Electricity Generation

Measurements

Sources

Uses

Electric Currents

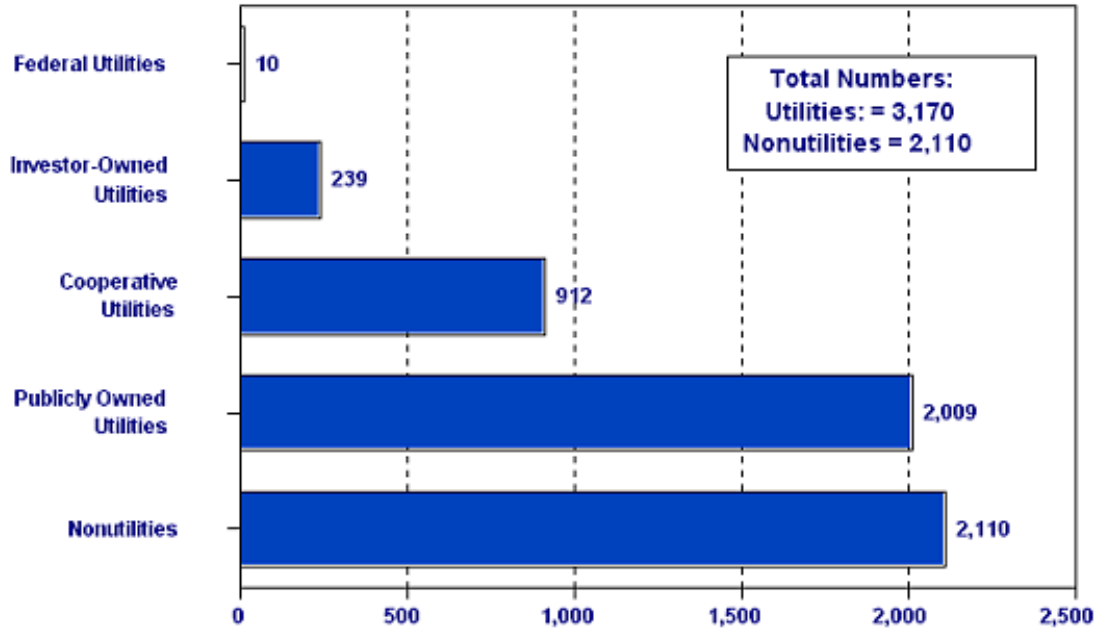
- Types
  - AC: alternating current: magnitude and direction vary cyclically
  - DC: direct current: direction remains constant
- Measurement
  - Volts: potential difference between two points in electric circuit
  - Amps: Unit of electrical current: amount of electrical charge per second

Units of Measure

- Watts: measures amount of electricity = one joule per second (watt= volts*amps)
- Kilowatts: 1,000 watts
- 1 kWh = 1,000 watts working for one hour
- Megawatts: 1,000 kW = 1 megawatt
- Gigawatts: 1,000 megawatts = 1 billion watts

