

Energy Resources: Production and Consumption

Environmental Sustainability Educational Resources

prepared by

Gregory A. Keoleian

Associate Research Scientist,

School of Natural Resources and Environment

Co-Director, Center for Sustainable Systems

University of Michigan



Contents

- Non-Renewable Energy Resources [slide 3]
- Renewable Energy Sources [slide 4]
- Peak Production of Petroleum in US [slide 5]
- Projected World Peak Production of Petroleum [slide 6]
- Projected World Peak Production of Petroleum [slide 7]
- Regional Shares of Crude Oil [slide 8]
- World Oil Production [slide 9]
- World Total Primary Energy Supply [slide 10]
- World Total Energy Consumption Projections [slide 11]
- World Total Energy Consumption Projections (by fuel type) [slide 12]
- World Total Energy Consumption 1990 -2020 (by region) [slide 13]
- U.S. Energy Flow [slide 14]
- U.S. Energy Consumption and Renewable Supply [slide 15]
- Additional Resources [slide 16]



Non-Renewable Energy Sources

- Conventional
 - Petroleum
 - Natural Gas
 - Coal
 - Nuclear
- Unconventional (examples)
 - Oil Shale
 - Natural gas hydrates in marine sediment



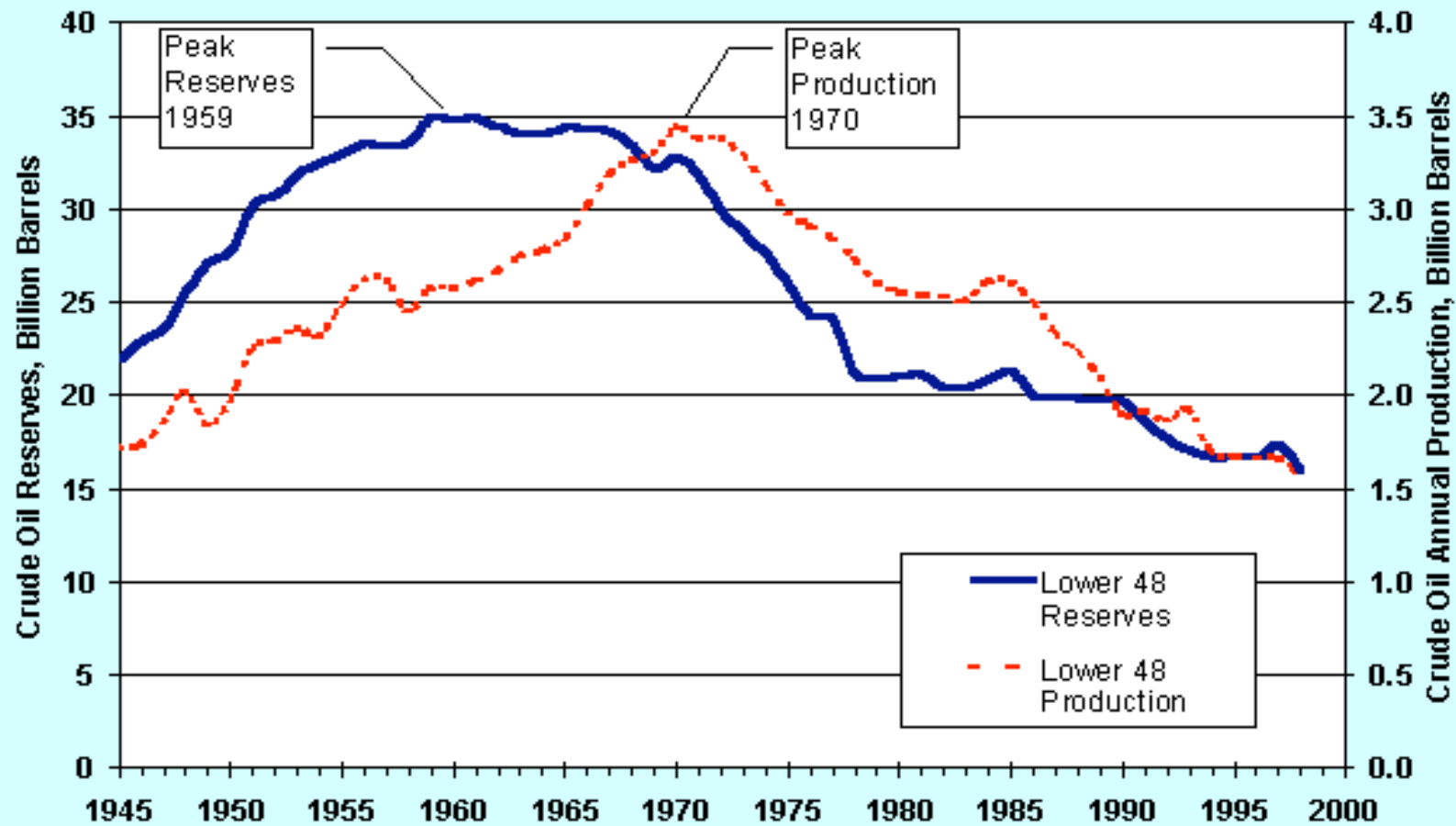
Renewable Energy Sources

- Solar photovoltaics
- Solar thermal power
- Passive solar air and water heating
- Wind
- Hydropower
- Biomass
- Ocean energy
- Geothermal
- Waste to Energy

