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ENERGY-TECHNOLOGY INNOVATION

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Key Words climate change, energy, innovation, oil dependence, technology

■ Abstract Energy-technology innovation (ETI) is the set of processes leading to new or improved energy technologies that can augment energy resources; enhance the quality of energy services; and reduce the economic, environmental, or political costs associated with energy supply and use. Advances achieved through ETI have made large contributions to the improvement of the human condition over the past 100 years. Still more will be required of ETI during the decades ahead if civilization is to succeed in meeting what we believe are the three greatest energy challenges still before it: reducing dependence on oil, drastically upgrading the energy services provided to the world's poor, and providing the energy required to increase and sustain prosperity everywhere without wrecking the global climate with the emissions from fossil-fuel burning. This will require significant enhancements to ETI through deeper analysis of ETI processes, greater investments in ETI, improved innovation policies, and better coordination and partnerships across sectors and countries.

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Public Energy RD&D Trends and Data

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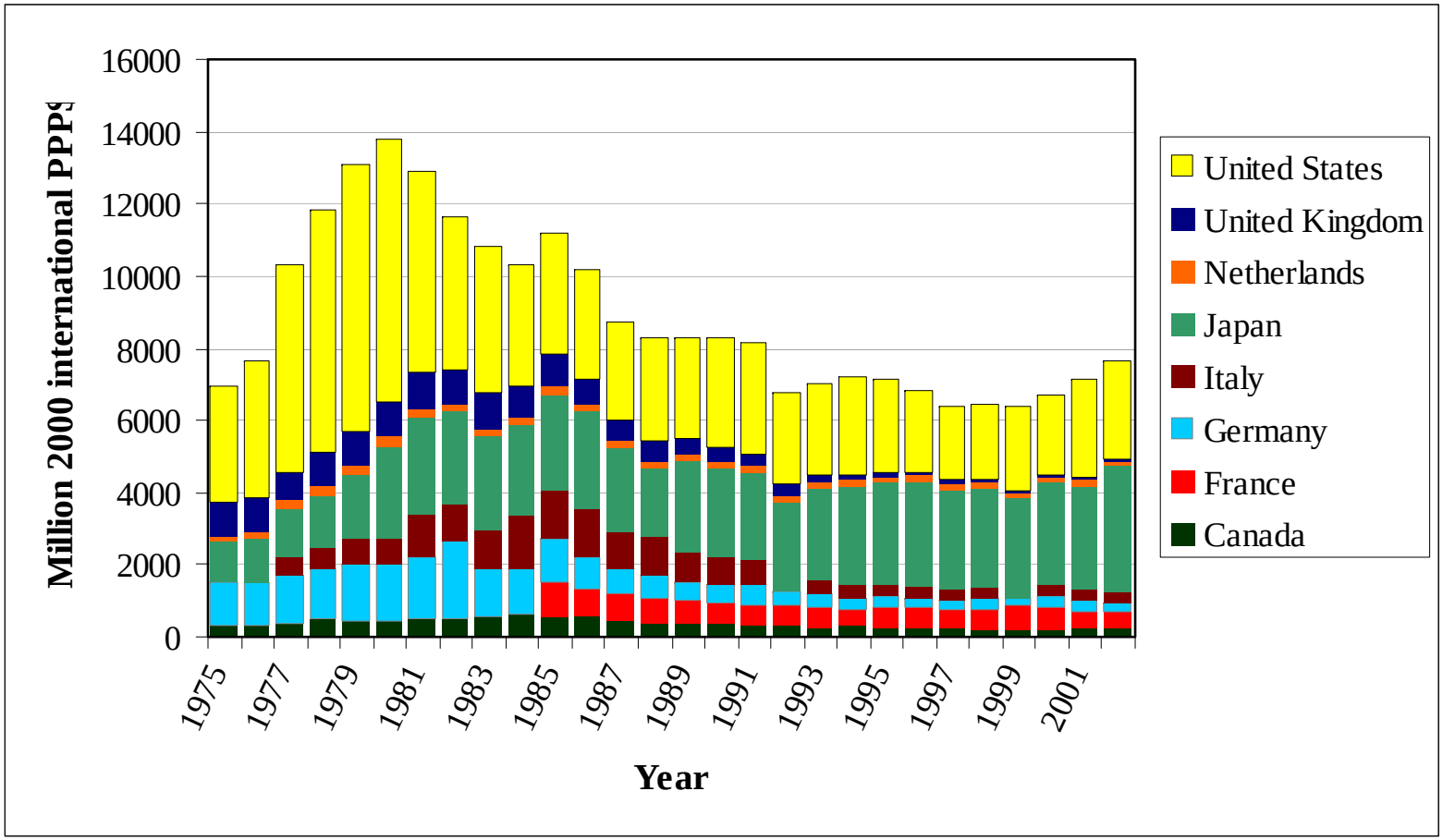
January 9, 2007

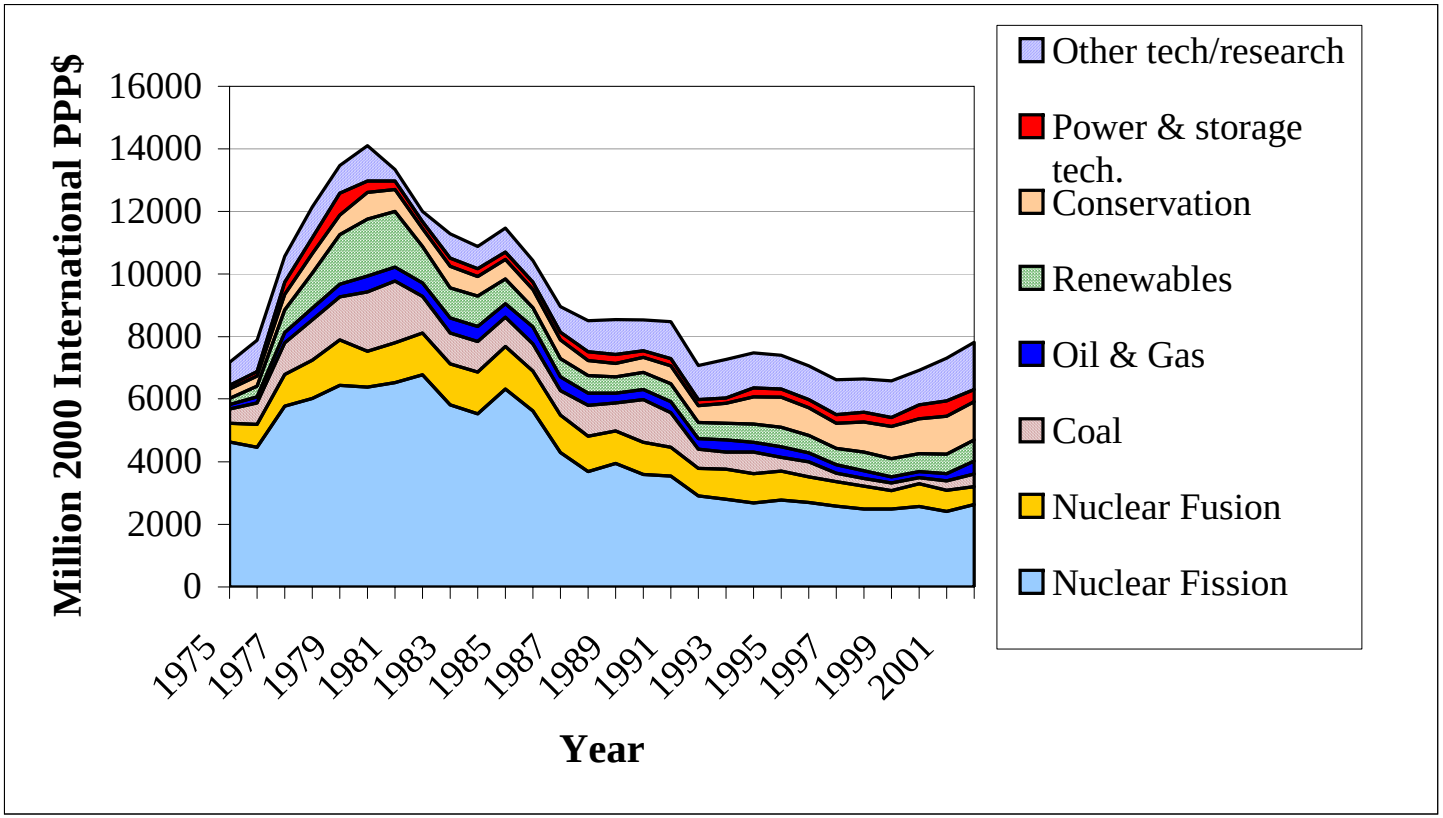
Public Investment Inputs into ERD&D

Figure 2 Trends in energy research, development, and demonstration expenditures by major International Energy Agency (IEA) member governments. Data are not available before 1985 for France and also not available for Italy for 1975-1976 and 1993.



