Congressional Research Service
Informing the legislative debate since 1914

Renewable Energy R&D Funding History: A Comparison with Funding for Nuclear Energy, Fossil Energy, and Energy Efficiency R&D

Fred Sissine
Specialist in Energy Policy

October 10, 2014

Congressional Research Service
7-5700
www.crs.gov
RS22858

CRS REPORT
Prepared for Members and
Committees of Congress

Summary

Energy-related research and development (R&D)—on coal-based synthetic petroleum and on atomic power—played an important role in the successful outcome of World War II. In the post-war era, the federal government conducted R&D on fossil fuel and nuclear energy sources to support peacetime economic growth. The energy crises of the 1970s spurred the government to broaden the focus to include renewable energy and energy efficiency. Over the 37-year period from the Department of Energy's (DOE's) inception at the beginning of fiscal year (FY) 1978 through FY2014, federal funding for renewable energy R&D amounted to about 17% of the energy R&D total, compared with 15% for energy efficiency, 26% for fossil, and 38% for nuclear. For the 67-year period from 1948 through 2014, nearly 12% went to renewables, compared with 10% for efficiency, 25% for fossil, and 49% for nuclear.

Contents

Figures

Tables

Contacts

Introduction

Cumulative Funding History

This report provides a cumulative history of Department of Energy (DOE) funding for renewable energy compared with funding for the other energy technologies—nuclear energy, fossil energy, and energy efficiency. Specifically, it provides a comparison that covers cumulative funding over the past 10 years (FY2005-FY2014), a second comparison that covers the 37-year period since DOE was established at the beginning of fiscal year 1978 (FY1978-FY2014), and a third comparison that covers a 67-year funding history (FY1948-FY2014) for DOE and predecessor agencies.

FY2013 and FY2014 Appropriations

The final amount of FY2013 Energy and Water Development appropriations for DOE energy technologies was established on March 26, 2013, by the FY2013 Defense and Military Construction/VA, Full Year Continuing Resolution (P.L. 113-6). Those appropriations were considered in the context of the Budget Control Act of 2011 (BCA, P.L. 112-25), which established overall discretionary spending limits for FY2012-FY2021.[1] P.L. 113-6 completed the FY2013 funding, which had been covered initially—through March 27, 2013—by the Continuing Appropriations Resolution, 2013 (P.L. 112-175).[2]

Final funding for FY2014 was set by the Consolidated Appropriations Act, 2014 (P.L. 113-76), which contained appropriations for all FY2014 appropriations bills, including Energy and Water Development programs (Division D).[3]

Guide to Tables and Charts

Table 1 shows the cumulative funding totals in real terms (2013 dollars) for the past 10 years (first column), 37 years (second column), and 67 years (third column). **Table 2** converts the data from **Table 1** into relative shares of spending for each technology, expressed as a percentage of total spending for each period.

Figure 1 displays the data from the first column of **Table 2** as a pie chart. That chart shows the relative shares of cumulative DOE spending for each technology over the 10 years from FY2005 through FY2014. **Figure 2** provides a similar chart for the period from FY1978 through FY2014. **Figure 3** shows a chart for FY1948 through FY2014.

[1] The American Taxpayer Relief Act (ATRA, P.L. 112-240), enacted on January 2, 2013, made a number of significant changes to the procedures in the BCA that apply during FY2013.

[2] For more details, see CRS Report R42498, *Energy and Water Development: FY2013 Appropriations*, coordinated by Mark Holt.

[3] For more details, see CRS Report R43121, *Energy and Water Development: FY2014 Appropriations*, coordinated by Carl E. Behrens.

Background

Evolution of the Department of Energy

The availability of energy—especially gasoline and other liquid fuels—played a critical role in World War II.[4] Another energy-related factor was the application of research and development (R&D) to the atomic bomb (Manhattan Project) and other military technologies. During the post-World War II era, the federal government began to apply R&D to the peacetime development of energy sources to support economic growth. At that time, the primary R&D focus was on fossil fuels and new forms of energy derived from nuclear fission and nuclear fusion.