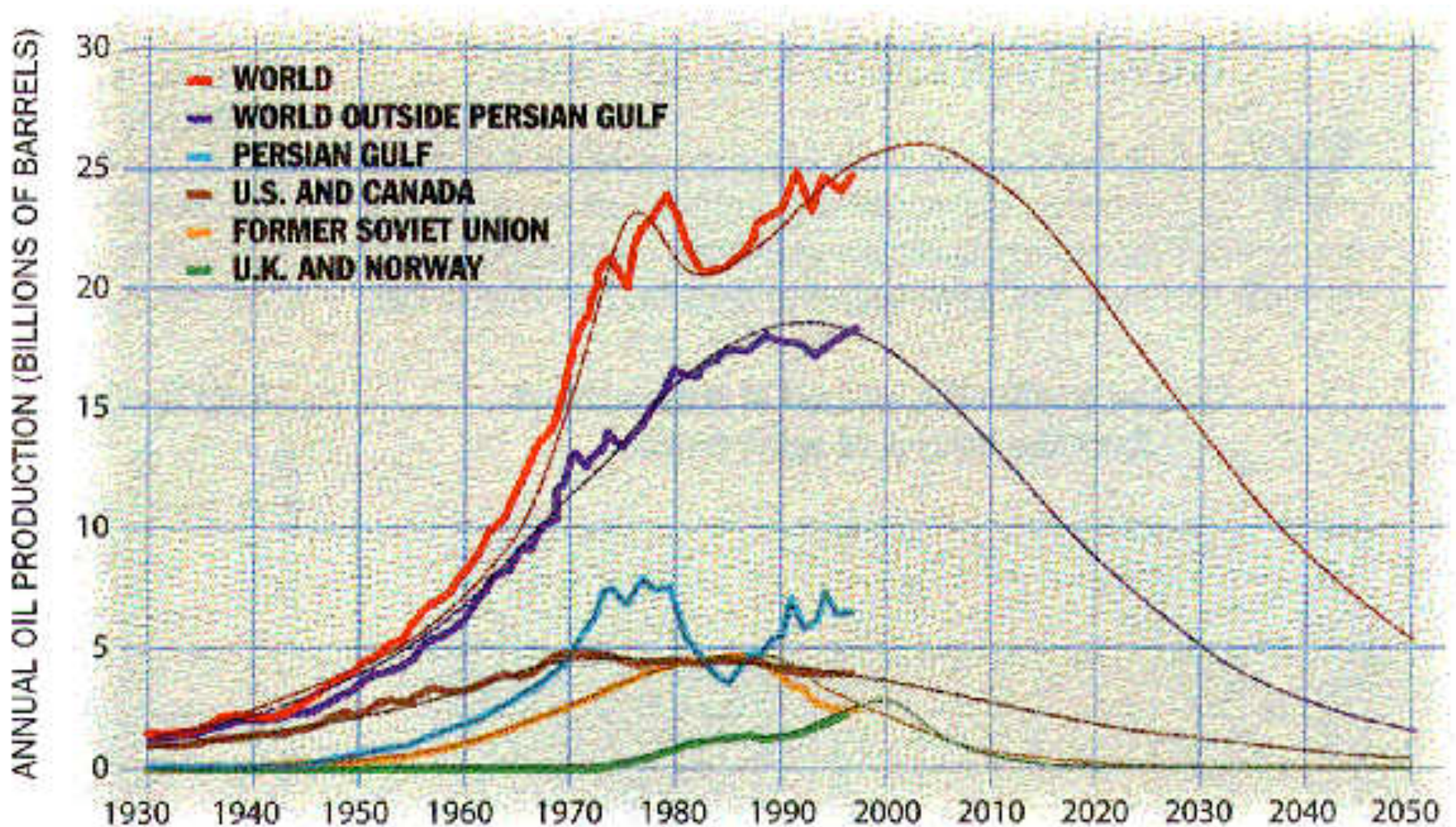


Peak Production of Petroleum in US