Source: IEA Energy R&D database

Figure 3 Trends in energy research, development, and demonstration expenditures by major International Energy Agency (IEA) member governments, by category.



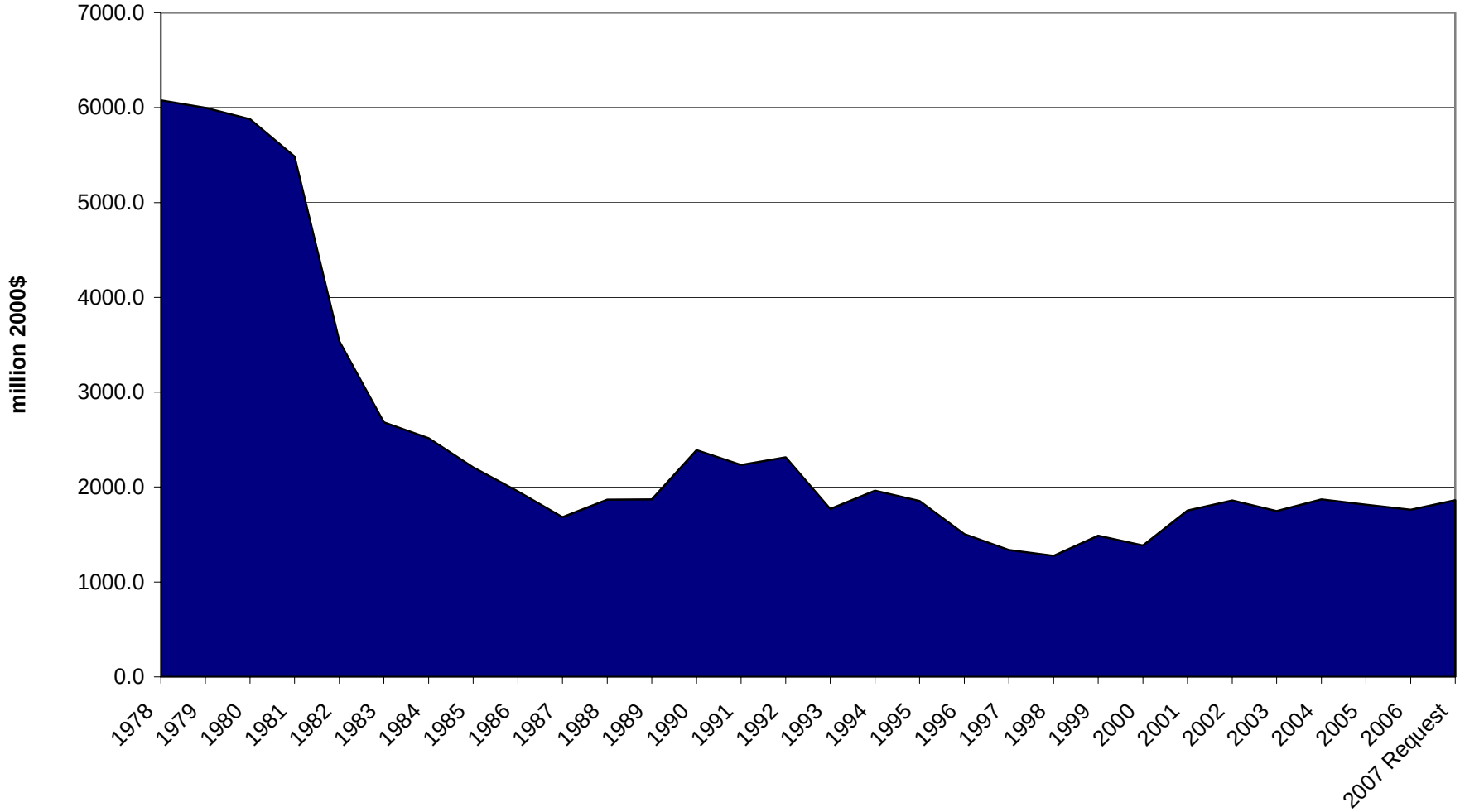
Source: IEA Energy R&D database

Notes About the Non-IEA Data

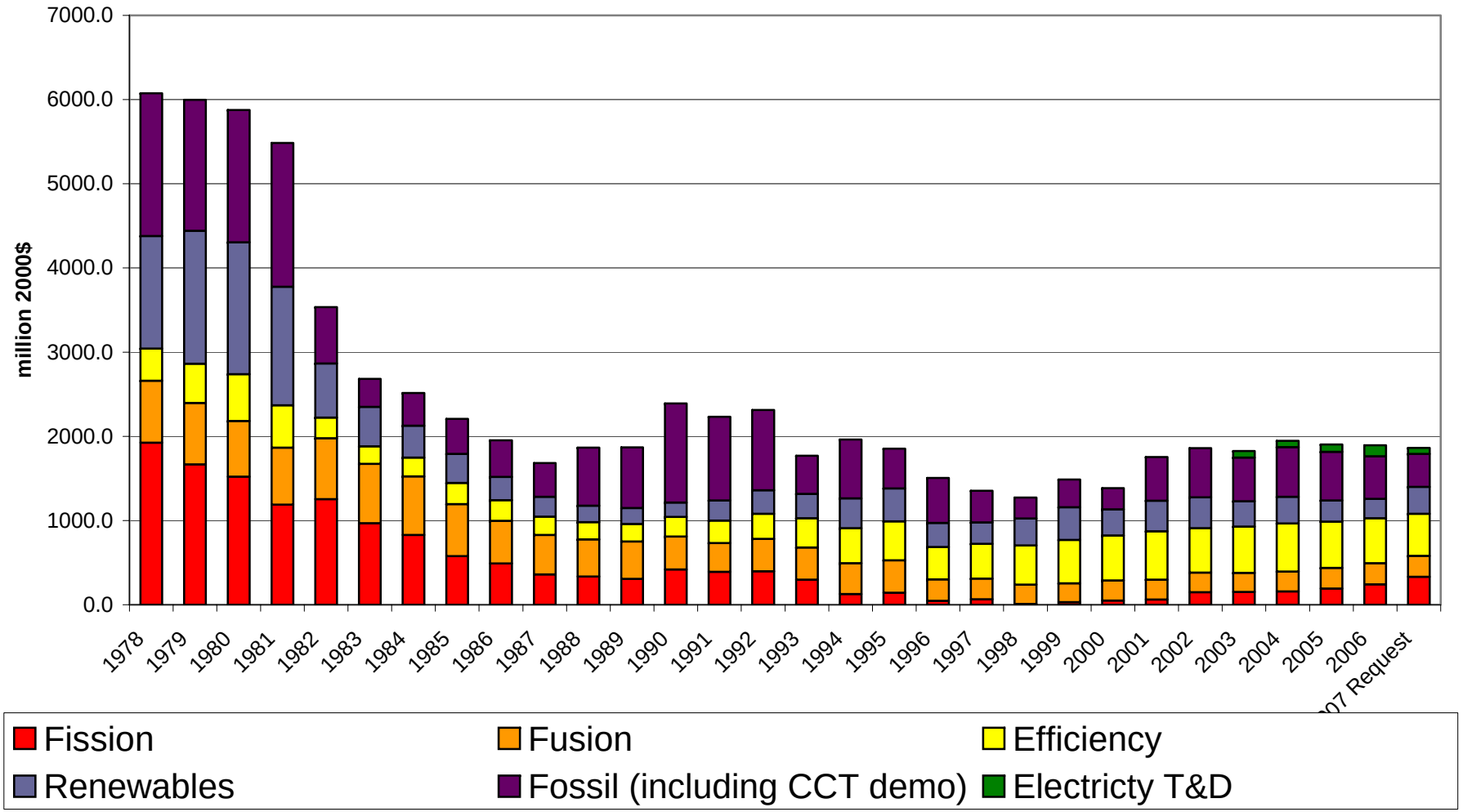
- What is measured: U.S. DOE energy RD&D
- What is not measured: deployment (fuzzy), non-energy fission and fusion nuclear (e.g. counter-proliferation), ERD&D in other agencies
- All subsequent charts are in constant 2000 dollars
- Problems with program direction estimates
- Data source is fiscal year Statistical Table of Appropriations, two years after the fiscal year, whenever possible.