Market Composition

Figure 1. Composition of the Electric Power Industry in the United States, 1998

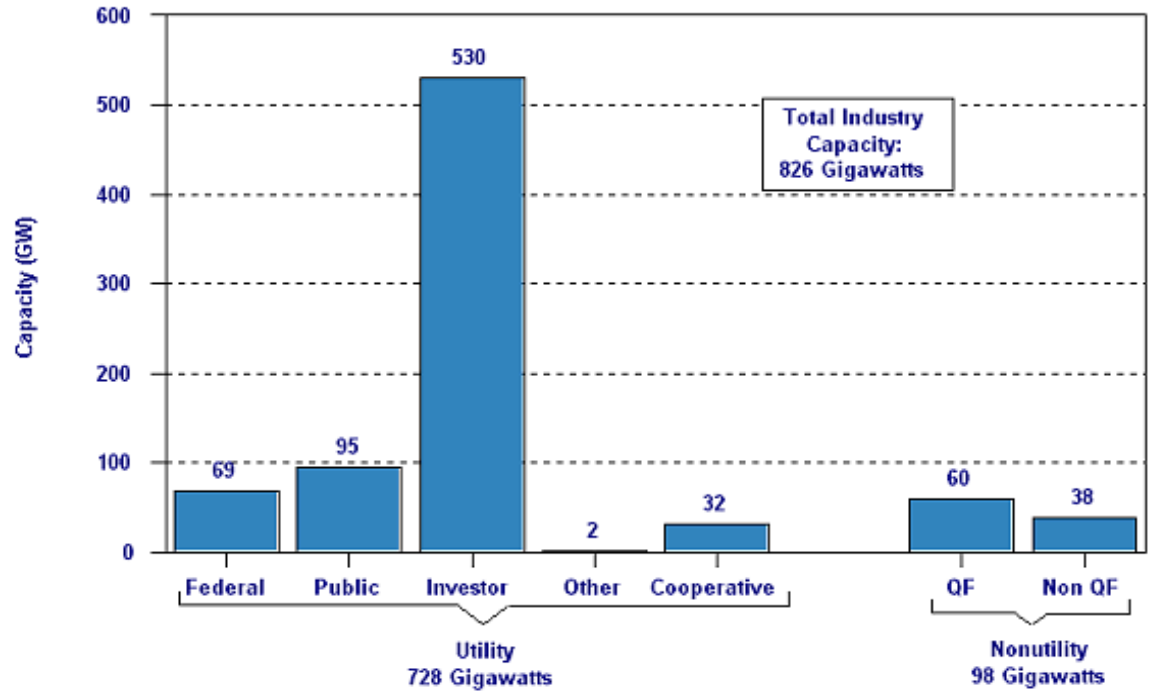


Notes: •Data are final. •Power marketers, Puerto Rico, and U.S. Territories are not included. •Nonutilities represent the number of generating facilities, as these facilities are generally incorporated, and each is required to file Form EIA-860-B.

Source: Energy Information Administration, *Electric Power Annual 1998 Volume II*, page 1.

Market Composition

Figure 3. Electric Industry Generating Nameplate Capacity by Type, 1998



Source: Energy Information Administration, • Utility: *Inventory of Electric Utility Power Plants in the United States 1999*, Table E3, page 344; • Nonutility: *Electric Power Annual 1998 Volume II*, Table 55, page 91.

