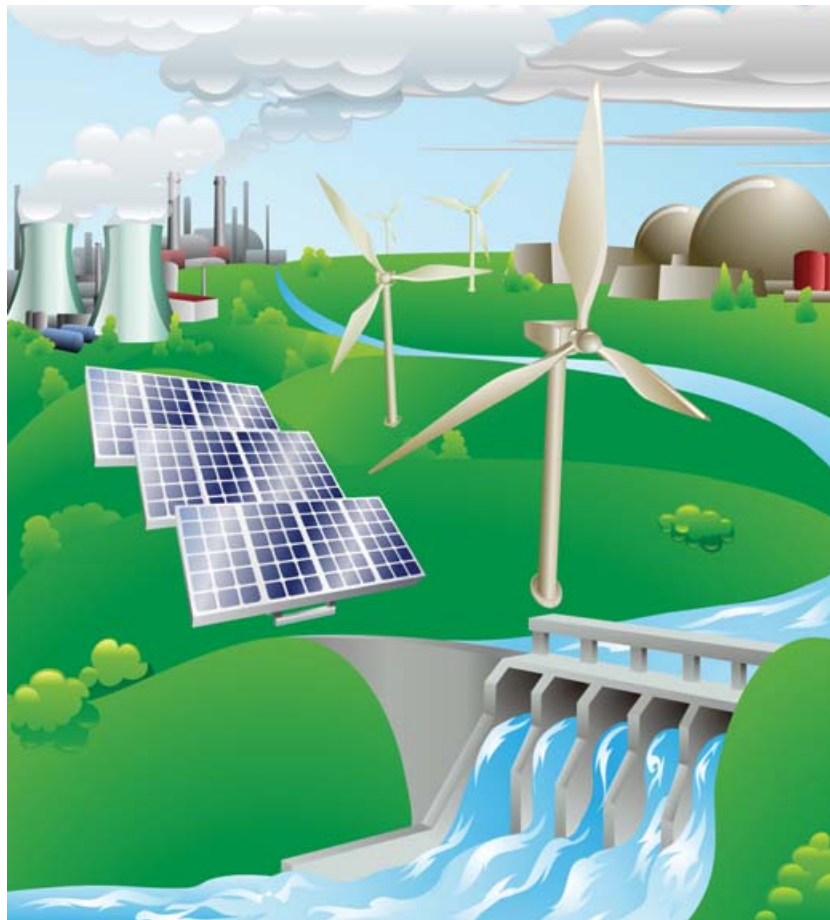
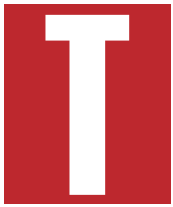


Energy Subsidy Myths and Realities



Playing favorites
or 'all of the above'?

BY ROGER H. BEZDEK AND ROBERT M. WENDLING



he issue of federal incentives for energy industries is highly contentious and has serious implications—for U.S. energy policy, environmental policy, and for budgets and deficit reduction. Thus far, unfortunately, the debate has suffered from a lack of rigorous empirical data. And that lack extends to the amounts, distributions, and forms of federal incentives. It only encourages an excess of rhetoric, claims, and counterclaims.

For example, renewable energy advocates and environmentalists contend that the federal government provides large subsidies and incentives to the fossil and nuclear industries, while offering relatively little to renewable energy. The oil and gas industries contend that their subsidies are modest and are essential for increasing production. And so forth.

To provide a clearer understanding of government spending patterns, recent research gathered comprehensive detailed information on federal energy incentives over the past six decades.¹ This research shows how the federal government has historically encouraged, promoted, and supported the development of U.S. energy resources—in many diverse ways, including direct subsidies, regulation, tax incentives.² The many forms of incentives make it difficult to quantify the relative costs and benefits of different policy priorities and approaches, but empirical data sheds some light on the issue, which might help future energy policy leaders make the best possible use of taxpayer dollars.

Historical Perspective

During the 60-plus years that federal incentives have played a significant role in the modern energy marketplace, government support has changed directions many times, making it extremely difficult to identify incentives and track them through year-to-year changes in legislation and budgets. According to research by Management Information Services, federal incentives for energy development from 1950 through 2010 totaled \$837 billion (2010 dollars). These incentives can be classified within six generic categories (see Figure 1).³ This classification illustrates not only the total federal incentives for each energy source—nuclear, hydro, coal, oil, natural gas, renewables, and geothermal⁴—but also the distribution of these incentives among the different policy options and support mechanisms.