Total DOE Energy RD&D Investments

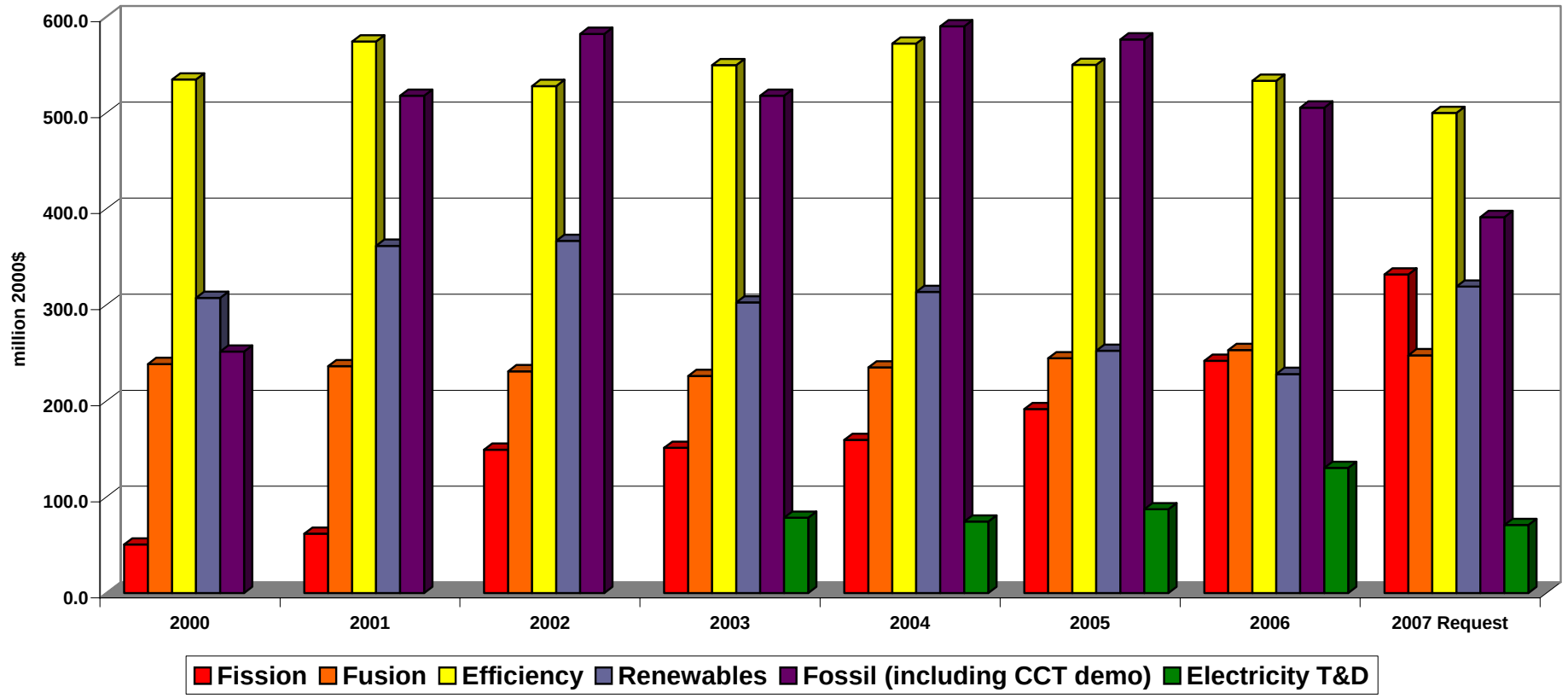
FY1978-FY07 Administration Request



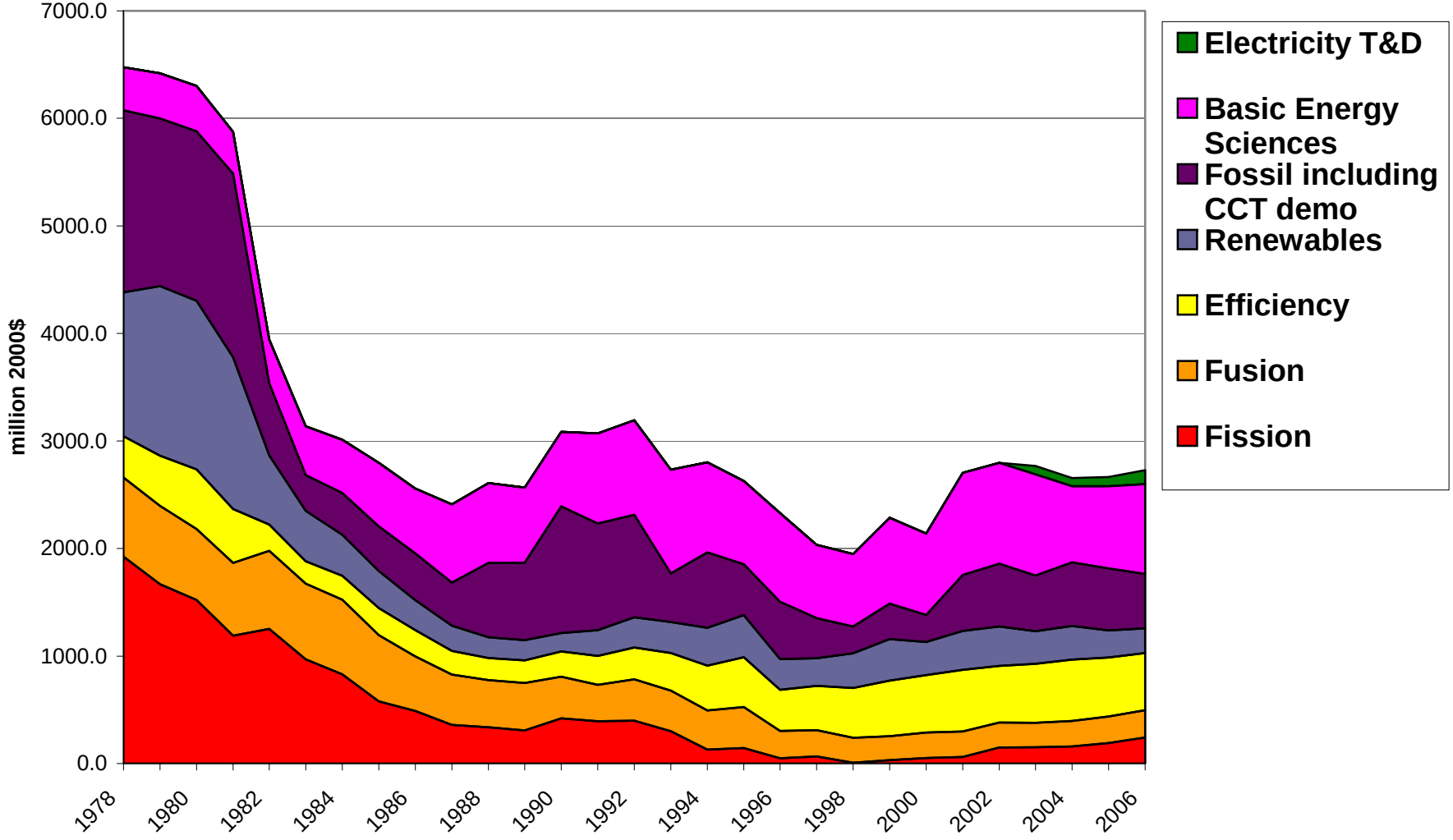
U.S. DOE Energy RD&D Spending
FY1978-FY2007 Admin. Request