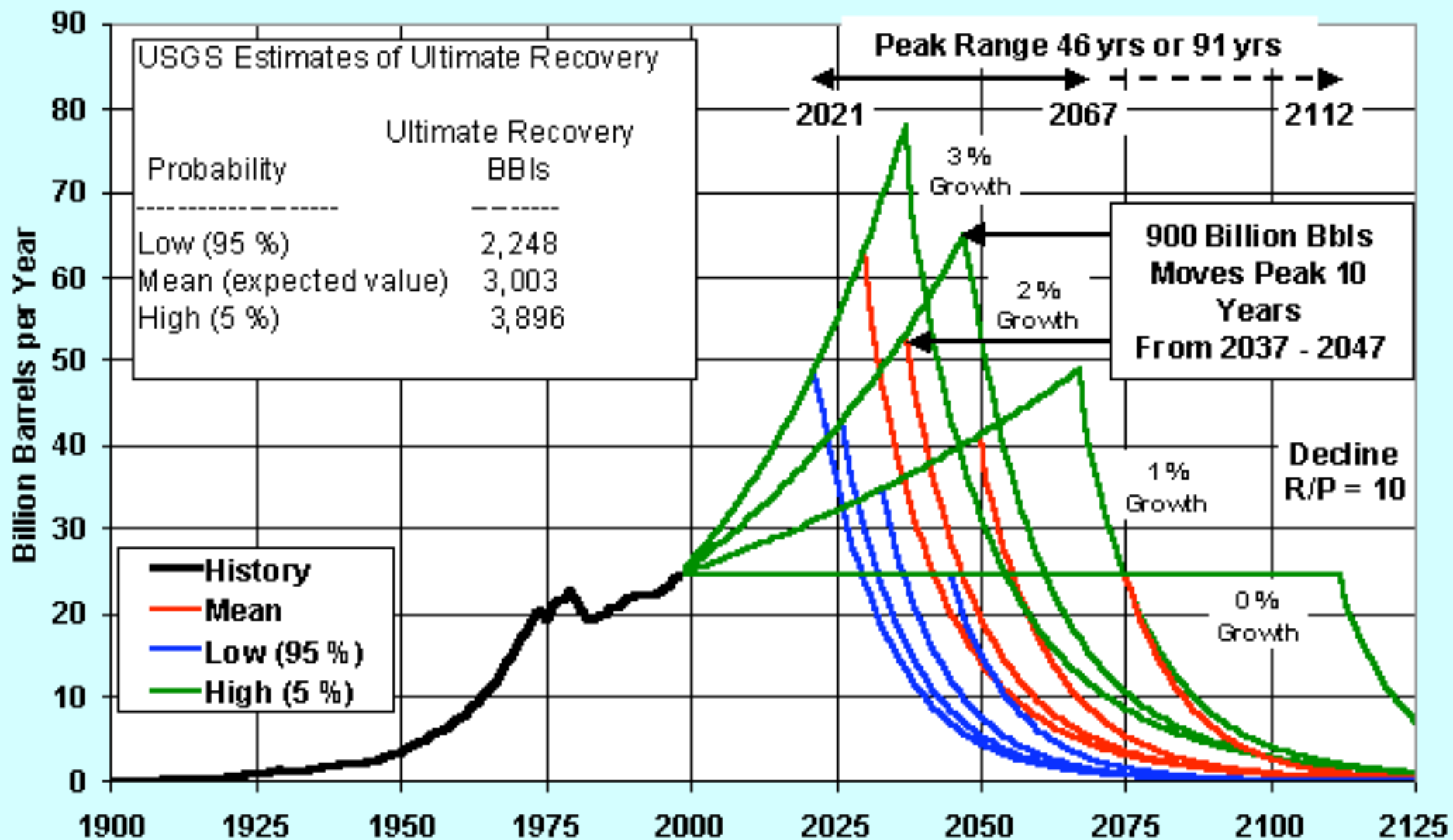
Lower 48 Crude Oil Reserves & Production, 1945-2000