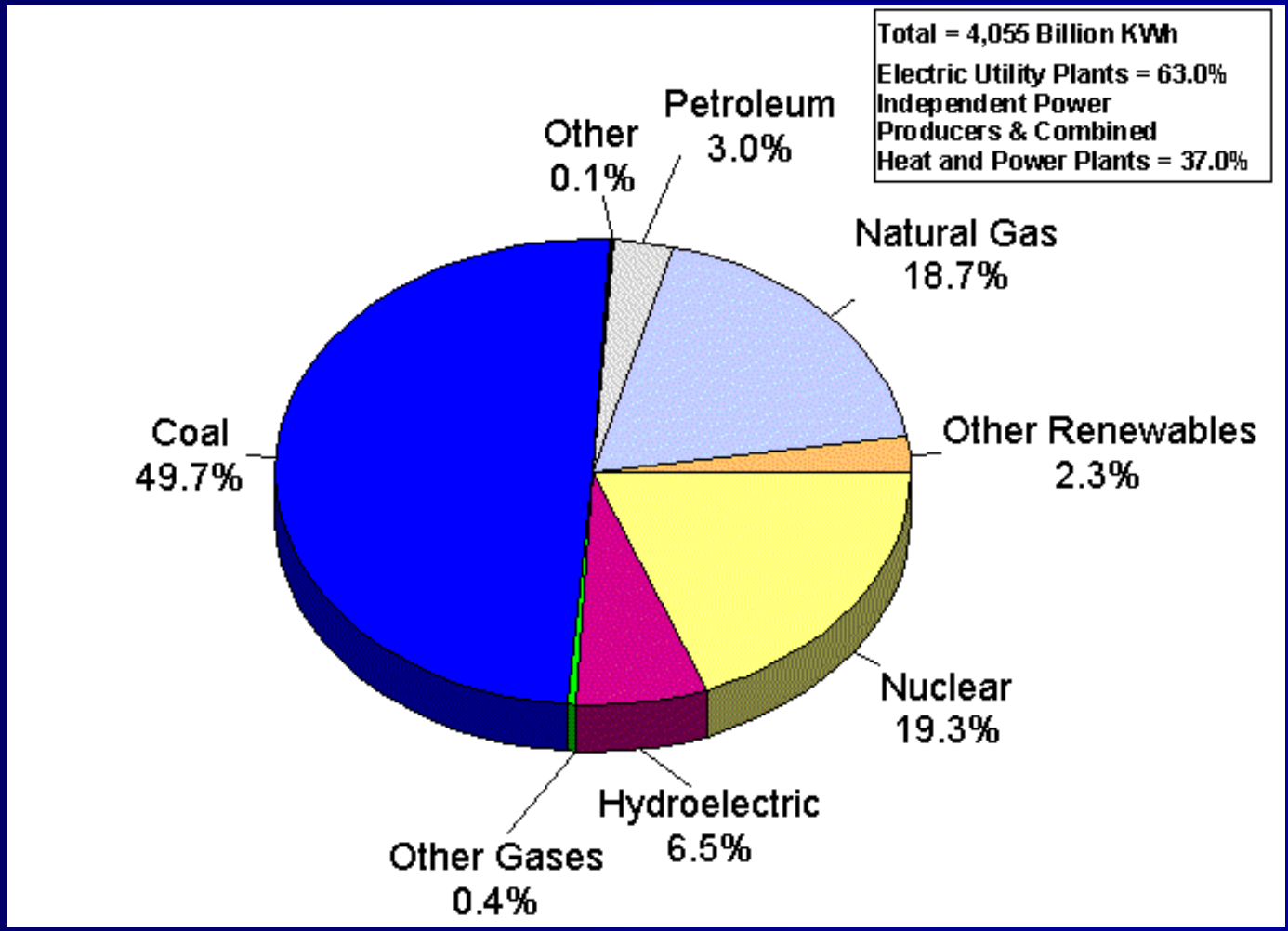
Utilities

- Vertically integrated investor-owned utilities meet 75% of national end users demand
- Consumers divided into sectors: residential, commercial, industrial, & other
- Rate schedule developed by sector
- Price: Average revenue per kilowatthour is cost per unit of electricity sold