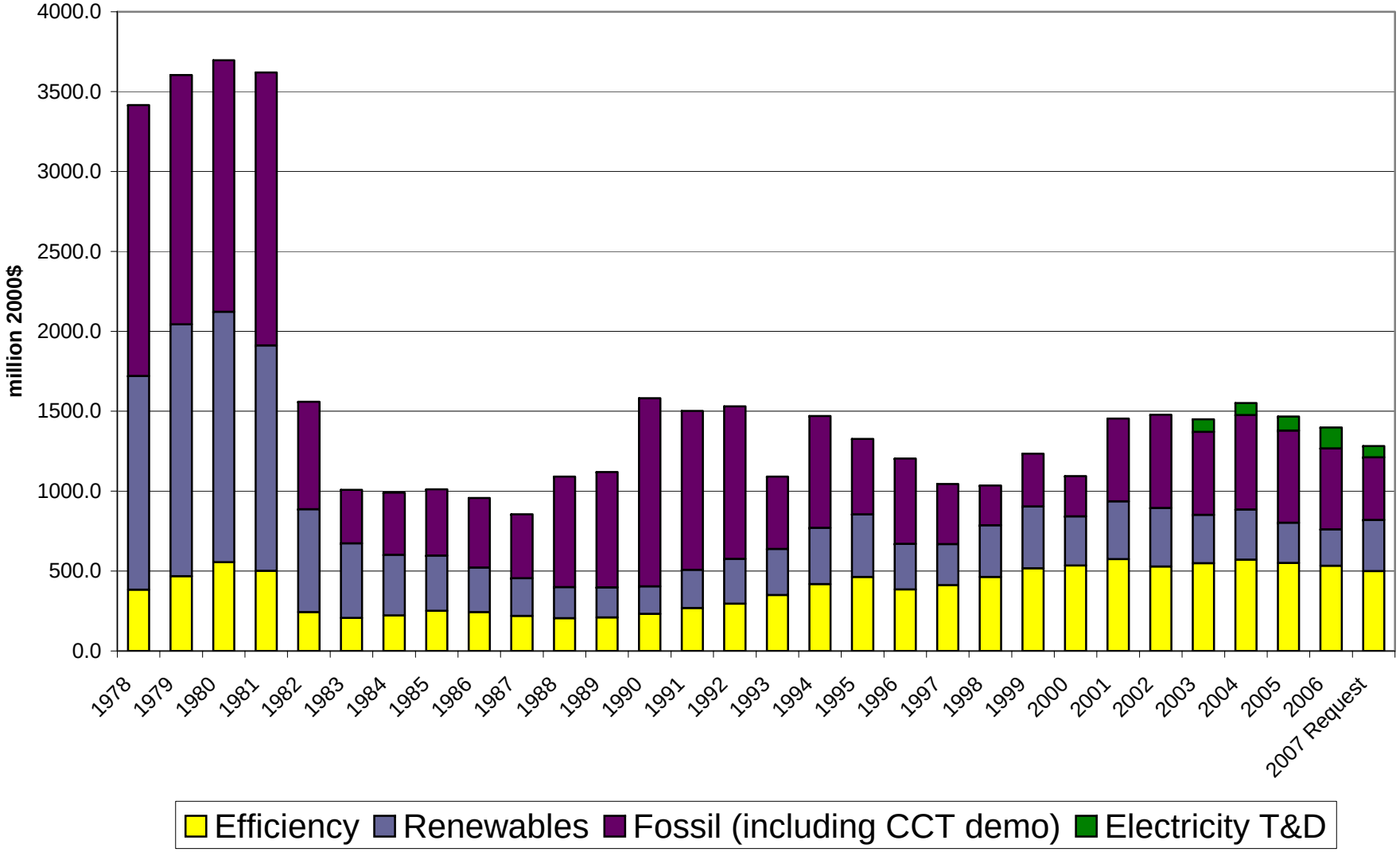
U.S. DOE Energy RD&D FY2000-FY2007 Request