The Atomic Energy Act of 1946 established the Atomic Energy Commission (AEC), which inherited all of the Manhattan Project's R&D activities.[5] A major focus of the AEC was research on "atoms for peace," the use of nuclear energy for civilian electric power production. Prompted by the Arab Oil Embargo of 1973, the Federal Energy Administration was established in mid-1974. In early 1975, the Energy Research and Development Administration (ERDA) was established, incorporating the AEC and several energy programs that had been operating under the Department of the Interior and other federal agencies.[6]

The Department of Energy (DOE) was established by law in 1977,[7] incorporating activities of the FEA and ERDA. All of the energy R&D programs—fossil, nuclear, renewable, and energy efficiency—were brought under its administration. DOE also undertook a small program in energy storage and electricity system R&D that supports the four main energy technology programs.[8]

Evolution of Energy Technology R&D Funding

From FY1948 through FY1977 the federal government provided an extensive amount of R&D support for fossil energy and nuclear power technologies.[9] Total spending on fossil energy technologies over that period amounted to about $16.4 billion, in constant FY2013 dollars. The federal government spent about $49.3 billion (in constant FY2013 dollars) during that period for nuclear fission and nuclear fusion energy R&D.[10]

[4] Regarding coal-based synthetic petroleum production—before, during, and after World War II—see DOE's discussion at http://fossil.energy.gov/aboutus/history/syntheticfuels_history.html.

[5] DOE, *Origins of the U.S. Department of Energy*, (DOE/HR-0098, draft), p. 8. Also, see DOE, A History of the Atomic Energy Commission, (DOE/ES-0003/ 1; by Alice L. Buck) July 1983 http://www.atomictraveler.com/HistoryofAEC.pdf.

[6] DOE, *Department of Energy 1977-1994*, p. 17-22, (DOE/HR-0098) http://energy.gov/downloads/summaryhistorypdf.

[7] The Department of Energy Organization Act, P.L. 95-91, was enacted on August 4, 1977.

[8] This program includes R&D on advanced batteries to store electricity and transmission equipment to transfer electricity with less heat loss (i.e. at higher levels of energy efficiency).

[9] DOE. Pacific Northwest Laboratory. *An Analysis of Federal Incentives Used to Stimulate Energy Production.* 1980. The spending for fossil energy included coal, oil, and natural gas technologies.

[10] Ibid.

The energy crises of the 1970s spurred the federal government to expand its R&D programs to include renewable (wind, solar, biomass, geothermal, hydro) energy and energy efficiency technologies. Modest efforts to support renewable energy and energy efficiency began during the early 1970s. From FY1973 through FY1977 the federal government spent about $2.5 billion (in constant FY2013 dollars) on renewable energy R&D, $890 million on energy efficiency R&D, and $180 million on electric systems R&D.[11] Since FY1978, DOE has been the main supplier of energy R&D funding.[12]

In real (constant dollar) terms, funding support for all four of the main energy technologies skyrocketed during the 1970s to a combined peak in FY1979 at about $8 billion (2013 constant dollars). Funding then dropped steadily, reaching a plateau of about $2 billion (2013 dollars) per year during the late 1990s. Since then, funding has increased gradually—except that the Recovery Act provided a one-year spike up to about $12 billion (2013 dollars) in FY2009. For FY2013, DOE energy R&D funding stands at about $3.7 billion (2013 dollars).

Table 1. DOE Energy Technology Cumulative Funding Totals

(billions of 2013 dollars)

	Period		
Technology	**FY2005-FY2014 (10 years)**	**FY1978-FY2014 (37 years)**	**FY1948-FY2014 (67 years)**
Renewable Energy	$7.87	$ 22.13	$ 22.96
Energy Efficiency	6.70	19.73	19.13
Fossil Energy	10.00	33.91	49.30
Nuclear Energy	11.66	50.14	97.44
Electric Systems	6.26	8.85	8.69
Total	$42.50	$132.69	$204.00

Sources: *DOE Budget Authority History Table by Appropriation*, May 2007; *DOE Congressional Budget Requests* (several years); DOE (Pacific Northwest Laboratory), *An Analysis of Federal Incentives Used to Stimulate Energy Production*, 1980. Deflator Source: *The Budget for Fiscal Year 2015*. Historical Tables. Table 10.1. Gross Domestic Product and Deflators Used in the Historical Tables, 1940-2019.

