The Florida Advanced Technological Education (FLATE) Center wishes to make available, for educational and non-commercial purposes only, materials relevant to the "EST1830 Introduction to Alternative/Renewable Energy" course comprised of images, texts, facilitator's notes, and other demonstration materials.

This instructional resource forms part of FLATE's outreach efforts to facilitate a connection between students and teachers throughout the State of Florida. We trust that these activities and materials will add value to your teaching and/or presentations.

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Introduction to Alternative and Renewable Energy

EST1830

1. Introductory Section

1.4 US Energy Flow Analytics

1.4 US Energy Flow Analytics

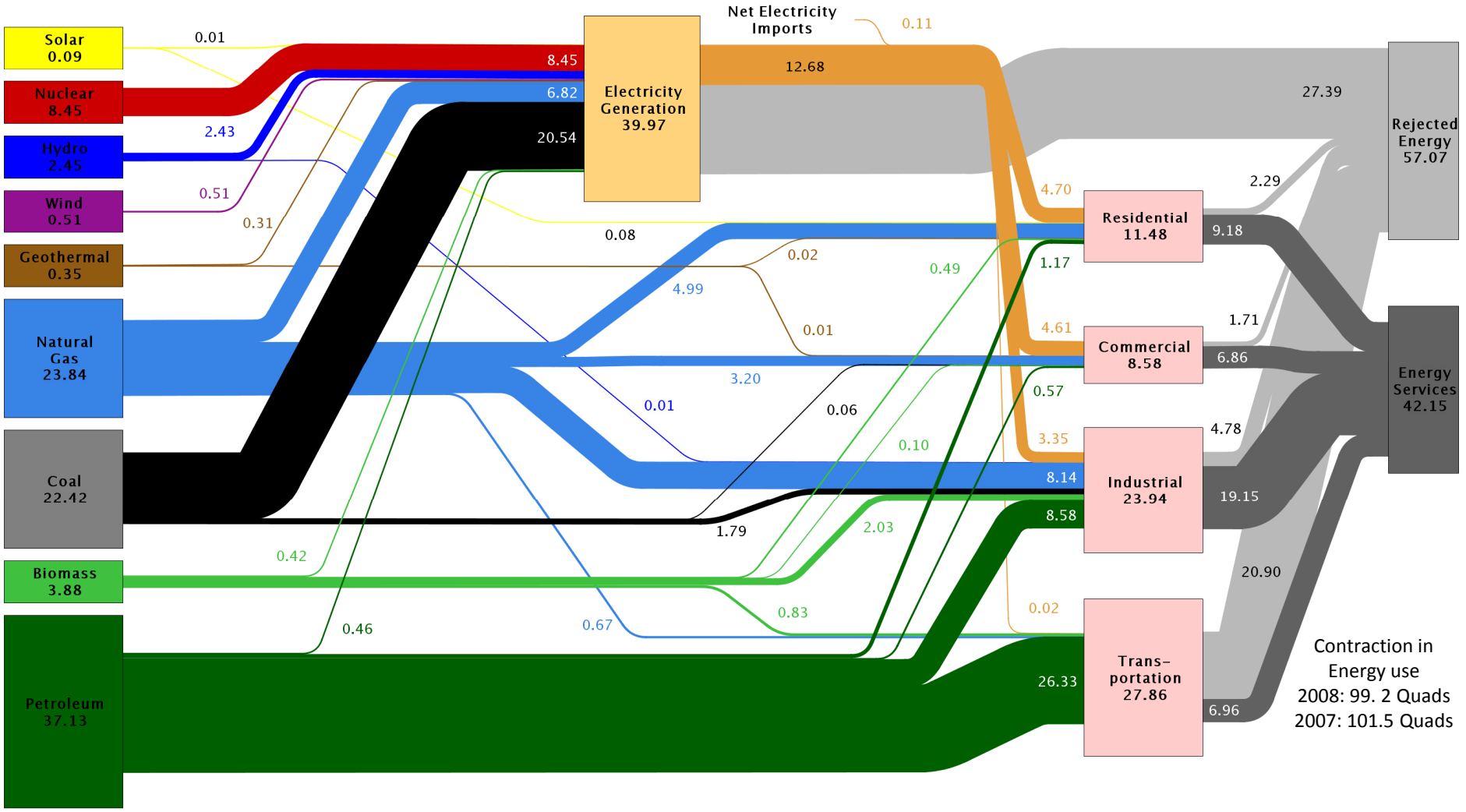
Supply

Energy Flow Charts

Demand

Estimated U.S. Energy Use in 2008: ~99.2 Quads

Lawrence Livermore National Laboratory

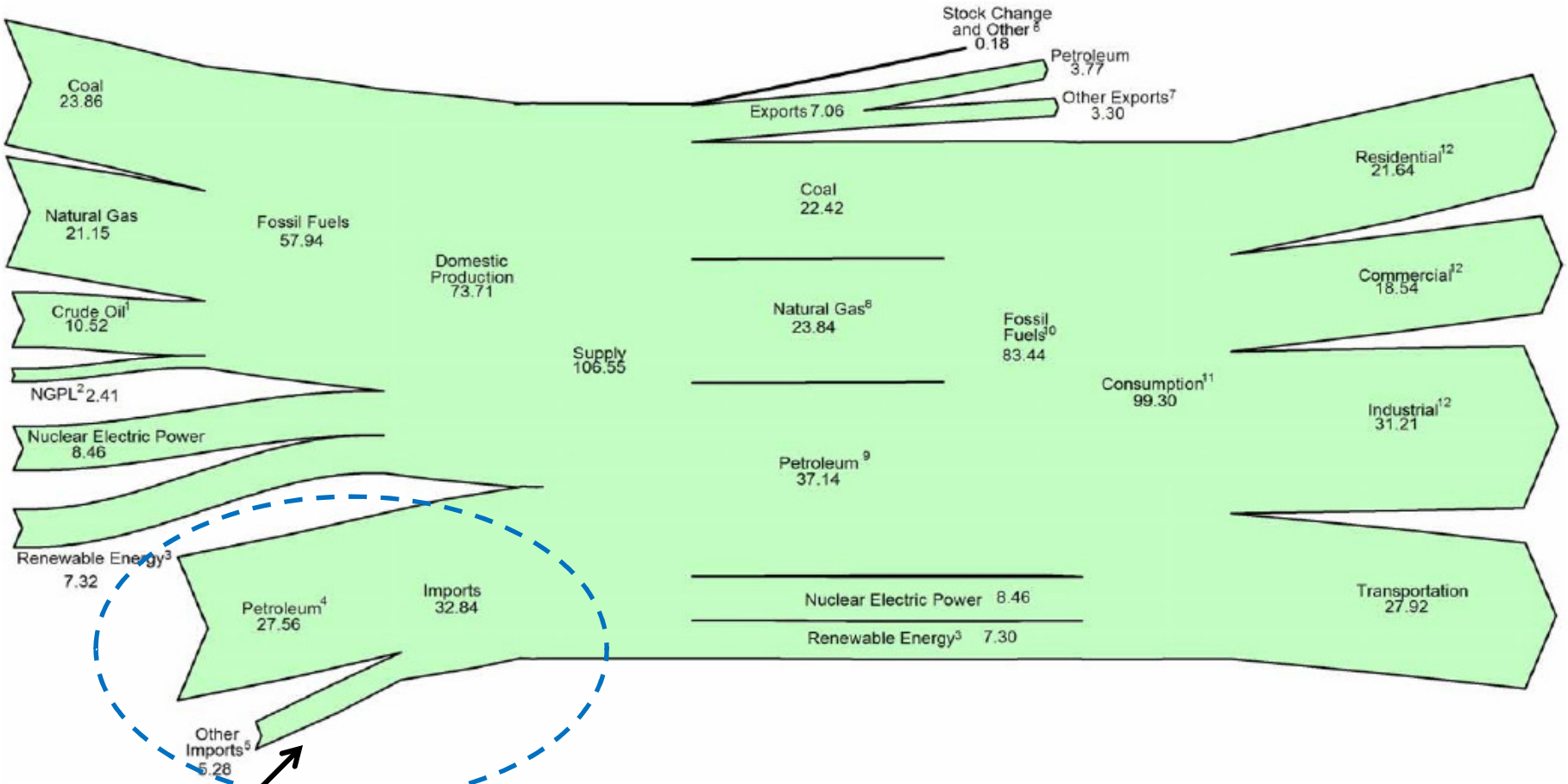


Contraction in Energy use
2008: 99. 2 Quads
2007: 101.5 Quads

Source: LLNL 2009. Data is based on DOE/EIA-0384(2008), June 2009. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports flows for non-thermal resources (i.e., hydro, wind and solar) in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 80% for the residential, commercial and industrial sectors, and as 25% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