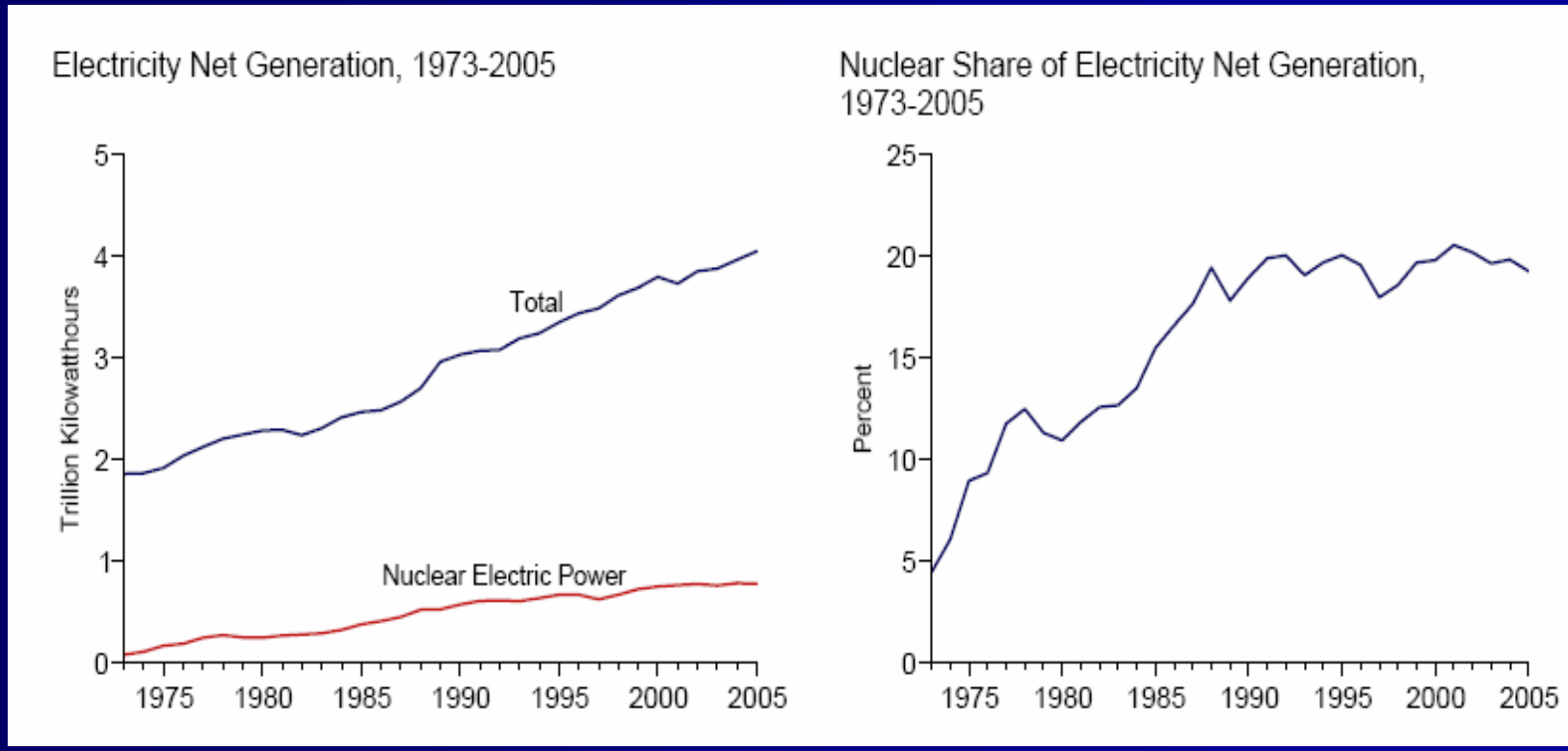
Non Utilities

- 2,110 nonutility power producers
- Regulated under PURPA
- Types
  - Cogeneration plants
  - Independent producers (small renewables, etc.)
  - Wholesale power generators