[11] *DOE Conservation and Renewable Energy Base Table.* February 1990.

[12] There has been some energy R&D funding—on a much smaller scale—provided by the Department of Defense and other agencies. Coverage of that funding is beyond the scope of this report.

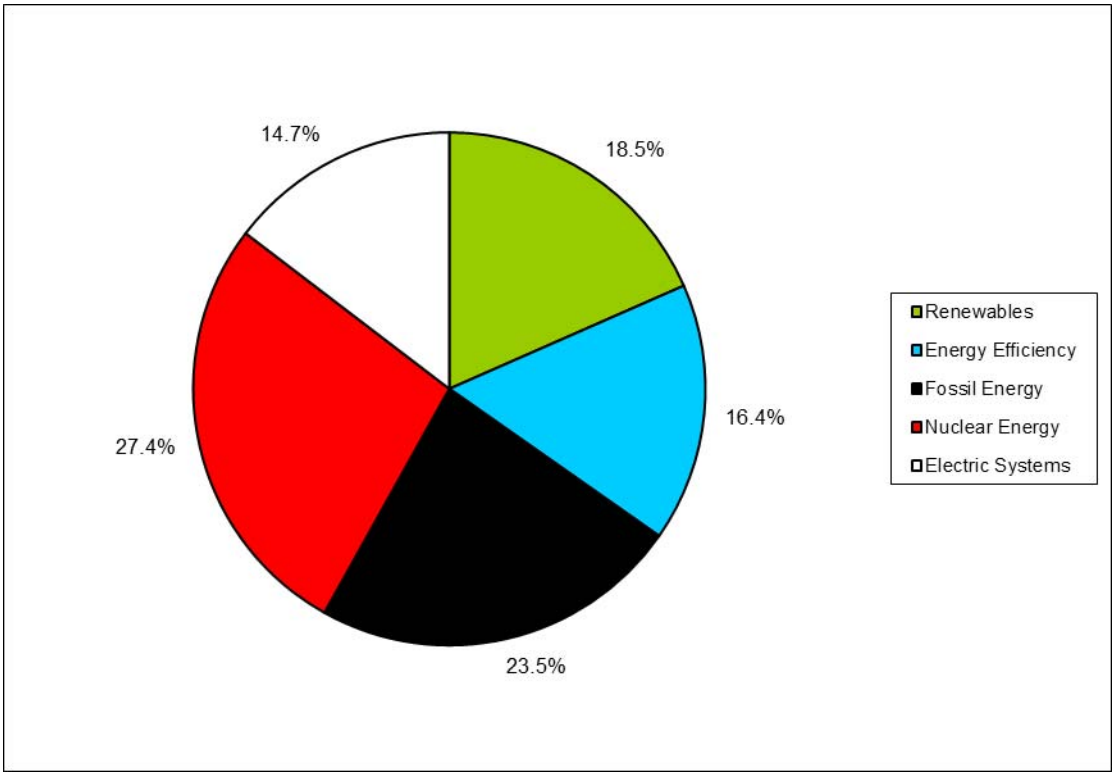
Table 2. DOE Energy Technology Share of Funding

(percent; derived from **Table 1**)

Technology	Period		
	FY2005-FY2014 (10 years)	**FY1978-FY2014 (37 years)**	**FY1948-FY2014 (67 years)**
Renewable Energy	18.5%	16.7%	12.1%
Energy Efficiency	15.8%	14.9%	10.1%
Fossil Energy	23.5%	25.6%	24.6%
Nuclear Energy	27.4%	37.8%	48.8%
Electric Systems	14.7%	6.7%	4.4%
Total	100.0%	100.0%	100.0%

