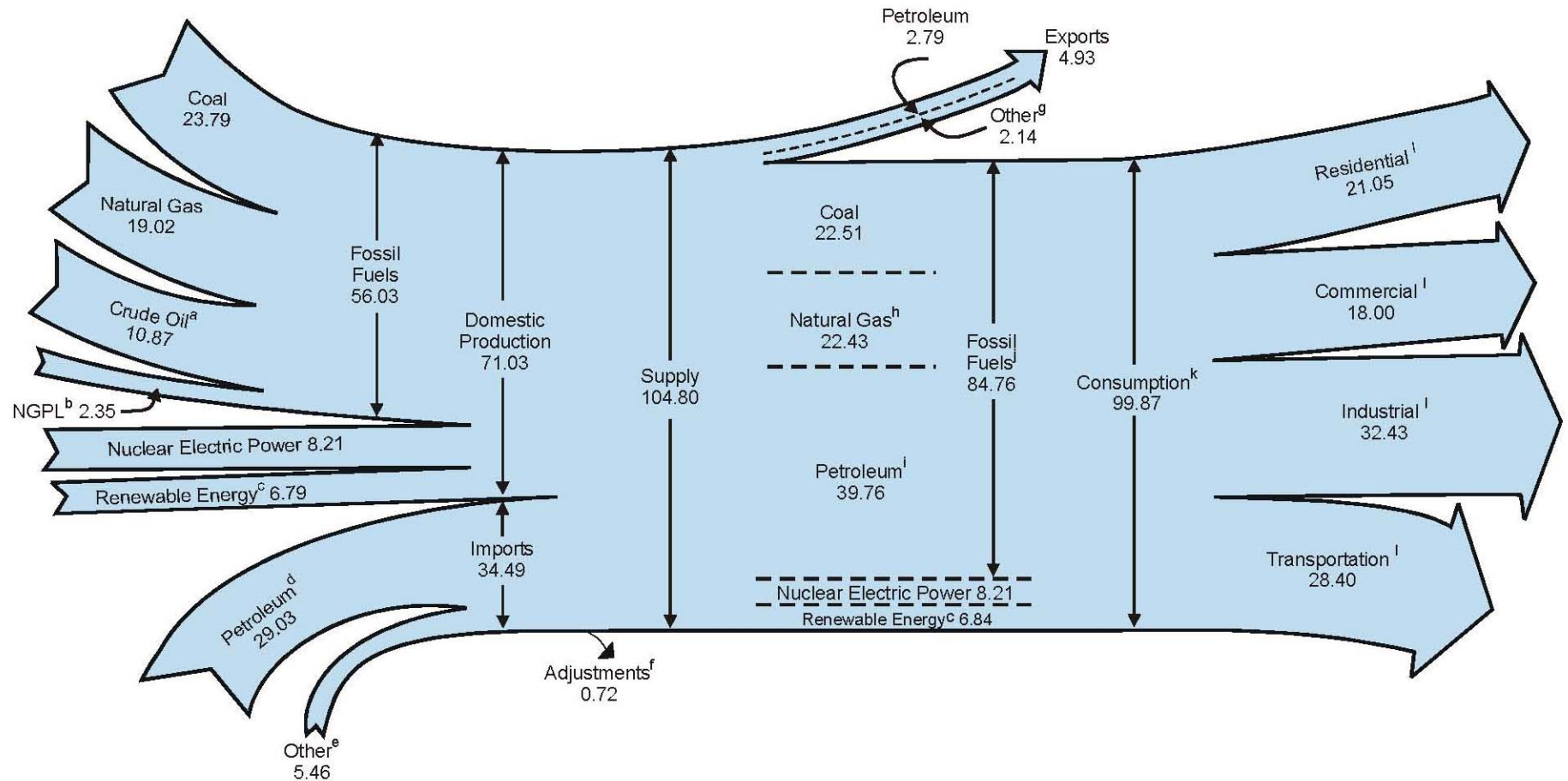

ESF Sustainable Energy Research and Demonstrations

*Michael J. Kelleher
Director Renewable Energy Systems
SUNY College of Environmental Science and Forestry
Syracuse, New York*

September 18, 2008



Diagram 1. Energy Flow, 2006
(Quadrillion Btu)



^a Includes lease condensate.

^b Natural gas plant liquids.

^c Conventional hydroelectric power, biomass, geothermal, solar/PV, and wind.

^d Crude oil and petroleum products. Includes imports into the Strategic Petroleum Reserve.

^e Natural gas, coal, coal coke, fuel ethanol, and electricity.

^f Stock changes, losses, gains, miscellaneous blending components, and unaccounted-for supply.

^g Coal, natural gas, coal coke, and electricity.

^h Natural gas only; excludes supplemental gaseous fuels.

ⁱ Petroleum products, including natural gas plant liquids, and crude oil burned as fuel.