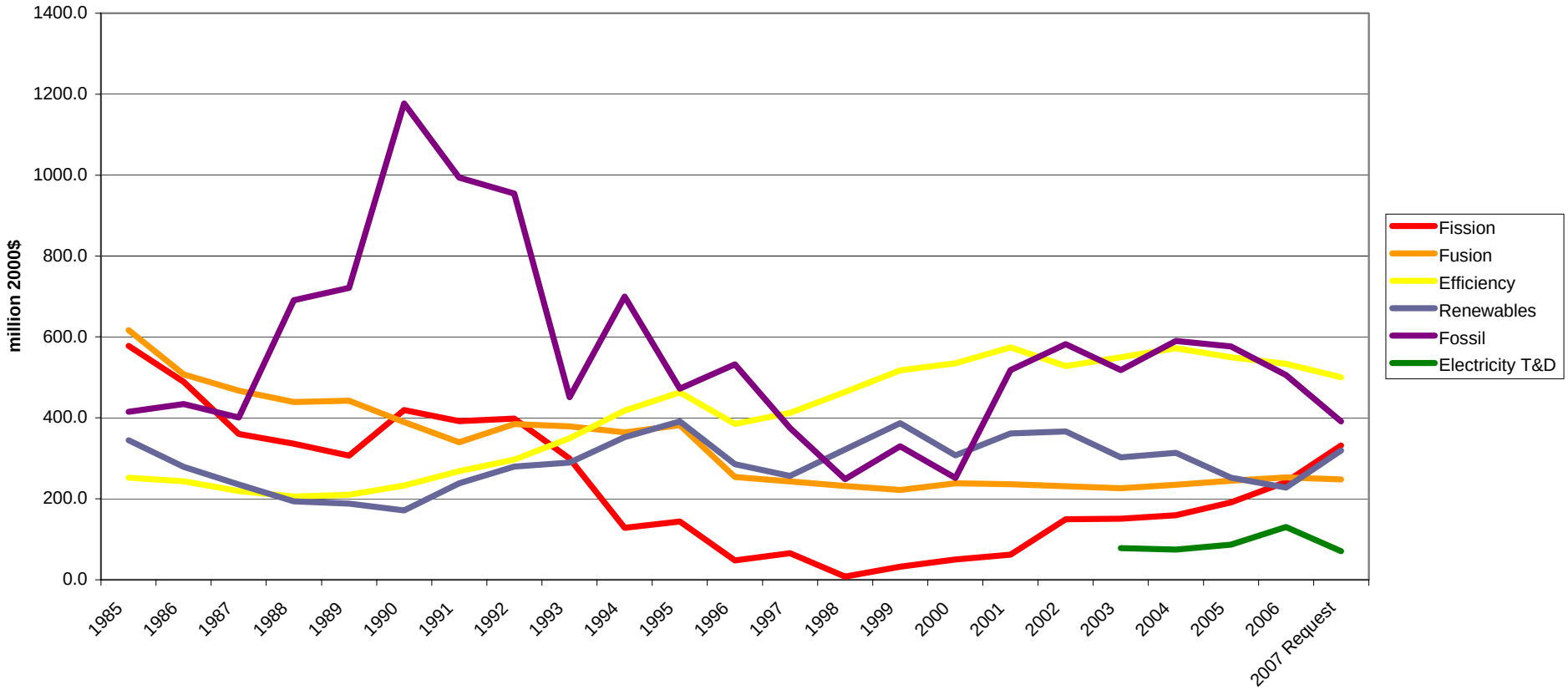
U.S. DOE Energy RD&D
FY1978-FY2006



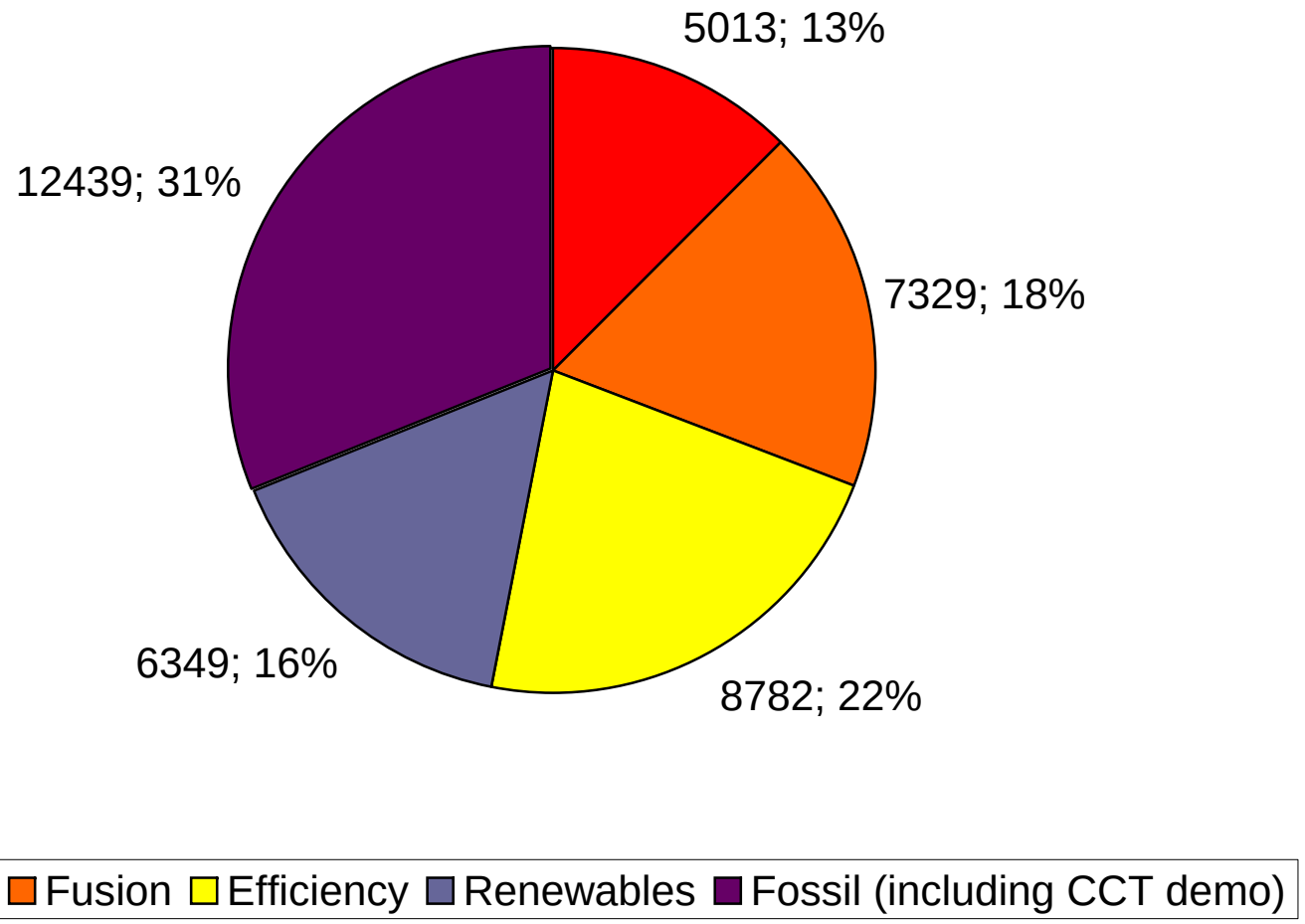
U.S. Non-Nuclear DOE Energy RD&D Spending



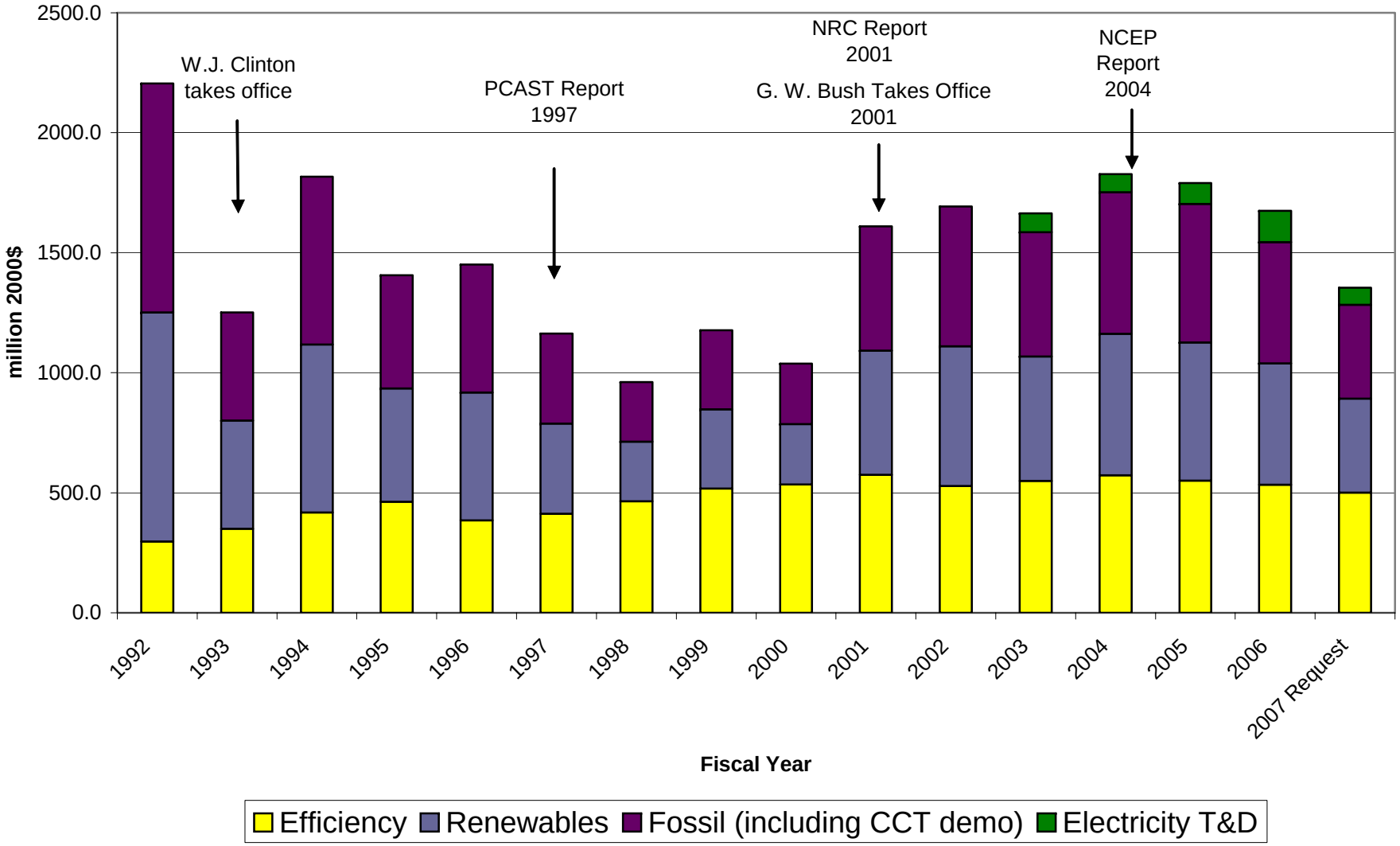
U.S. DOE Energy RD&D Spending by Category (FY1985-FY2007 Admin. Request)