Sources of Electricity

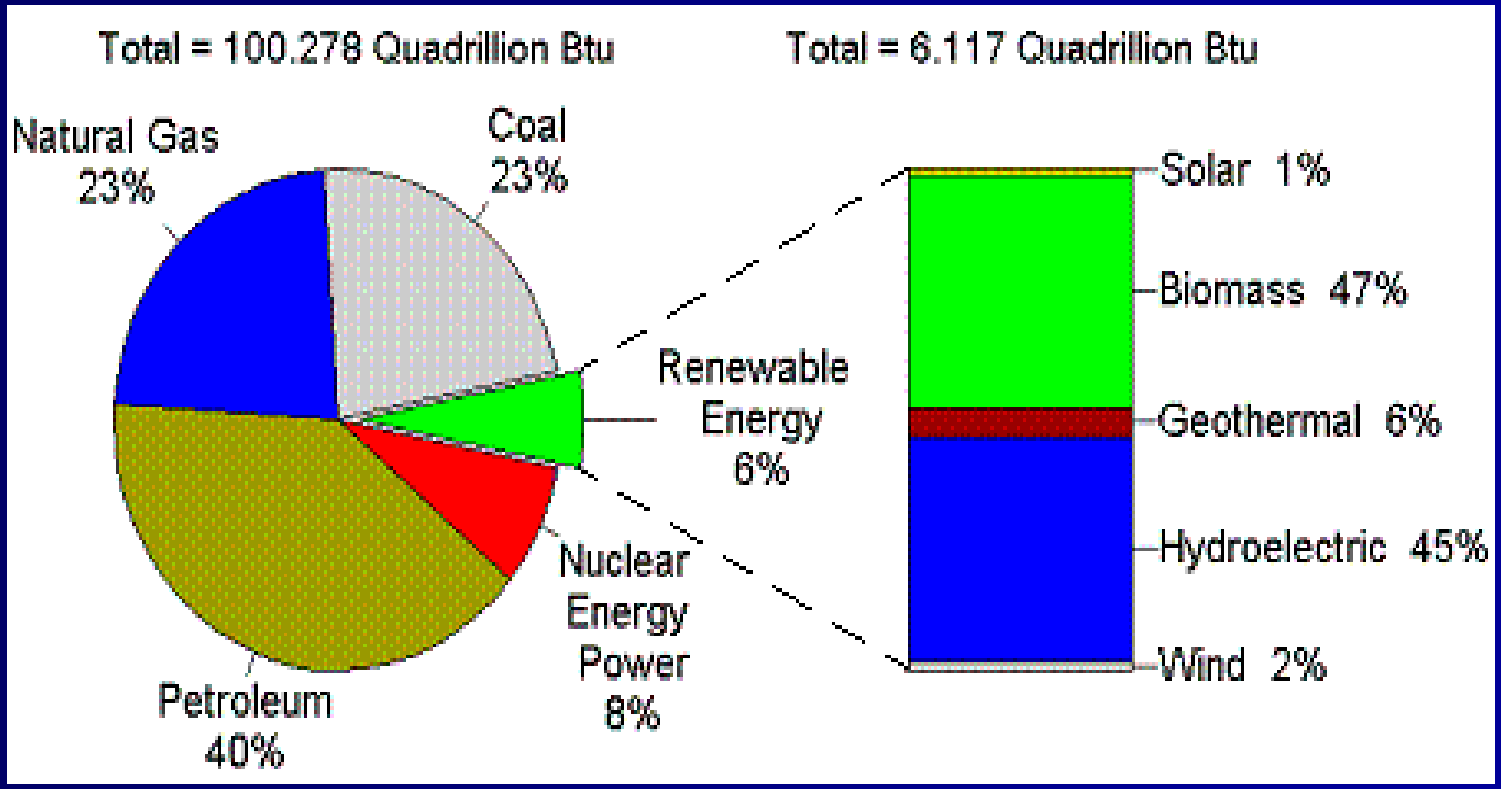


Nuclear Energy



Renewable Energy

Renewable energy as a percentage of total national energy consumption



Electricity Generation

- Baseload Unit: Meets base demand; constant capacity
- Peakload Unit: Least efficient; used at times of greatest demand
- Intermediate-load Unit: Demand high, but not at peak; used in transition between base and peak load

Electricity Generation

- Prime Movers: based on load demand and fuel stocks
- Types
  - steam turbine (most common; meets baseload)
  - gas combustion turbine (reserve, peak loads)
  - water turbine (dams and run-of-river)
  - wind turbine
  - Internal combustion engines (diesel generators)

End Users

Residential	Commercial	Industrial	Other
•Heating •Cooling •Refrigeration •Lighting •Water heating •Cooking •Laundry •Appliances	•Hotels •Retail stores •Restaurants •Businesses •Health facilities •Educational	•Manufacturing •Mining •Construction •Agriculture •Fishing •Forestry	•Street Lighting •Transport •Municipalities •Government

Regulation

- EIA: collects statistics from industry
- FERC: regulates interstate electricity transmission
- NRC: Nuclear power industry
- DOE: R&D, Energy security, nuclear security/nonproliferation, cleanup
- PURPA: Public Utility Regulatory Policies Act of 1978
  - Small producers (QF's)/surplus energy sales

Sources

- Wikipedia searches for definitions
- EIA
  - http://www.eia.doe.gov/cneaf/electricity/page/prim2/toc2.html
  - http://www.eia.doe.gov/cneaf/electricity/epa/figes1.html
  - http://www.eia.doe.gov/cneaf/electricity/page/prim2/chapter2.html#utilities
- Electric Power Monthly, Jan. 2007 http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html
- FERC, DOE, NRC