- *Research and development (R&D)*;
- *Regulation*: Federal regulations and mandates;⁵
- *Taxation*: Special exemptions, allowances, deductions, credits, etc. related to the federal tax code;
- *Disbursements*: Direct financial subsidies, such as grants;
- *Government services*: Assistance provided by the federal government without direct charge; and
- *Market activity*: Direct federal involvement in the marketplace.

The research quantified the expenditures from 1950 to 2010 and identified the types of incentives provided and the energy sources targeted with each type of incentive.⁶ The amounts and recipients of each type of incentive are summarized in Figure 1, which shows three key facts. Namely, the federal government has

Much of U.S. energy policy is literally invisible—off-budget and hidden from scrutiny.

provided \$837 billion (2010 dollars) for energy developments since 1950. The largest type of incentive has been tax concessions, amounting to about 47 percent of all incentives. And federally funded regulation and R&D, at 19 and 18 percent respectively, are the second- and third-largest incentives. The dominance of oil and gas incentives is apparent in Figure 2. Federal tax concessions for oil and gas are the largest of all incentives, amounting to nearly 80 percent of all tax-related allowances for energy. Regulation of prices on oil for stripper wells or new wells comprises the second largest amount of incentives aimed at a particular energy type. In the R&D category, nuclear energy received about half of the expenditures since 1950 and coal about a quarter of the total. This figure also illustrates that oil and gas received almost 60 percent (\$490 billion) of federal spending to support energy since 1950. Oil alone received three-fourths (\$369 billion) of this amount. Coal received approximately 12 percent (\$104 billion) of federal incentives, while hydro received approximately 11 percent (\$90 billion). Wind, solar and geothermal received approximately 10 percent (\$81 billion), and nuclear received approximately 9 percent (\$73 billion) of federal incentives. If all of the renewable sources—hydro, geothermal, biofuels, wind, and solar—are grouped together, then renewables received the second highest percent of federal incentives, 23 percent. And nuclear energy was the beneficiary of about half (\$74 billion) of federal spending on energy R&D.⁷

Each energy type benefits from a mix of federal incentives, and the distribution is shown in Figure 2. For the period 1950 to 2010, the mix for each energy type is illustrated in Figures 3a and 3b.

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FIG. 1**TOTAL FEDERAL ENERGY INCENTIVES**

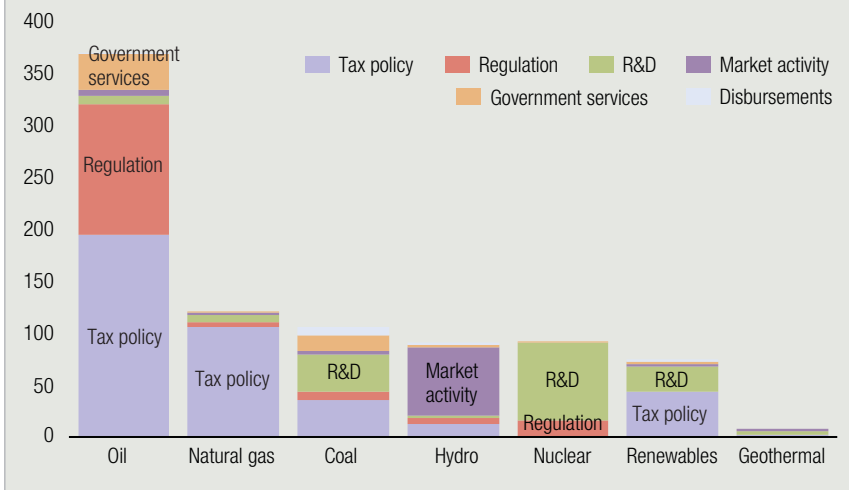
Total cost of federal incentives for energy development through 2010 (\$Billions - 2010).

	Nuclear	Hydro	Coal	Oil	Natural Gas	Renewables	Geothermal	TOTAL	Percent
R&D	\$73.8	\$1.5	\$35.9	\$8.0	\$6.8	\$23.6	\$3.7	\$153.3	18.3
Regulation	16.1	5.3	8.1	124.8	3.8	0.0	0.0	158.1	18.9
Taxation	0.0	13.4	34.6	194.4	106.2	43.8	1.8	394.2	47.1
Disbursements	-18.1	1.9	6.9	1.4	0.0	2.1	0.0	-5.8	--
Government Services	1.5	1.6	15.7	34.2	1.6	2.4	0.0	57.0	6.8
Market Activity	0.0	65.8	2.7	5.7	2.4	2.1	1.7	80.4	9.6
TOTAL	\$73.3	\$89.5	\$103.9	\$368.5	\$120.8	\$74.0	\$7.2	\$837.2	
Percent	8.8	10.7	12.4	44.0	14.4	8.8	0.9		100.0

Source: Management Information Services, Inc.

