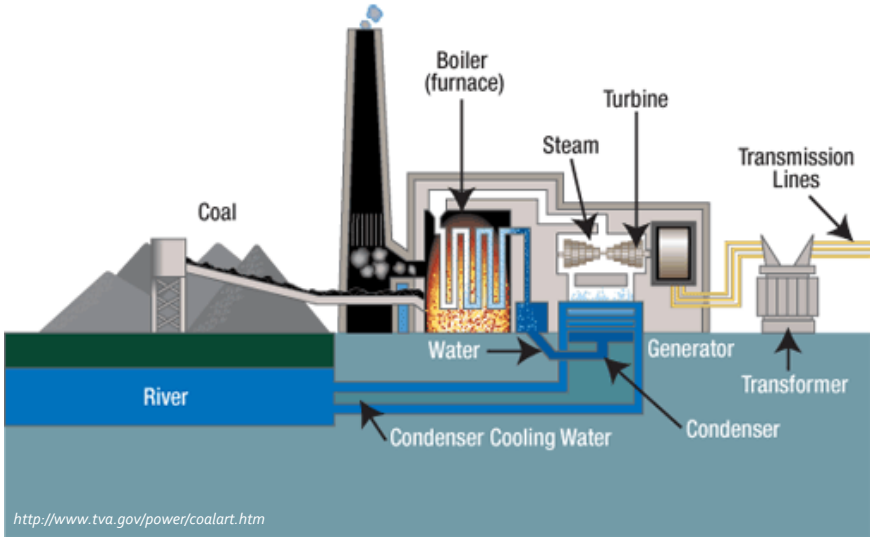
The Future of Coal, MIT, 2007

But…

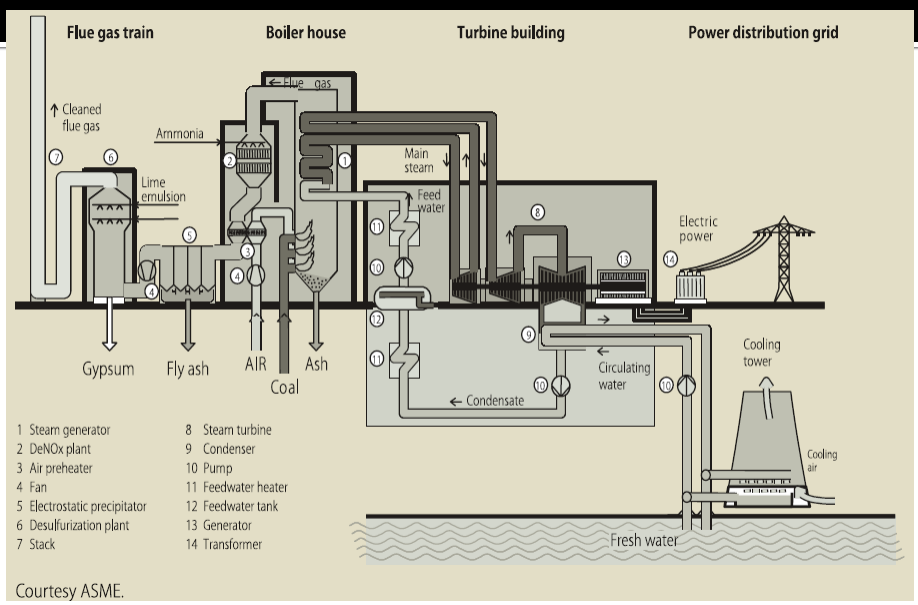
- Carbon intensity of Coal is Very High (92g CO_2/MJ)
- One typical plant = 3 million tons/year CO_2
- US produces 1.5 billion tons/year from coal burning power plants
- If 60% of the US CO_2 from coal were captured for sequestration, it would be **20 million barrels a day**

The Future of Coal, MIT, 2007

Sub-critical Coal-Fired Power Plant



Sub-critical Pulverized Coal System



Courtesy ASME.

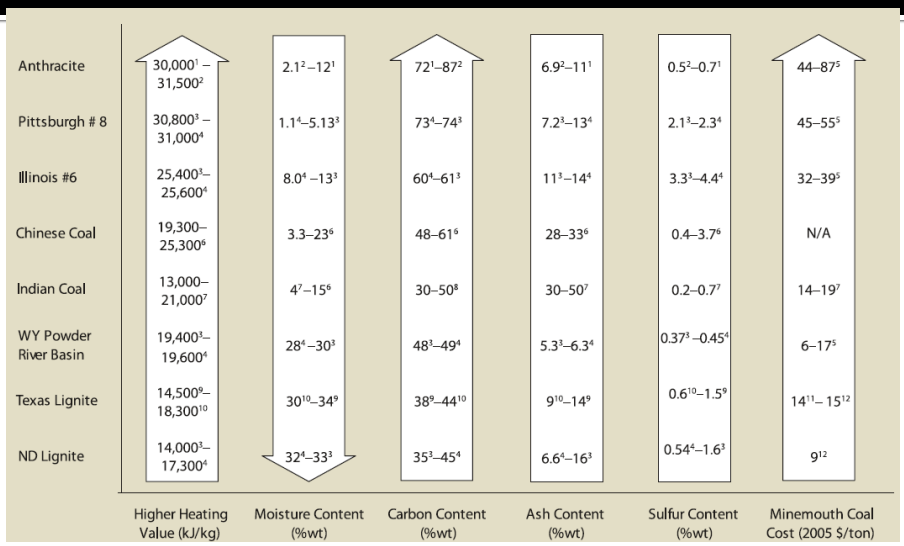
Generating Efficiency

Thermal Energy in Fuel
Electricity Produced

Influenced By:
- Fuel Source
- Plant Design
- Environment

Lower efficiency = More coal burned per unit electricity produced.

Coal Types



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