Energy Flow Charts

Figure 1.0 Energy Flow, 2008
(Quadrillion Btu)



Imports

[11] Includes 0.11 quadrillion Btu of electricity net imports.

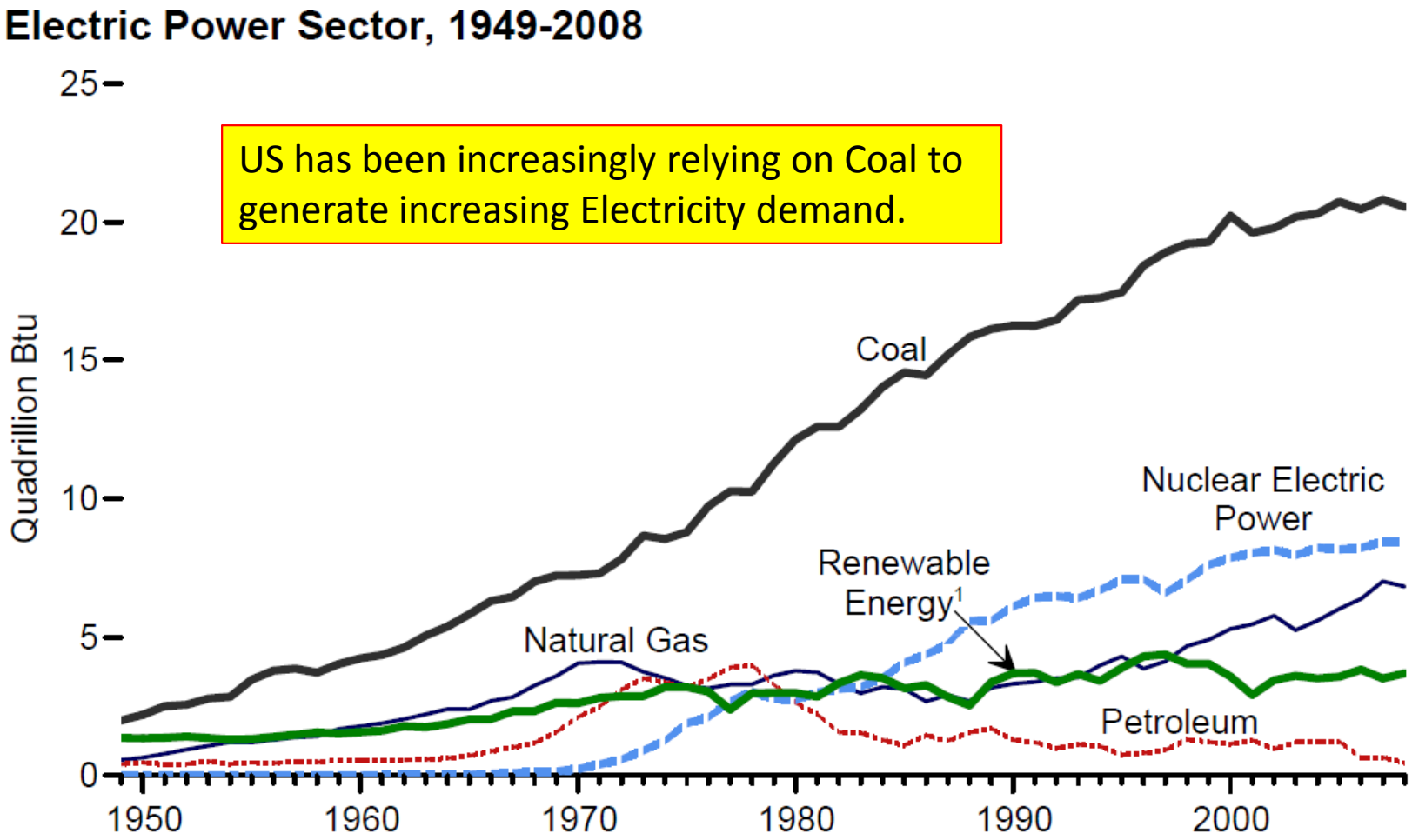
[12] Primary consumption, electricity retail sales, and electrical system energy losses, which are allocated to the end-use sectors in proportion to each sector's share of total electricity retail sales. See Note, "Electrical Systems Energy Losses," at end of Section 2.