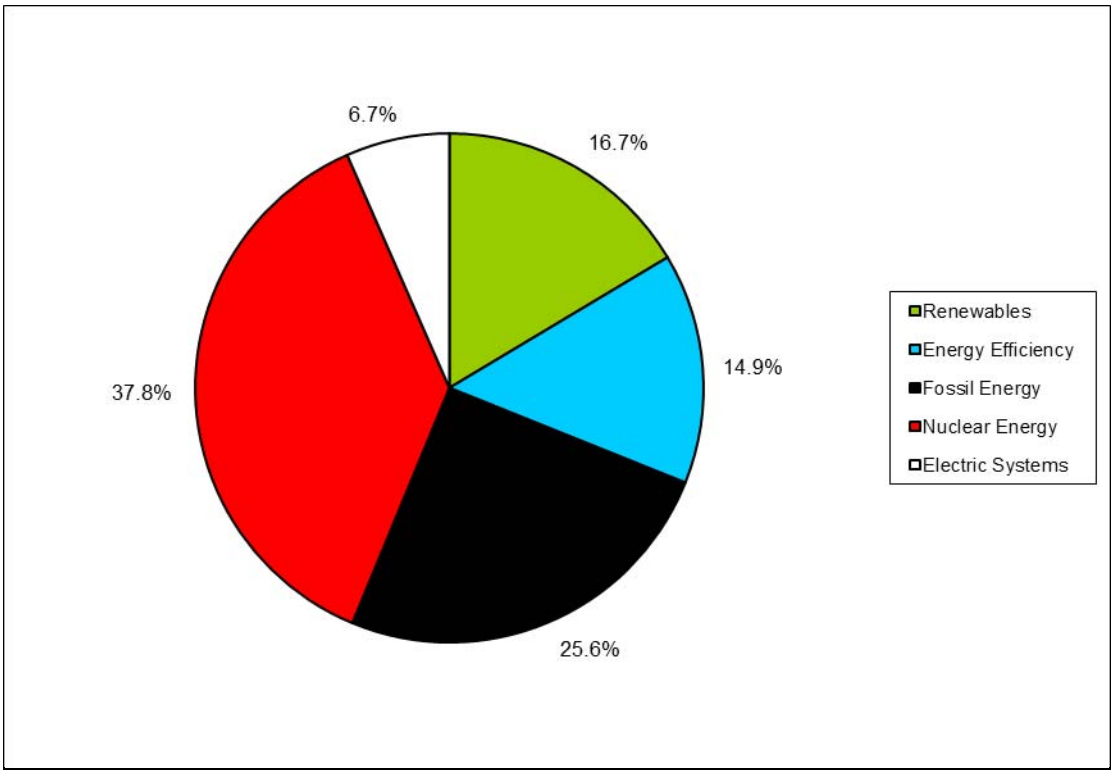
Sources: *DOE Budget Authority History Table by Appropriation*, May 2007; *DOE Congressional Budget Requests* (several years); DOE (Pacific Northwest Laboratory), *An Analysis of Federal Incentives Used to Stimulate Energy Production,* 1980; *DOE Conservation and Renewable Energy Base Table*. February 1990. Deflator Source: *The Budget for Fiscal Year 2015*. Historical Tables. Table 10.1. Gross Domestic Product and Deflators Used in the Historical Tables, 1940-2019.