Projected World Peak Production of Petroleum

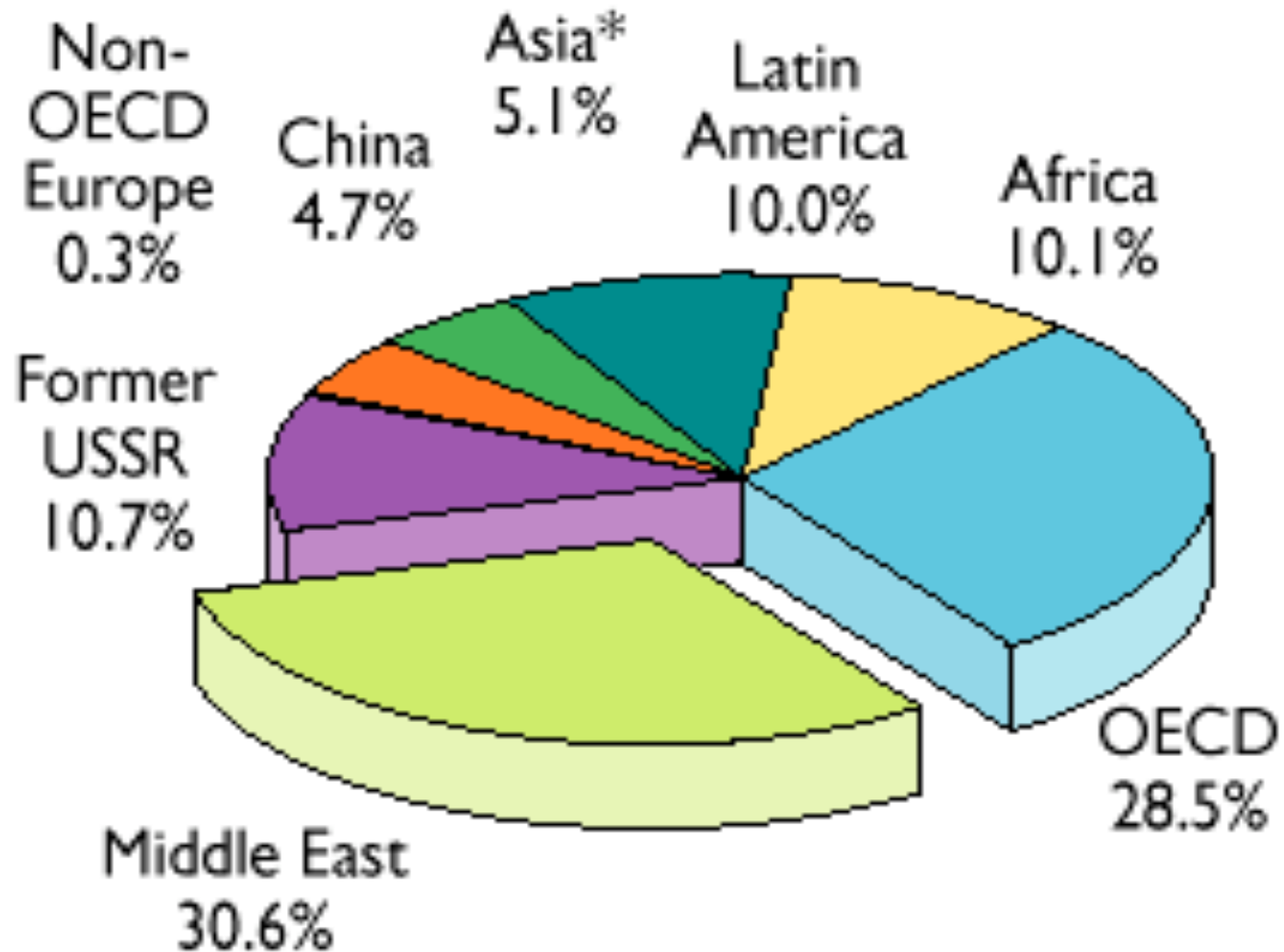


12 EIA World Conventional Oil Production Scenarios

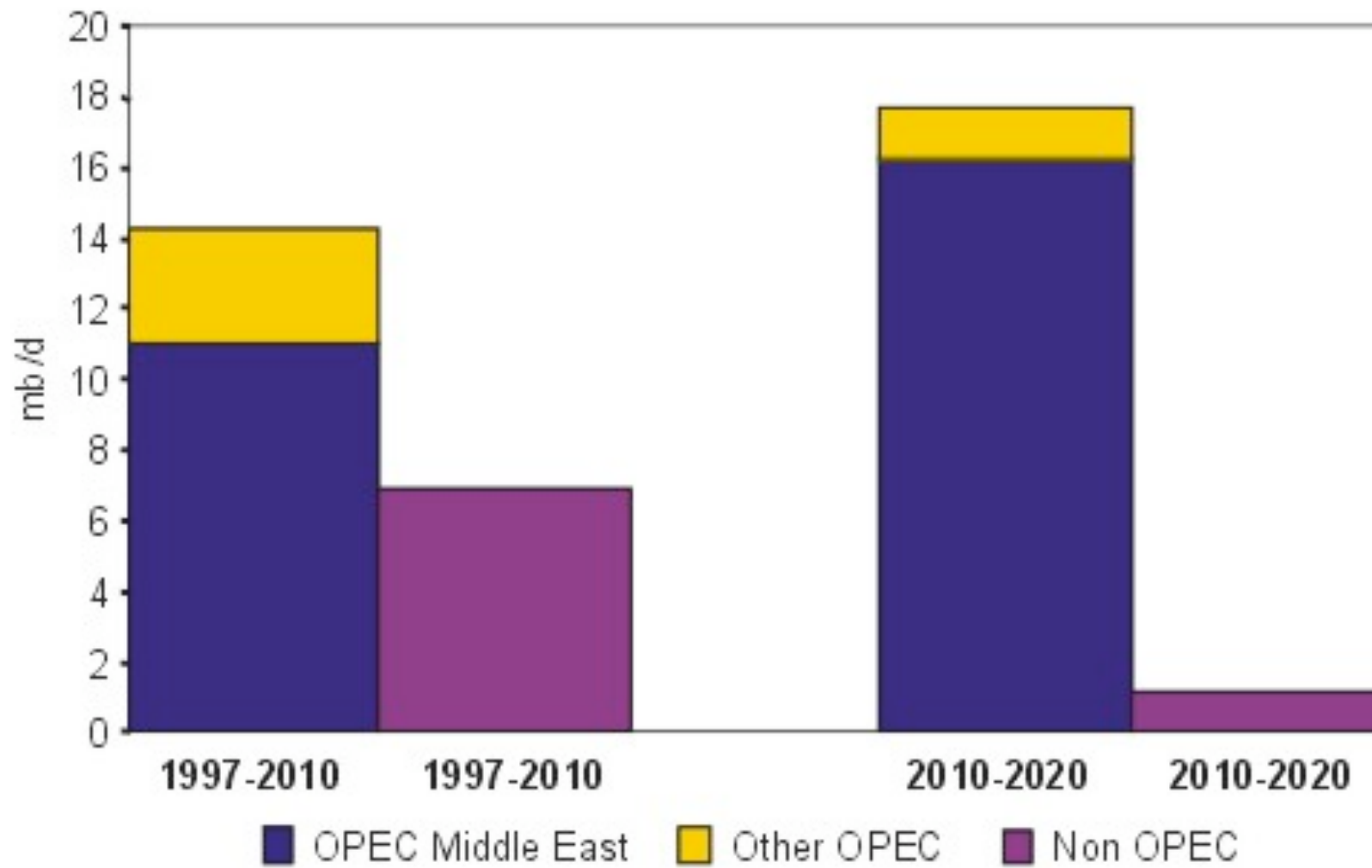


Note: U.S. volumes were added to the USGS foreign volumes to obtain world totals.