^j Includes 0.06 quadrillion Btu of coal coke net imports.

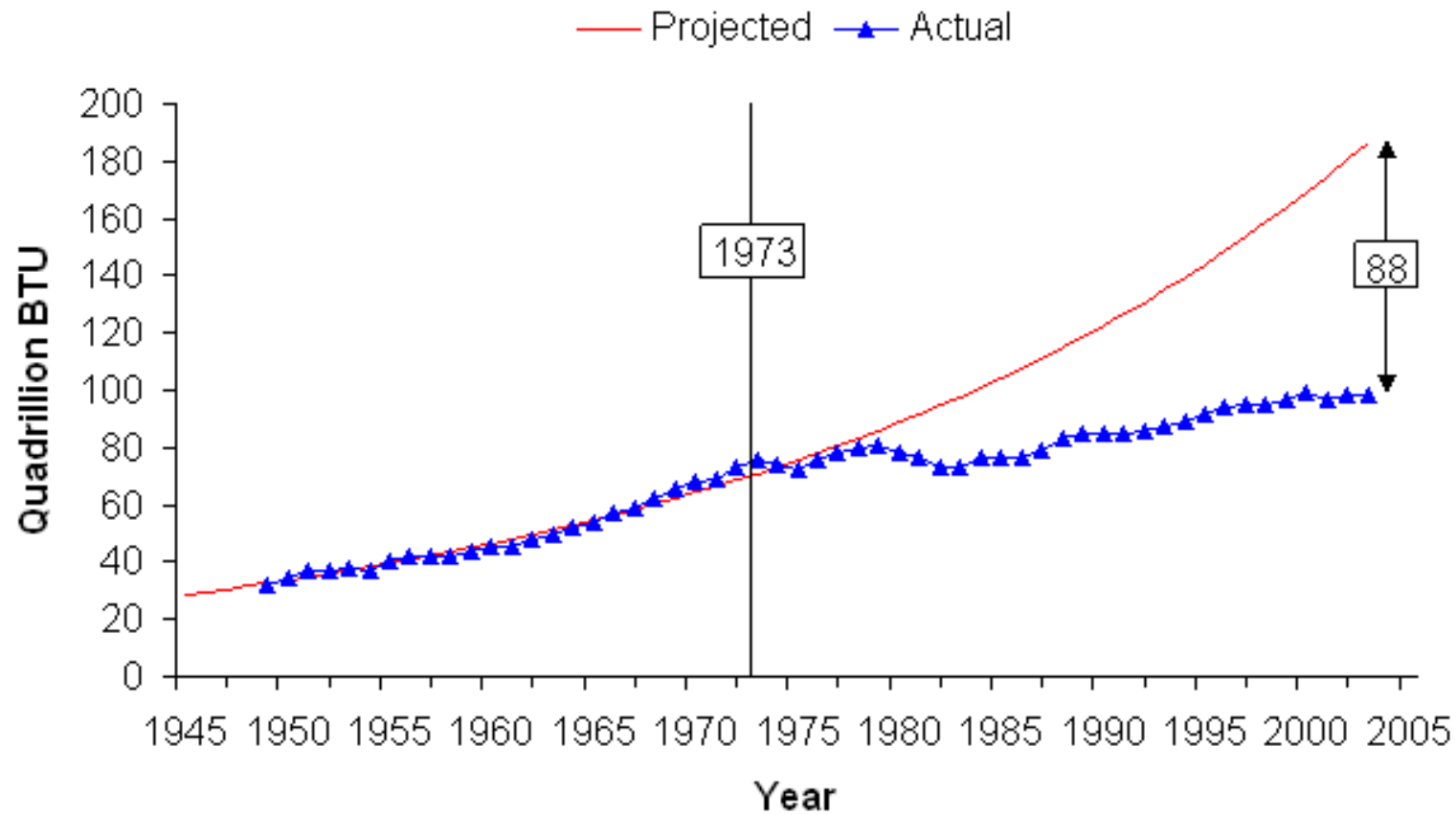
^k Includes 0.06 quadrillion Btu of electricity net imports.

^l 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.

Notes: • Data are preliminary. • Values are derived from source data prior to rounding for publication. • Totals may not equal sum of components due to independent rounding.

Sources: Tables 1.1, 1.2, 1.3, 1.4, and 2.1a.

US Energy Consumption, 1949-2003



Source: Energy Information Administration, Form EIA-861, "Annual Electric Power Industry Report."