Figure 1. DOE Energy Technology Share of Funding, FY2005-FY2014



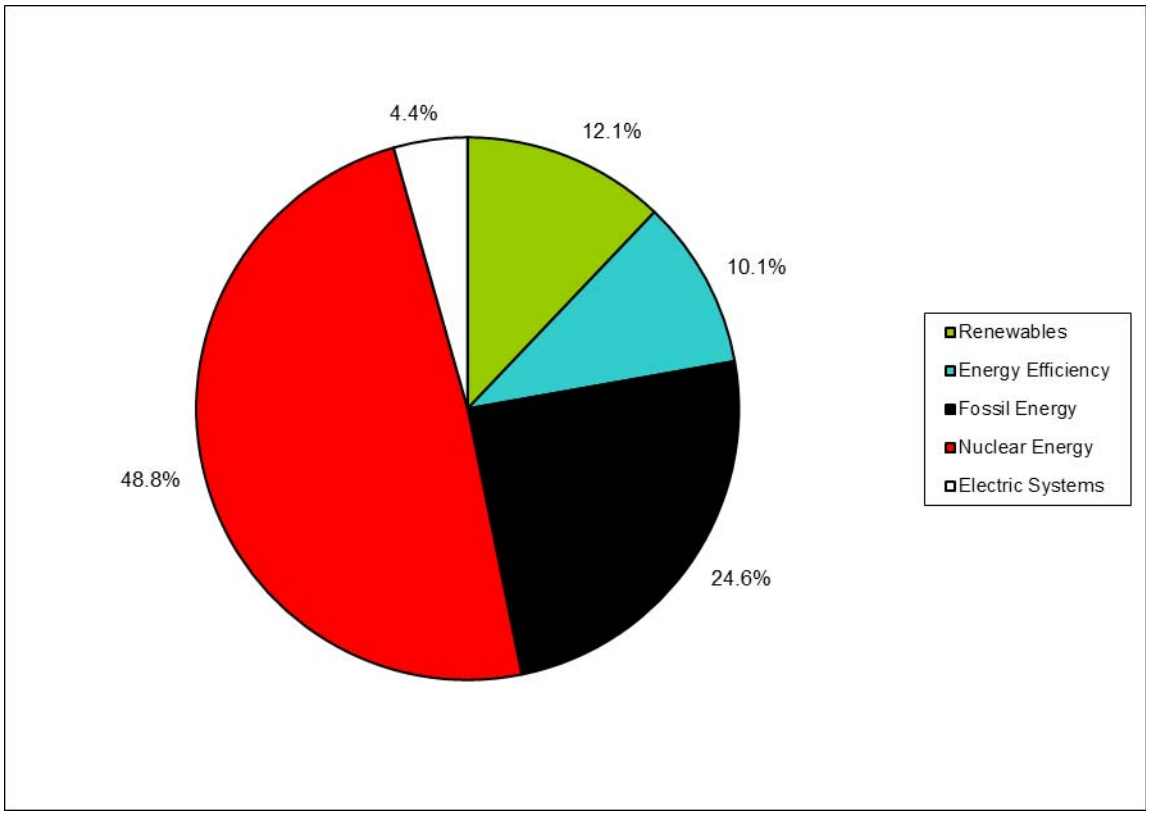
Source: *DOE Budget Authority History Table by Appropriation*, May 2007; *DOE Congressional Budget Requests* (several years); Deflator Source: *The Budget for Fiscal Year 2015*. Historical Tables. Table 10.1. Gross Domestic Product and Deflators Used in the Historical Tables, 1940-2019.