FIG. 2**ENERGY INCENTIVES BY RESOURCE**

Comparison of federal expenditures for energy development, 1950 through 2010 (\$Billions - 2010).



Source: Management Information Services, Inc.

little to renewable energy (biofuels, wind, and solar). Thus, the refrain is often heard, “The fossil industries are being given huge federal financial incentives, while renewable energy is being starved.”

The data show that this conventional wisdom is wrong. In fact, there’s a huge imbalance in recent federal energy incentives; however, the imbalance is strongly in favor of renewable energy (RE)—especially when the contribution to energy supply of the different energy technologies is considered.

For example, the U.S. obtains about 83 percent of its energy from fossil fuels (37 percent from oil, 25 percent from natural gas, and 21 percent from coal), 9 percent

from nuclear power, 3 percent from hydro, and 3 percent from biofuels, wind, and solar (see Figure 4). As shown in Figure 5, federal energy subsidies are heavily weighted in favor of biofuels, wind, and solar: Of the approximately \$16.1 billion in 2010 federal energy subsidies, these three RE technologies received about \$10.5 billion—65 percent of the total. Subsidies for fossil energy totaled less than \$5 billion—30 percent. Thus, in 2010, biofuels, wind, and solar received more than twice the federal incentives as oil, coal, and natural gas combined.

Recent Trends

Estimating historical federal energy incentives is important, but it doesn’t indicate more recent trends in federal energy incentives policies—for example, it’s unclear how subsidies in the 1950s and 1960s relate to current energy incentives and policies. In particular, there’s a common perception that recent and current federal energy policies provide large subsidies and incentives to the fossil industries (oil, coal, and natural gas) while providing relatively

little to renewable energy (biofuels, wind, and solar). Thus, the refrain is often heard, “The fossil industries are being given huge federal financial incentives, while renewable energy is being starved.”

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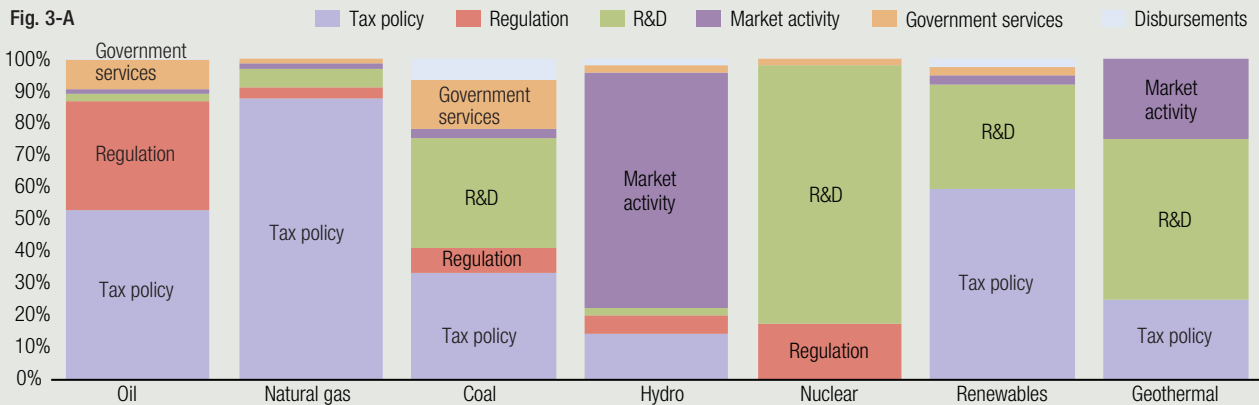
This imbalance is demonstrated in Figure 6, which compares U.S. energy supplies from each technology with federal subsidies for that technology.