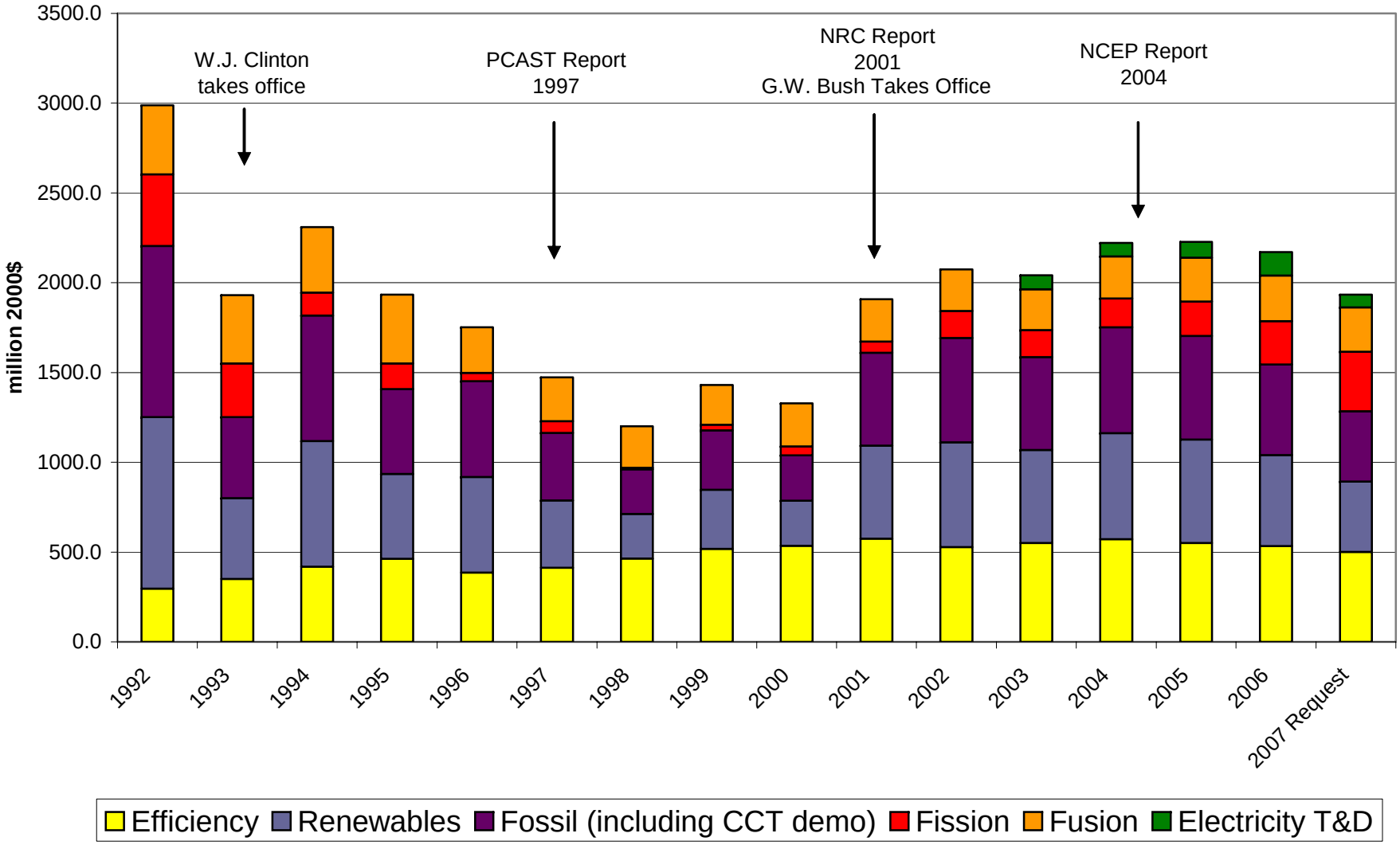
Cumulative Spending on U.S. DOE Energy RD&D (FY1985-FY2006)
(million 2000$)



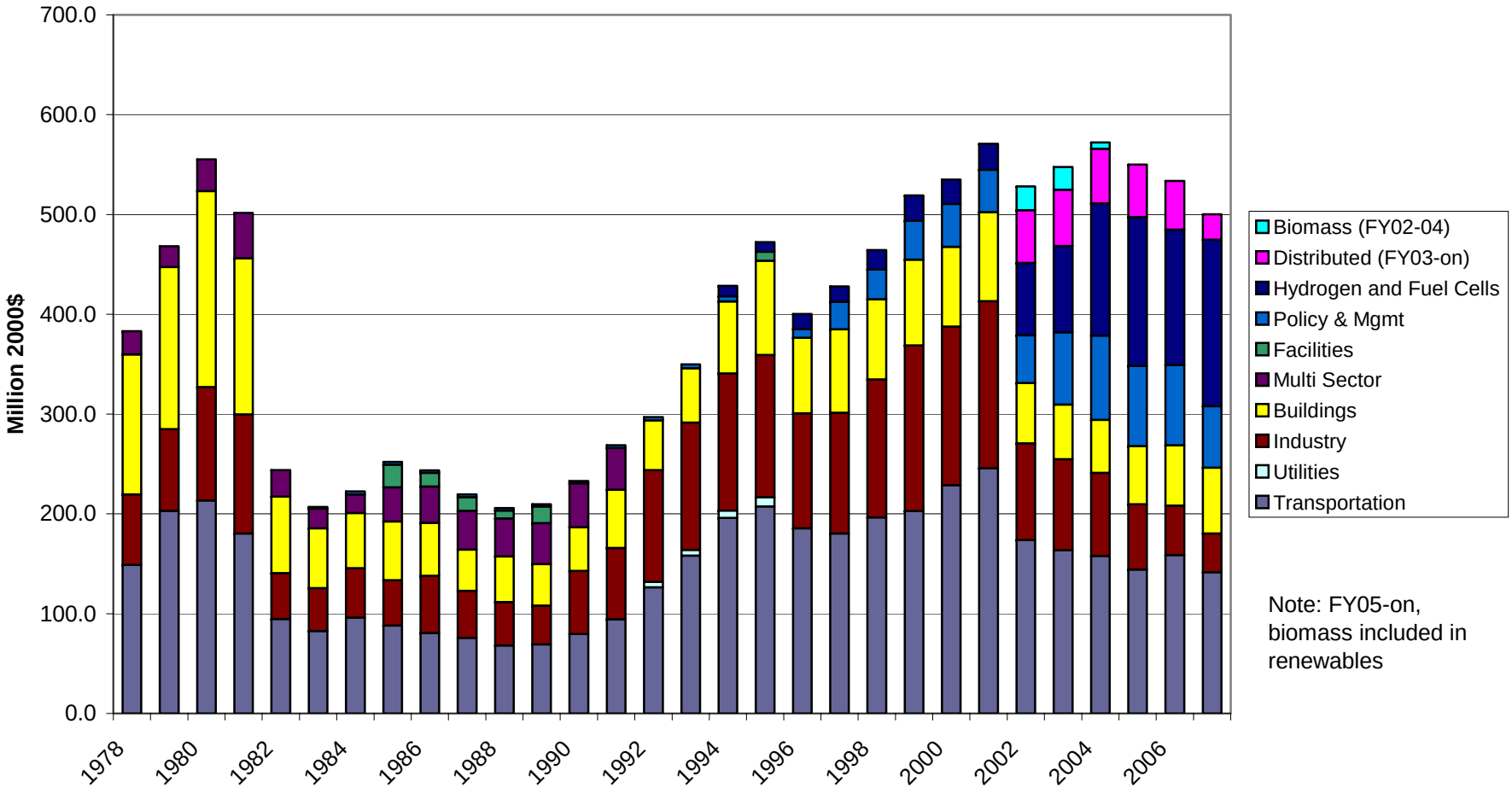
U.S. Non-Nuclear DOE Energy RD&D With Events