Conservation/Efficiency Needs

- Total energy consumption in 2008: 99.2 Quad
  - Rejected (Lost) energy= 57.07 Quad
    - 57.5% of total energy consumption did no useful work
  - Energy used for services = 42.15 Quad
    - 42.5% of total energy consumption provided all energy services in the US
- Where are the energy losses?
  - Electricity generation: 27.39 Quad (48%)
    - Losses occur at generation, transmission, distribution
    - Mostly as waste heat
  - Transportation: 20.90 Quad (37%)
  - Industrial: 4.78 Quad (8%)
  - Residential & Commercial: 4 Quad (7%)

85%

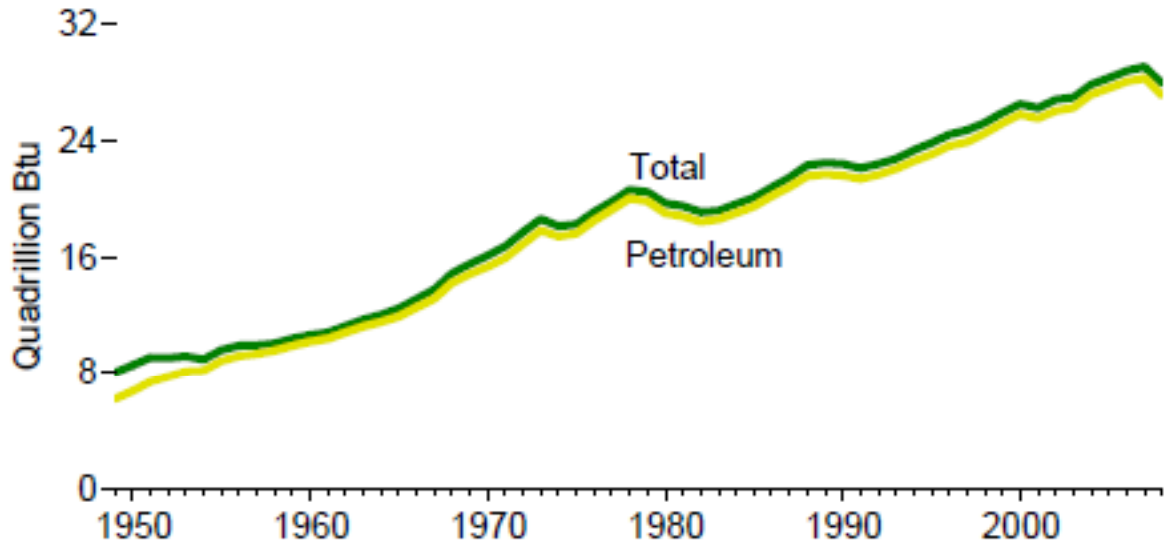
US Energy Consumption for generating electricity



Source: Annual Energy Review 2008, http://www.eia.doe.gov/aer

US Transportation Consumption

Figure 10. Transportation Total Energy Consumption



Transportation sector use of energy experienced tremendous growth overall but registered noticeable pauses in 1974, 1979-1982, 1990 and 1991, 2001 and 2008. In 2008, petroleum accounted for 94 percent of the transportation sector's total use of energy. In Btu, motor gasoline accounted for 62 percent of all petroleum used in the sector; in barrels, motor gasoline accounted for 64 percent .

US has been increasing its demand of Petroleum.

Source: Annual Energy Review 2008, http://www.eia.doe.gov/aer