SUNY-ESF
Improve Your World

Sustainability Starts with Conservation

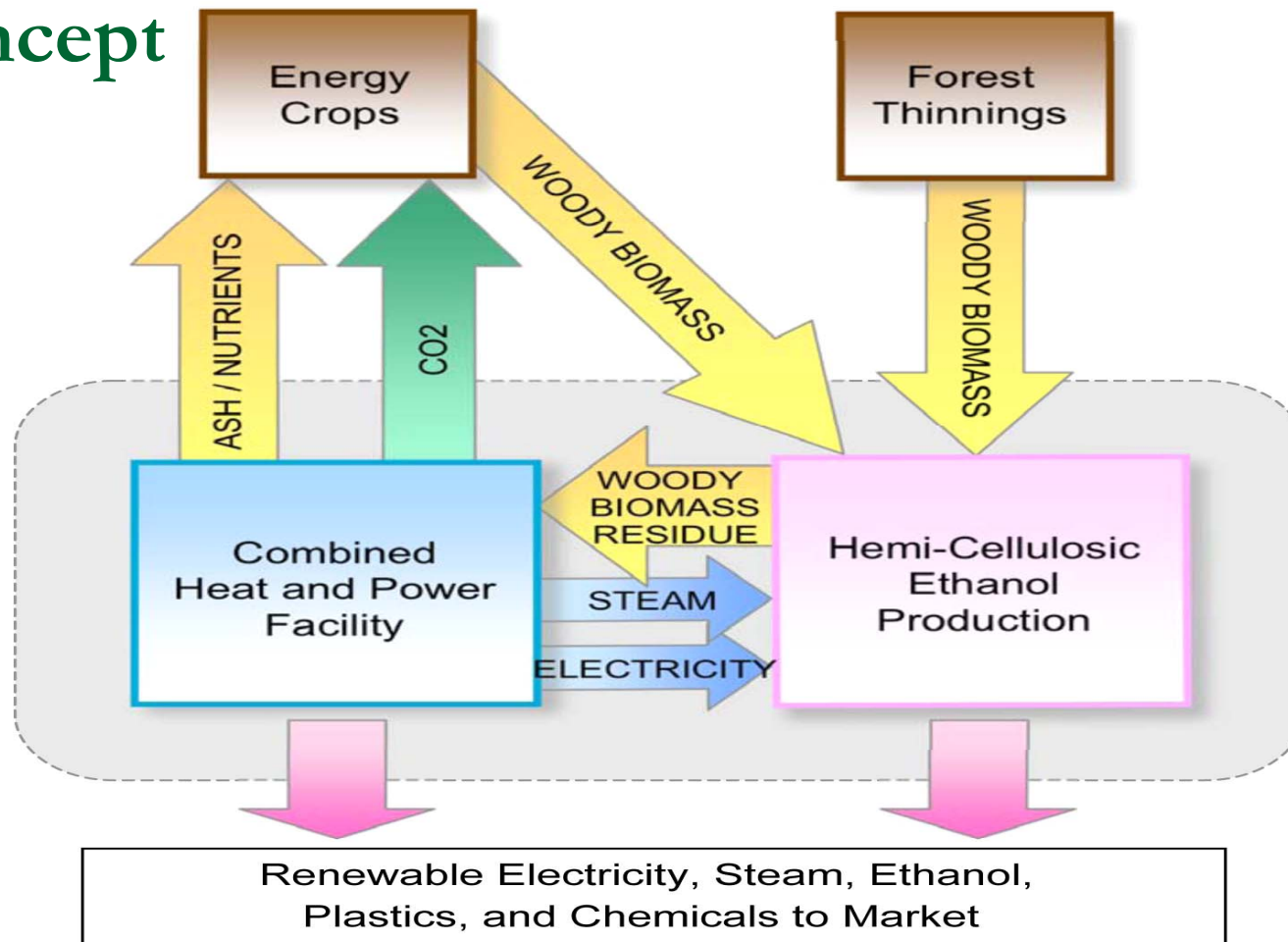
ESF High Efficiency Chiller Replacement and Energy Audits

- \$1.2M replacement will save ESF \$170,000/yr and reduce annual oil consumption by 2,500 barrels/yr
- NYPA financed



SUNY-ESF
Improve Your World

Sustainable Fuels and More Efficient Use of Resources: The Wood-based Biorefinery Concept



Converting Waste to Fuel, ESF Biodiesel Production Facility



SUNY-ESF
Improve Your World

Fuel Cell, Efficient Power and Heat Generation



~80% Conversion efficiency
17% of campus electrical
requirements

Funded by Grants:
NYSERDA
US DOE
EPRI
~\$1.5M



Green Roof: Insulation and Stormwater Control



- PVC roofing system w/green roof overlay
- ~\$9.60/sq.ft. additional cost/total cost \$69K
- 6 different sedums planted 1 plant/sq.ft. configuration
 - Drought tolerant
 - Self-propagating



Photovoltaics



- 40 KW of installed (\$400,000)
- \$200,000 funded by NYSERDA

Small Wind Turbine (coming)

- Endurance S-250
- 4-5 kW
- 11.8 mph avg. wind speed
- Expect 500 kWh/month
- Tower height 126 feet