The imbalance in favor of RE shown in Figure 6 is longstanding, and the federal government has supported RE technologies for decades. Further, the imbalance is increasing. For example, as shown in Figure 7, in the four years from 2007 through 2010, RE received about 30 percent more in federal subsidies than did

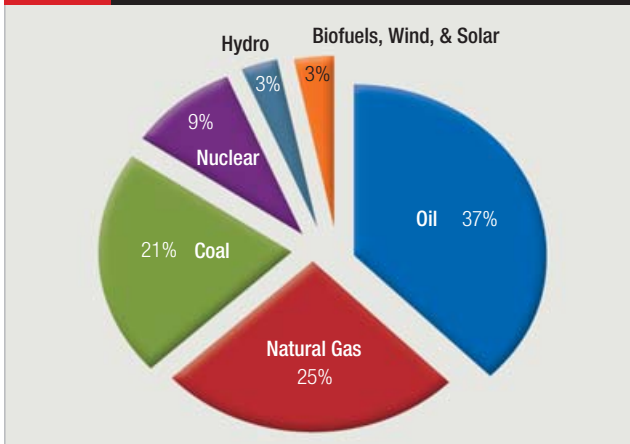
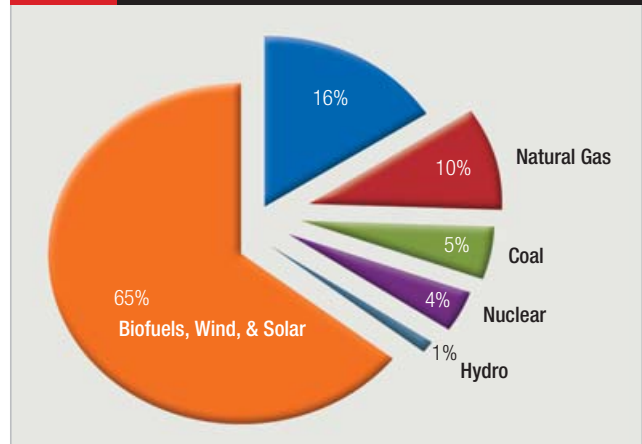
Incentives can take on a life of their own and persist well beyond the original rationale.

FIG. 3**WHERE IS THE MONEY GOING?**

Distribution of federal incentives for each energy source.

Fig. 3-A**Fig. 3-B****Type of Incentive****Energy Source**

Type of Incentive	Oil	Natural Gas	Coal	Hydro	Nuclear	Renewables	Geothermal
Tax Policy	52.6%	87.6%	33.7%	14.4%	0.0%	59.5%	28.6%
Regulation	33.9%	3.3%	7.7%	5.6%	17.4%	0.0%	0.0%
R&D	2.2%	5.8%	34.6%	2.2%	80.4%	32.4%	57.1%
Market Activity	1.6%	1.7%	2.9%	73.3%	0.0%	2.7%	0.0%
Government Services	9.2%	1.7%	15.4%	2.2%	2.2%	2.7%	0.0%
Disbursements	0.3%	0.0%	6.7%	2.2%	0.0%	2.7%	0.0%

FIG. 4**U.S. ENERGY SUPPLY****FIG. 5****2010 FEDERAL ENERGY SUBSIDIES**

all fossil energy combined. As noted, in 2010, RE received more than twice as much as oil, coal, and natural gas combined. And preliminary data for 2011 indicate that RE will receive nearly four times as much federal subsidies as all fossil fuels combined.

This information isn't meant to imply that either fossil energy or renewables receive too much or too little federal support. How to define appropriate levels and types of federal incentives for energy is an extremely complex and highly controversial issue, about which numerous studies, papers, and books have been written—and it's outside the scope of this analysis. Nevertheless, the data summarized here provide useful insight into an important topic—one that's very timely given the current acrimonious

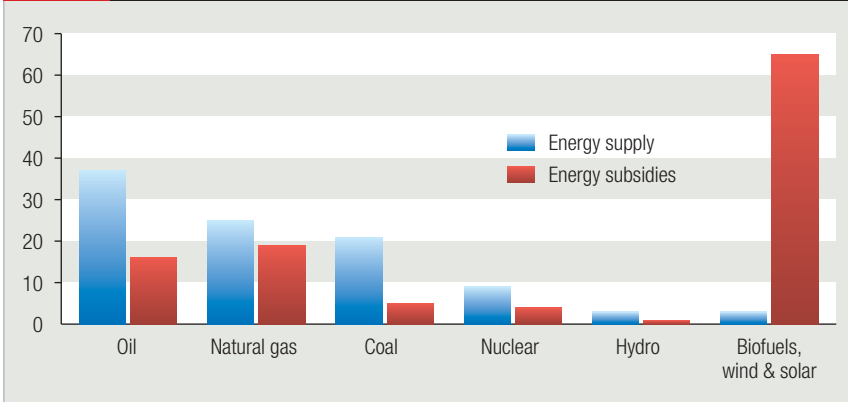
debate in Congress over federal spending, tax, and energy policies.