1999 Regional Shares of Crude Oil Production (3445 Mt)

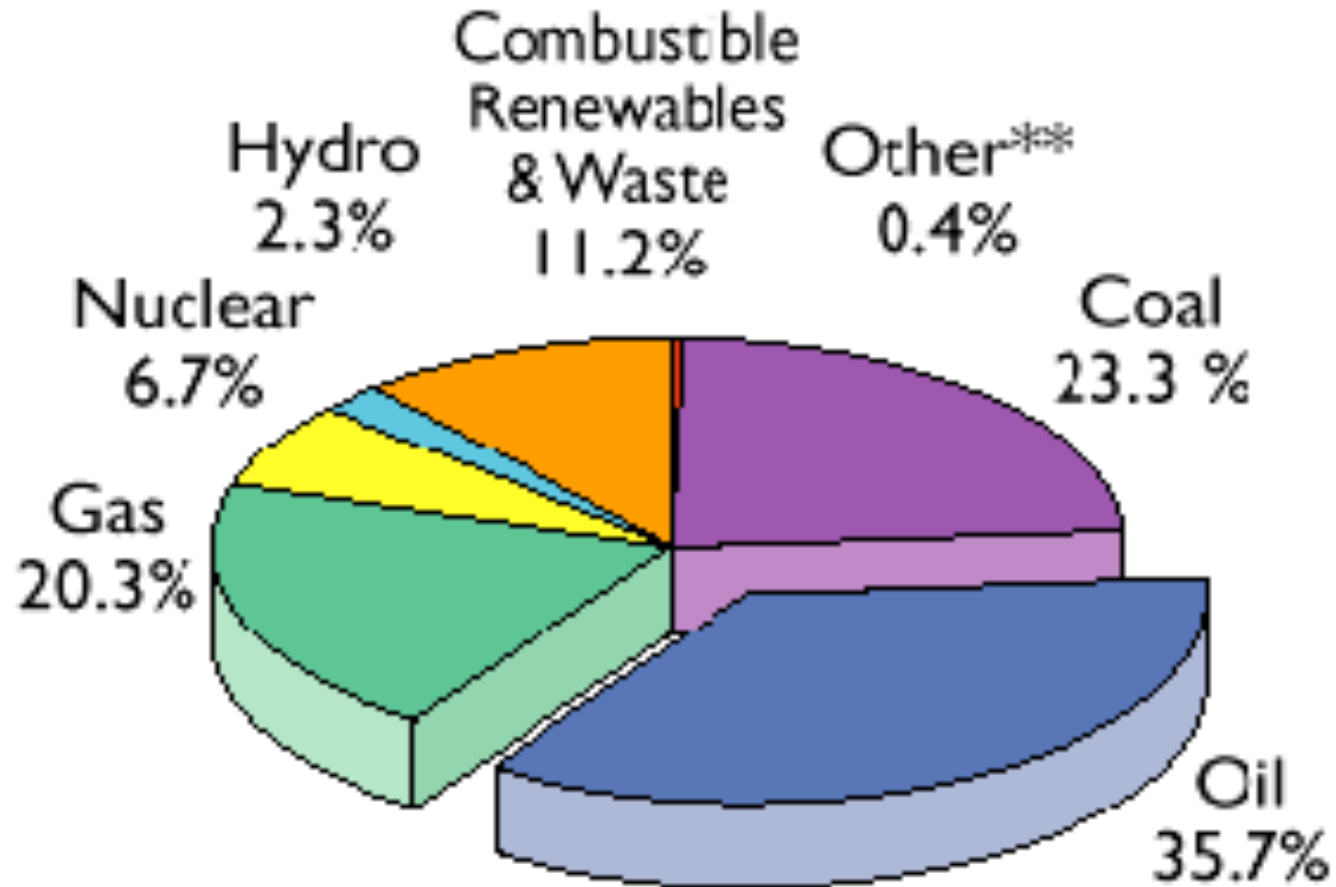


World Incremental Oil Production



World Total Primary Energy Supply in 1998