U.S. DOE Energy RD&D With Events

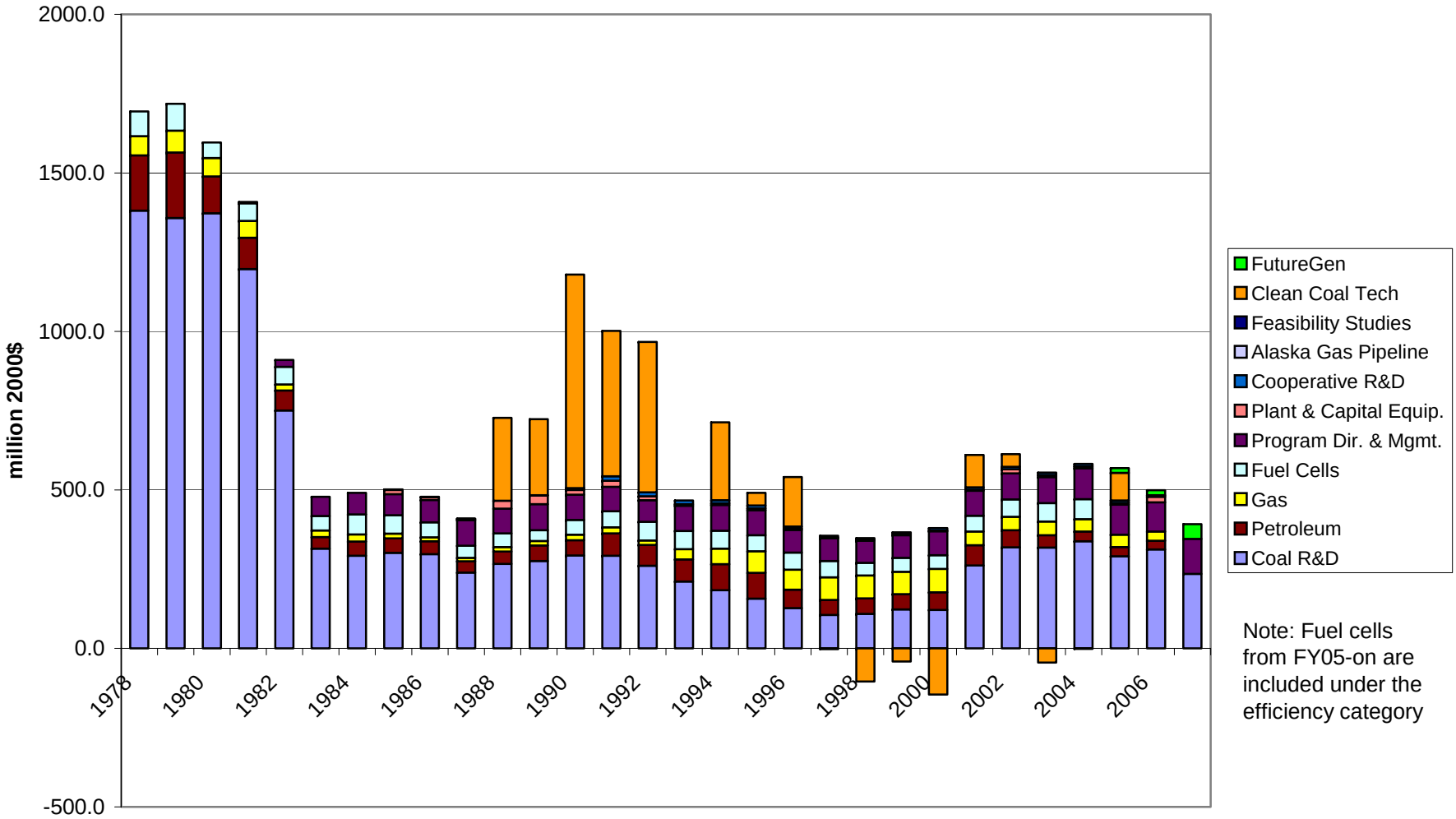


Composition of DOE Efficiency ERD&D (FY1978-FY2007 Admin. Request)



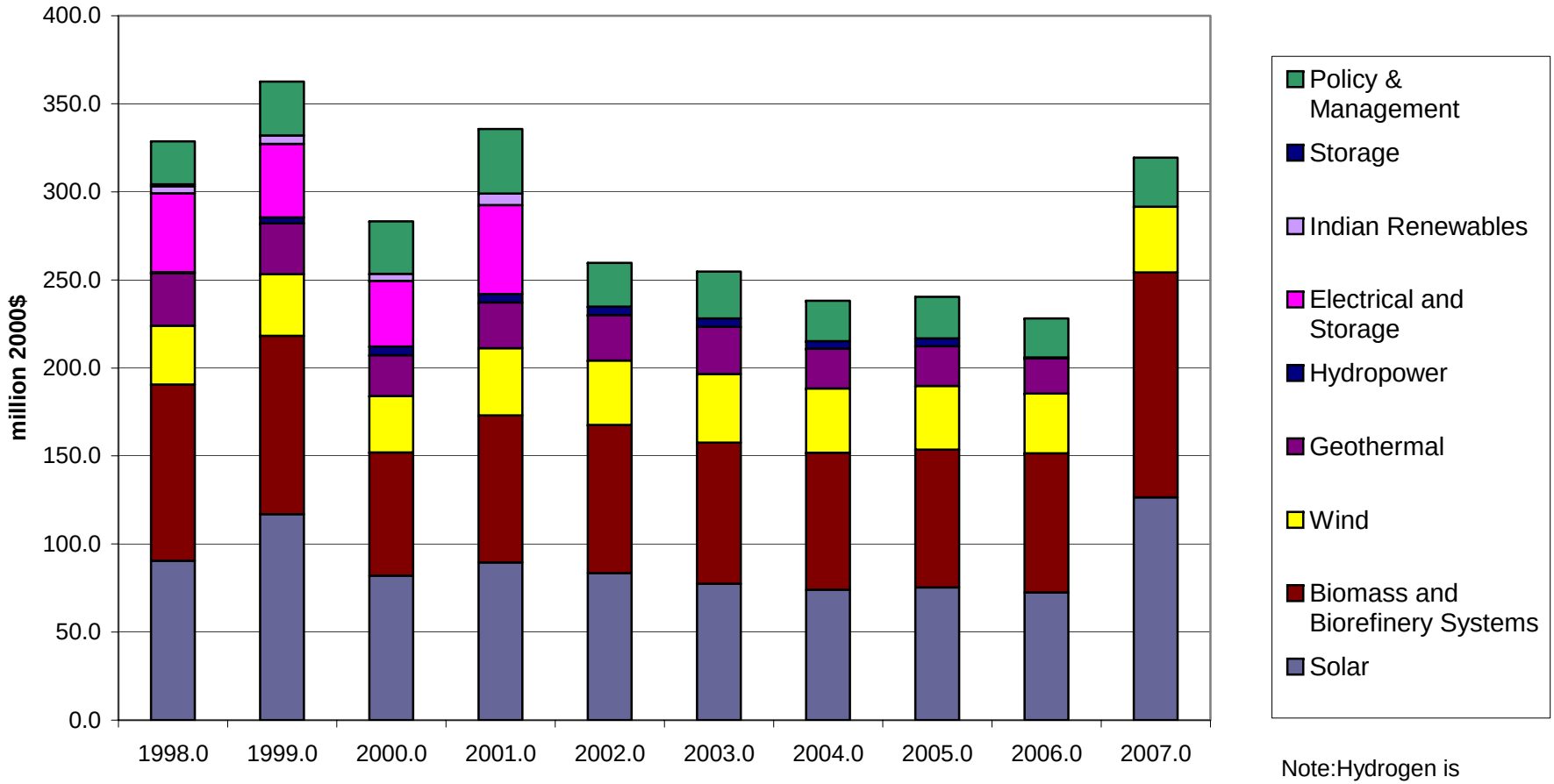
Note: FY05-on, biomass included in renewables

Composition of DOE Fossil Energy RD&D Spending (FY1978-FY2007 Admin. Request)



Note: Fuel cells from FY05-on are included under the efficiency category

Composition of Renewable Energy DOE ERD&D Spending (FY1998-FY2007 Admin. Request)



Note:Hydrogen is included in the Efficiency category

Other Important Notes

- Geothermal, hydropower, petroleum, and natural gas RD&D are all cancelled in the FY07 request
- Weatherization funding (deployment) is cut by $91 million current dollars. Weatherization activities help the poor install energy-efficient technologies

Conclusions: Specifics

- Carbon sequestration funding at $73 million is ridiculously low.
- It seems reasonable to zero out petroleum and natural gas funding.
- Although the percentage increases in solar, wind, and biomass investments seem impressive, their total budgets are relatively small.