Figure 2. DOE Energy Technology Share of Funding, FY1978-FY2014



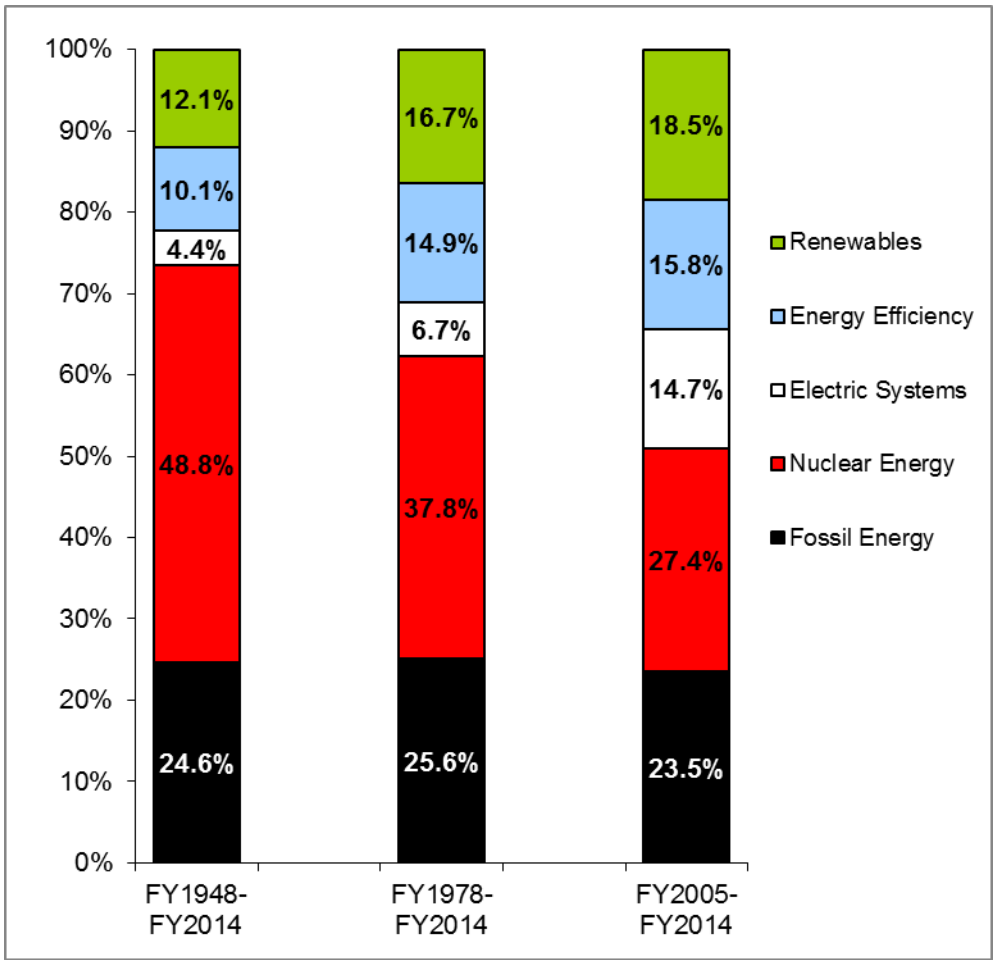
Sources: *DOE Budget Authority History Table by Appropriation*, May 2007; *DOE Congressional Budget Requests* (several years); Deflator Source: *The Budget for Fiscal Year 2015*. Historical Tables. Table 10.1. Gross Domestic Product and Deflators Used in the Historical Tables, 1940-2019.

Figure 3. DOE Energy Technology Share of Funding, FY1948-FY2014



Sources: *DOE Budget Authority History Table by Appropriation*, May 2007; *DOE Congressional Budget Requests* (several years); DOE (Pacific Northwest Laboratory), *An Analysis of Federal Incentives Used to Stimulate Energy Production*, 1980; *DOE Conservation and Renewable Energy Base Table*. Feb. 1990. Deflator Source: *The Budget for Fiscal Year 2015*. Historical Tables. Table 10.1.

Figure 4. DOE Energy Technology Share of Funding, Comparison over Three Periods



Sources: *DOE Budget Authority History Table by Appropriation*, May 2007; *DOE Congressional Budget Requests* (several years); DOE (Pacific Northwest Laboratory), *An Analysis of Federal Incentives Used to Stimulate Energy Production*, 1980; *DOE Conservation and Renewable Energy Base Table*. Feb. 1990. Deflator Source: *The Budget for Fiscal Year 2015*. Historical Tables. Table 10.1.

Note: Column to far left shows shares for the period FY1948-FY2014; middle column shows shares for period from FY1978-FY2014; and far right column shows shares for period from FY2005-FY2014.

Author Contact Information

Fred Sissine
Specialist in Energy Policy
fsissine@crs.loc.gov, 7-7039