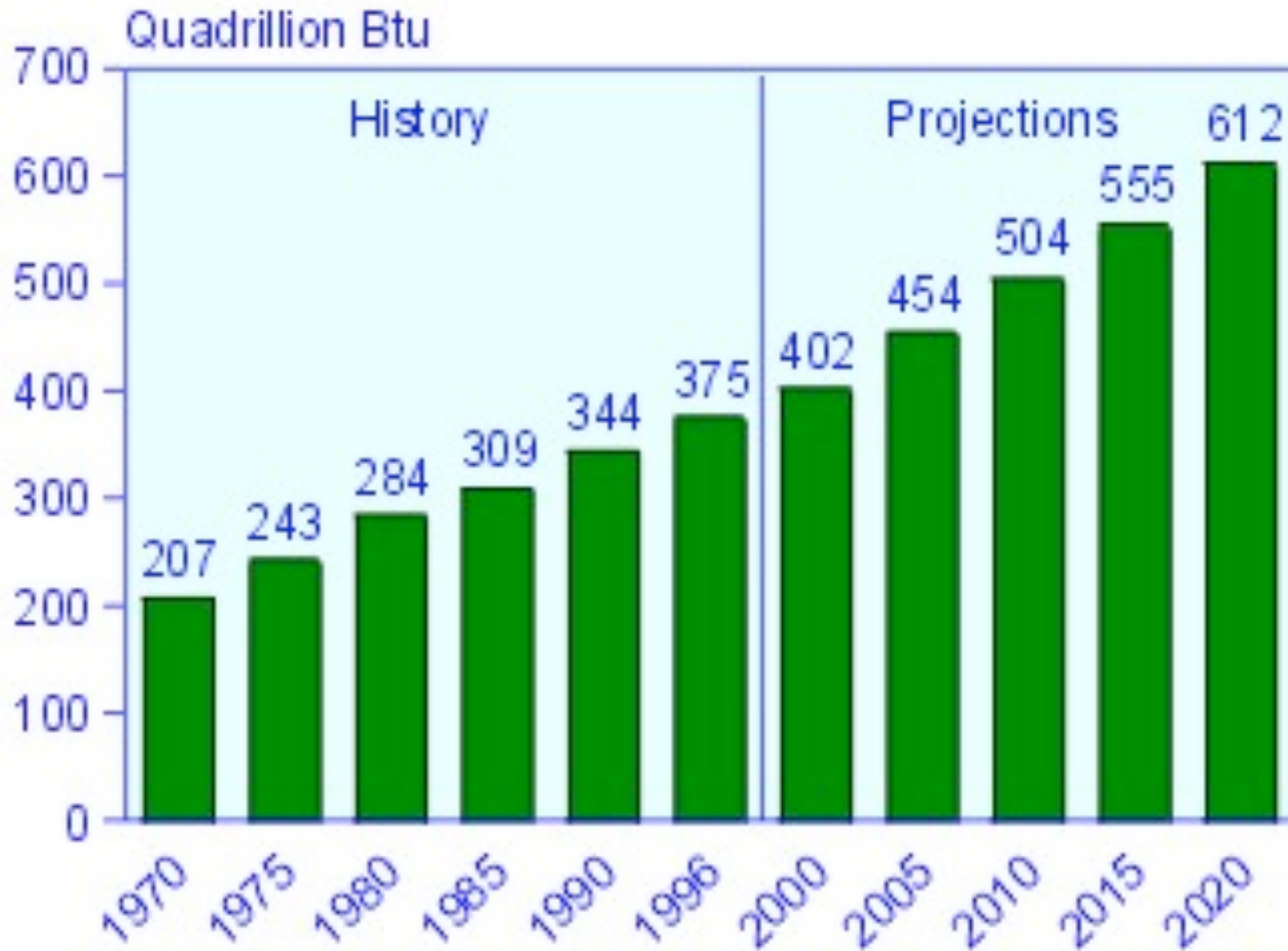
(9491 Mtoe)



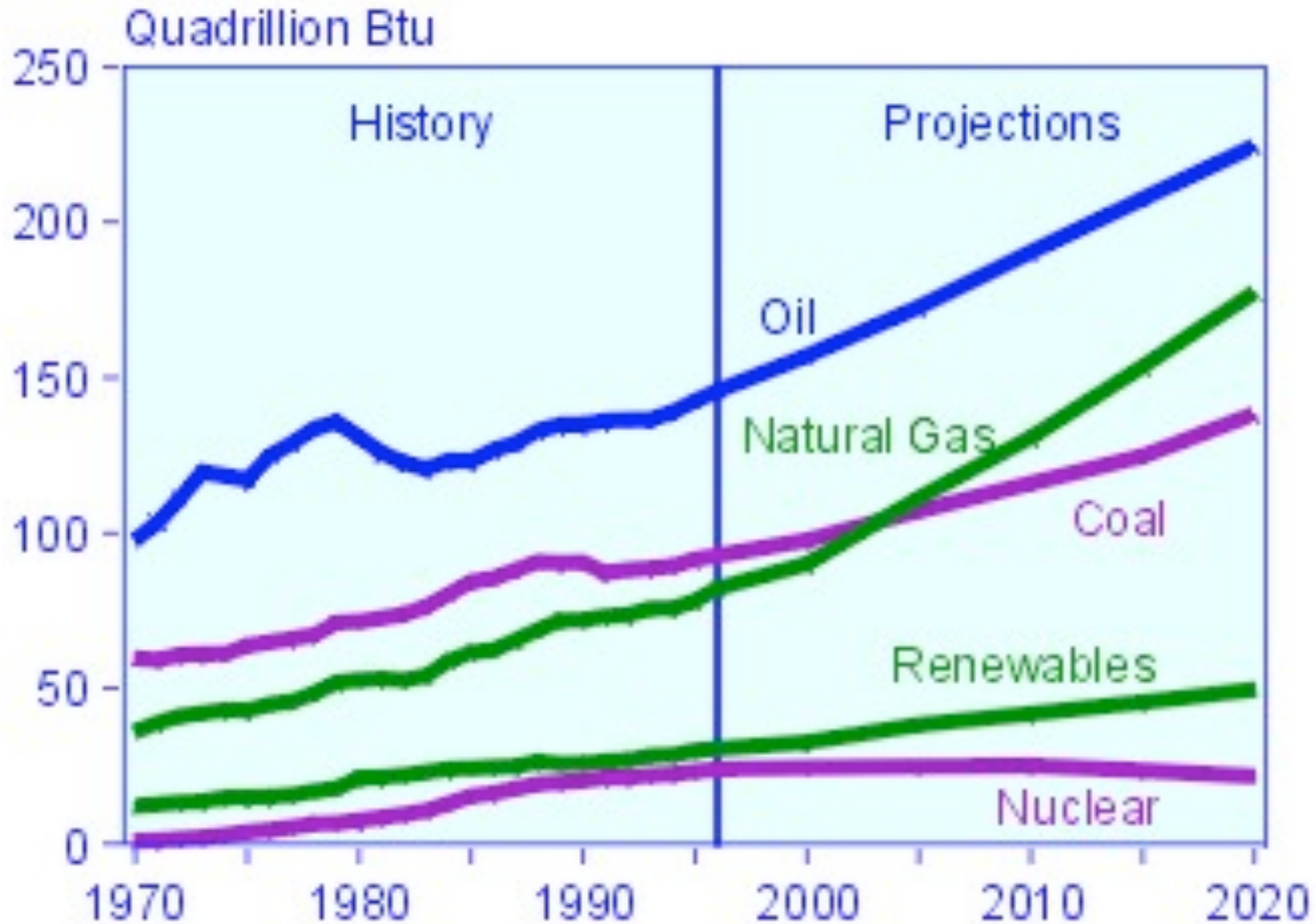
**Other includes geothermal, solar, wind, heat, etc.