Findings and Implications

Research analysis yields a number of implications for U.S. energy policy.

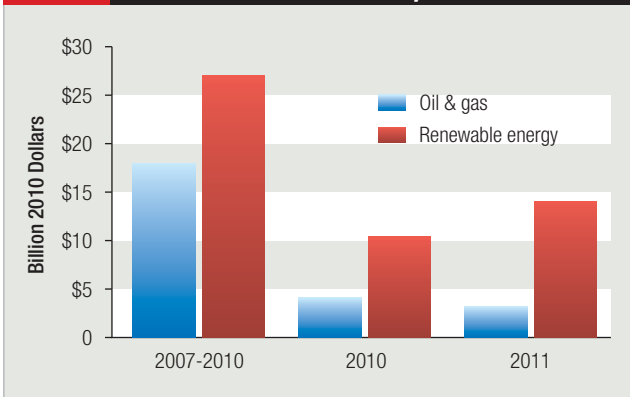
One of the most interesting, and perhaps troubling findings is that much of U.S. energy policy is literally invisible: Federal energy incentives are overwhelmingly off-budget and hidden from easy scrutiny. Over the past six decades, two-thirds of all federal energy subsidies were in the form of either tax incentives or regulatory incentives, and were thus never explicitly budgeted to support energy technologies. This raises obvious and important

FIG. 6 U.S. ENERGY SUPPLY AND ENERGY SUBSIDIES, 2010



Energy incentives are very much “different strokes for different folks.” Different types of energy incentives are of radically different importance for the energy technologies. Nuclear and geothermal depend critically on R&D, and benefit little from tax incentives. Natural gas is almost wholly dependent on tax incentives, and for it the importance of all other types of incentives is trivial. For hydro, market activity incentives are determinant. For oil, tax and regulatory incentives are key.

FIG. 7 U.S. ENERGY SUBSIDIES, 2007-2011



Contrary to conventional wisdom, renewable energy hasn't been shortchanged, and the perception that the renewable industry has been historically underfunded with respect to incentives is open to debate. Since 1950, renewable energy, including solar, hydropower, and geothermal, has received the second largest subsidy—\$171 billion (21 percent of the total), compared to \$121 billion (14 percent) for natural gas, \$104 billion (12 percent) for coal, and \$73 billion (9 percent) for nuclear power. In recent years, incentives for renewable energy have greatly exceeded those for fossil fuels or for nuclear energy.

There's a serious cost-benefit mismatch, since considerable disparity exists between the level of incentives received by different energy sources and their current contribution to the U.S. energy mix. Although oil has received roughly its proportionate share of energy subsidies, nuclear energy, natural gas, and coal might have

been under-subsidized, and renewable energy, especially solar, might have received a disproportionately large share of federal energy incentives.

Energy programs and incentives can take on a life of their own and persist well after the scientific rationale and general consensus supporting them have ended. The persistence of the Breeder Reactor program in the 1980s and the Magneto-hydrodynamics program in the 1990s are relevant examples. A more recent example is the continued heavy subsidization of corn ethanol.

R&D funding is skewed, and recent federal R&D expenditures bear little relevance to the contributions of various energy sources in the total energy mix. For example, renewable sources—excluding hydro—produce little energy or electricity, but received \$6 billion in R&D funds between 2001 and 2010, whereas coal, which provides about one-third of U.S. energy requirements and generates nearly half of the nation's electricity, received about the same amount of R&D money. Nuclear energy, which provides 10 percent of the nation's energy and 20 percent

policy questions and concerns.

The conventional wisdom that the oil industry has been the major beneficiary of federal financial largess is correct. Oil accounted for nearly half (\$369 billion) of all federal support between 1950 and 2010.

Tax incentives dominate, and policies that allowed energy companies to forego paying taxes dwarfed all other kinds of federal energy incentives. Tax policy accounted for \$394 billion (47 percent) of total federal energy incentives between 1950 and 2010, with the oil industry receiving \$194 billion and the natural gas industry \$106 billion.

The share of energy R&D incentives is diminishing, and despite the critical importance of R&D for the U.S. energy future, as an energy incentive it's of relatively small and declining quantitative significance. Over the past six decades, R&D accounted for only about one-sixth of all federal energy incentives. That share was dwarfed by energy tax incentives, and was even smaller than regulatory incentives.