Outcome Metrics

Figure 4 Trends in energy intensity for major countries. Energy values for China are presented on the right ordinate. Source: World Development Indicators online database **(**http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/**)** ktoe = kilotons of oil equivalent.

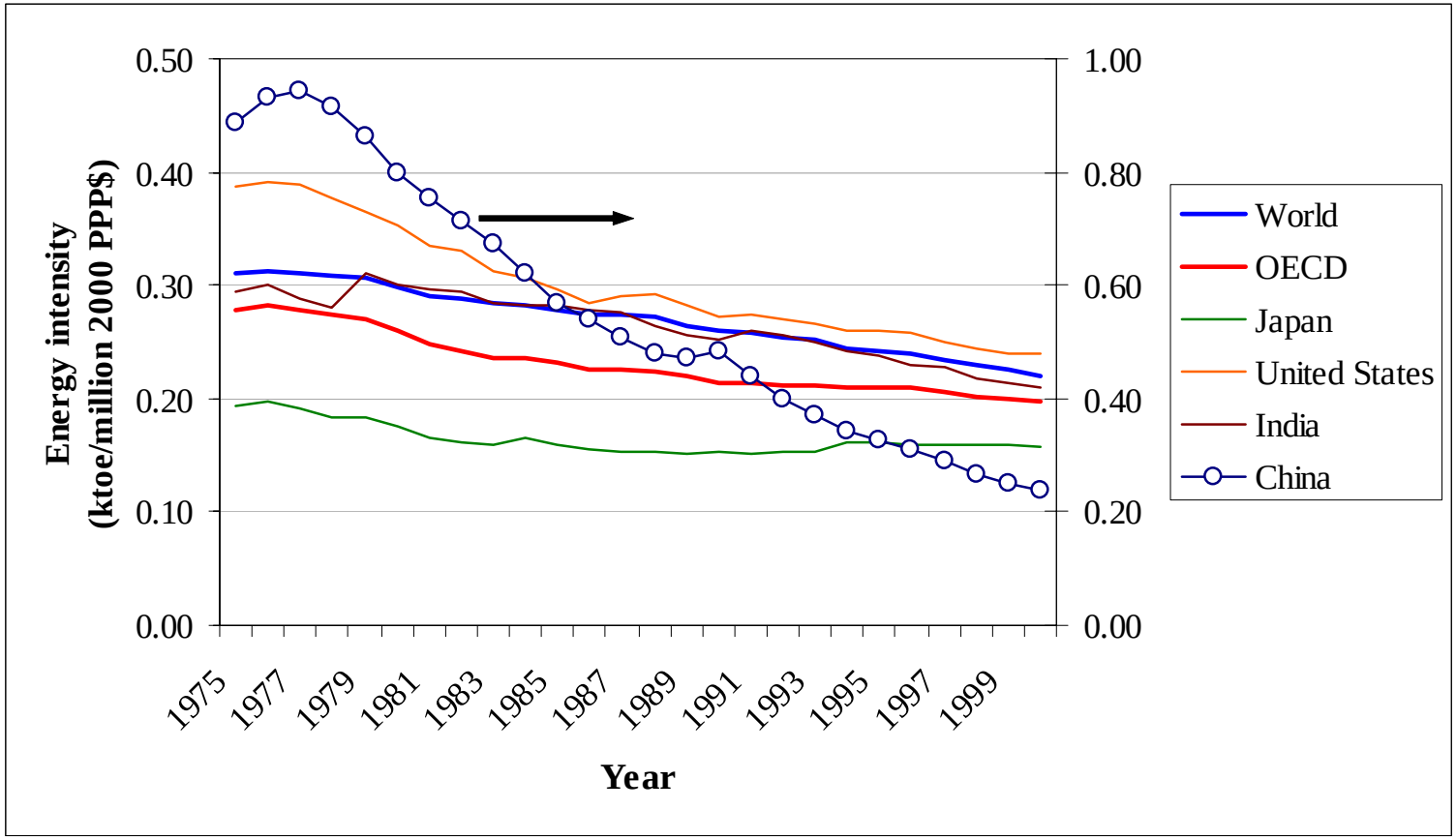
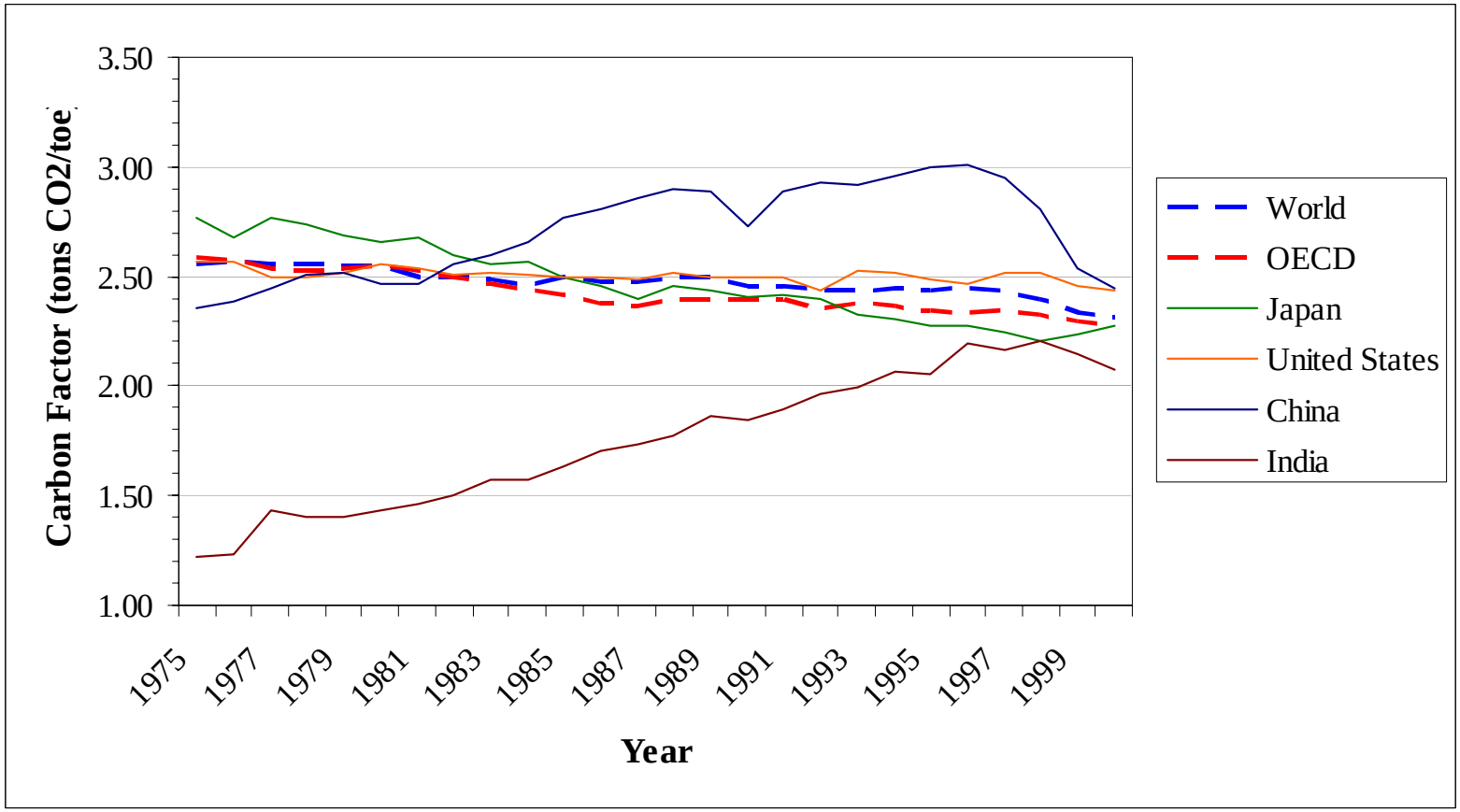


Figure 5 Trends in carbon factor for major countries. Source: World Development Indicators online database **(**http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/**)** ktoe = kilotons of oil equivalent.



Acknowledgements

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Database is available at
http://bcsia.ksg.harvard.edu/energy