World Energy Consumption



World Energy Consumption

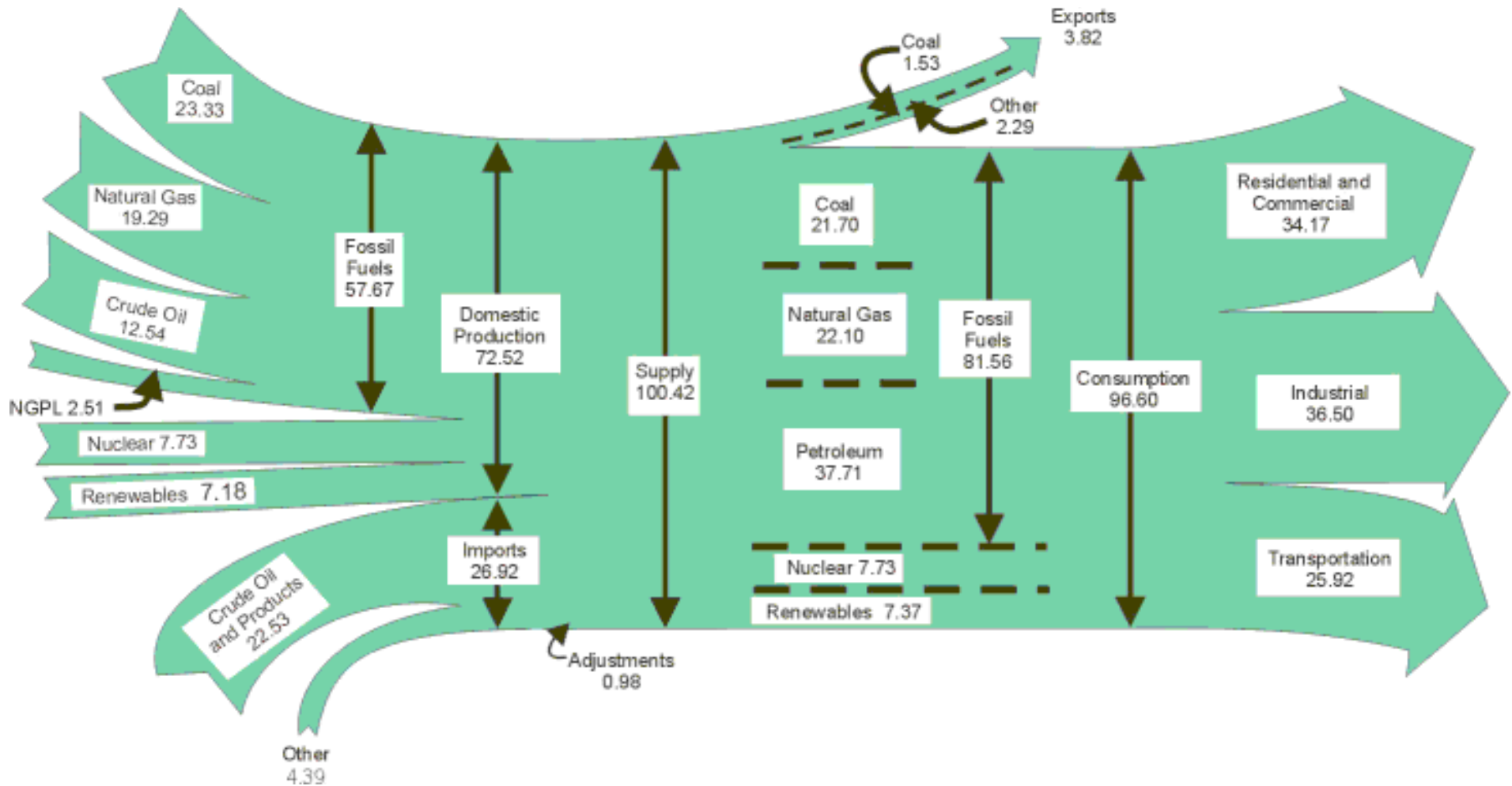


World Total Energy Consumption 1990 -2020 (Quadrillion Btu)

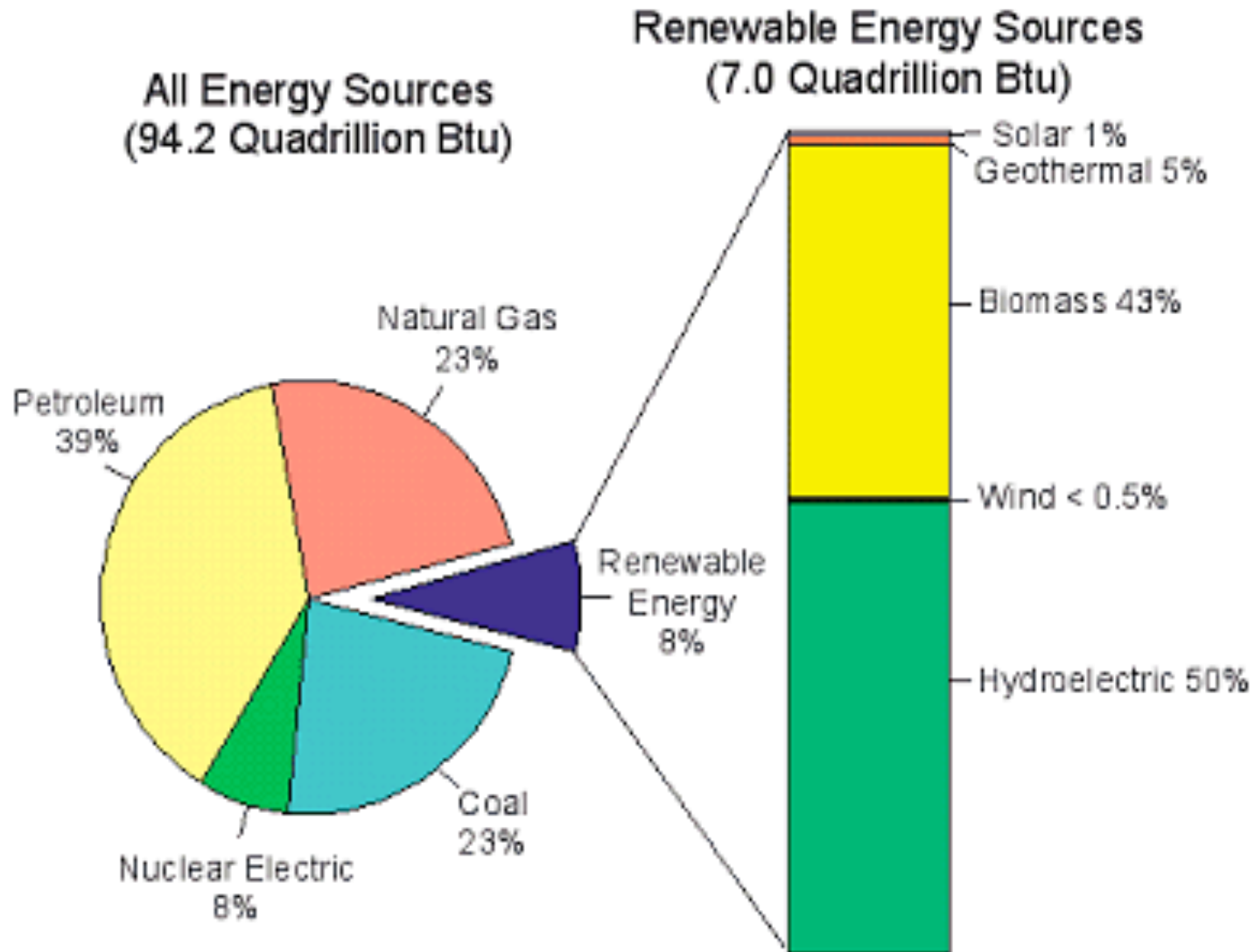
Region/Country	1990	1997	2020
United States	84.0	94.2	120.9
Western Europe	59.9	64.0	78.4
Japan	18.1	21.3	25.4
China	27.0	36.7	97.3
Former Soviet Union	61.0	40.8	57.3
Total World	346.7	379.9	607.7



U.S. Energy Flow, 1999



U.S. Energy Consumption by Source, 1998



Totals may not equal sum of components due to independent rounding.



Additional Resources

- US Department of Energy, Energy Information Administration
 - web site: www.eia.doe.gov