Energy R&D peaked in real terms in 1981 and has never come close to receiving that level of funding since then. Further, the quantitative significance of the energy R&D incentive continues to decline; Historically, R&D accounted for just over 18 percent of energy incentives, but by 2010 R&D accounted for only about 12 percent.

of its electricity, was also underfunded, receiving \$3.2 billion in R&D funds over the past decade.

There's a fine line between some energy subsidies and welfare payments, since various types of energy-related programs are more properly considered social welfare or poverty alleviation programs. For example, Weatherization Assistance Grants (WAG) are offered by DOE to assist low-income households in weatherizing their homes, and the DHHS-administered Low Income Home Energy Assistance Program (LIHEAP) has the mission of assisting "low income households, particularly those with the lowest incomes that pay a high proportion of household income for home energy, primarily in meeting their immediate home energy needs." Programs of these types indirectly affect energy markets, but their primary purpose is to provide financial assistance to low-income persons and households. In fact, since inability to pay utility bills is the second leading cause of homelessness—after domestic violence—WAG and LIHEAP can also be categorized as housing assistance programs.⁹

Government intervention in energy markets affects long-term resource options, and political considerations factor into this. For some of the energy technologies, government intervention and support has literally created the industry. Relevant examples include government development of hydroelectric projects starting in the 1930s—TVA, Grand Coulee, the Hoover Dam, etc.; government support of nuclear power since its inception in the 1940s; and government support of renewable energy. The RE electricity options—photovoltaics, solar thermal, and wind—are almost entirely dependent for their existence on government subsidies and mandates.

However, the fossil energy technologies, while benefiting from government support, aren't critically dependent on it for their existence. For example, while oil has been the major beneficiary of federal subsidies and incentives over the past six decades, even with much less generous government support oil would still be critical to the economy. Similar comments apply to coal and natural gas. Thus, the determinate nature of federal support differs radically among the energy technologies, and

**More recently,
as in 2007
through 2011,
the imbalance
strongly favors
renewables.**

government support of some technologies might be necessary for keeping these available as long-term resource options. Indeed, if low-carbon energy alternatives are desired for future deployment, then substantial, continuing government incentives might be necessary for some technologies for many years.

Finally, as might be expected, political considerations are a key determinant of energy subsidies. Thus, while oil might not have needed all of the federal support it has received, given the importance and influence of the oil industry in the U.S., it's hardly surprising that it has received generous incentives. The political popularity of wind and solar has helped renewable energy receive substantial federal support in spite of the lack of their commercial viability. And, there's little doubt that the first presidential caucuses being held in Iowa every four years contributes mightily to the perpetuation of ethanol subsidies. ■

Endnotes:

1. *60 Years of Energy Incentives: Analysis of Federal Expenditures for Energy Development*, Management Information Services Inc. report prepared for the Nuclear Energy Institute, Washington, D.C., October 2011.
2. In addition to direct subsidies, regulation, and tax incentives, the study considers other policy initiatives including market support, demonstration programs, R&D, procurement mandates, information generation and dissemination, technology transfer, directed purchases, and other types of actions.
3. The information presented here was compiled from publicly available documents prepared by federal agencies with a role in energy development, including the U.S. Department of Energy and its predecessors, the U.S. Nuclear Regulatory Commission, the Office of Management and Budget (OMB), the Treasury Department, and others.
4. Geothermal is listed as a separate category because it's a distinct technology and a separate line item in the DOE budget. Further, when the federal energy agencies were reorganized in the 1970s, geothermal wasn't classified as a renewable energy technology—and the debate over its classification continues.
5. Regulation can serve as an incentive in various ways, for example, when the government bears regulatory costs—if not covered by producer fees.
6. Current-year expenditures (nominal dollars) were converted into constant 2010 dollars using price deflators derived from data published by OMB, Congressional Budget Office, and the U.S. Department of Commerce's Bureau of Economic Analysis.
7. About \$42 billion—almost 60 percent—of the total spent on nuclear energy research since 1950 was spent before 1975 to explore a range of reactor concepts and potential applications for military and civilian uses.
8. For example, the oil and gas industries receive substantial financial benefits from tax incentives, such as the tax deductions for intangible drilling and development costs and for percentage depletion.
9. This issue isn't unique to energy. For example, the Supplemental Nutritional Assistance Program (Food Stamps) is one of the nation's most important anti-poverty programs, but it also has obvious benefits for U.S. agriculture.

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