

1. Introduction

Background

In May 1999 the Acting Director of the Office of Policy, U.S. Department of Energy (DOE), requested that the Energy Information Administration (EIA) “undertake a service report that updates EIA’s 1992 report on Federal Energy Subsidies and begins an examination of the energy market impact of these subsidies. The report will serve as a building block to promote understanding regarding the level and composition of direct market interventions which may affect the use of energy or the composition of energy supply, and how these interventions have changed since the 1992 report.” The Office of Policy also specified that the subsidy must be specific, cover primary energy only, and provide a financial benefit. The Office of Policy has indicated that a second report, covering end-use energy and electricity, will also be requested.

The 1992 EIA report¹ was issued at the request of the Congress following the congressional mandate requiring that, within available funds, EIA produce a one-time study defining direct and indirect Federal energy subsidies, methods of valuation of such subsidies, and a survey of existing subsidies, as well as an analysis of actions and costs necessary to produce a periodic report.² The present report differs from the 1992 report in that it focuses on subsidies that clearly affect “goods” rather than “services.”

There is no universally accepted definition of what constitutes a subsidy. Typically, a subsidy is defined as a transfer of economic resources by a government to the buyer or seller of a good or service that has the effect of reducing the price paid, increasing the price received, or reducing the cost of production of the good or service. The net effect of such a subsidy is to stimulate the production or consumption of a commodity over what it would otherwise have been.³ The transfer of resources from the government entity must be contingent in some way on the actual production or consumption of the subsidized good or service by the recipient.

Public interest in energy subsidies arises in part from concerns that they may affect competition between energy and non-energy investments or between different forms of energy. Concerns also arise when subsidies lead to higher prices or taxes, either direct or indirect. For example, some argue that investments in energy efficiency, conservation, and renewable energy are hindered by Federal subsidies to more conventional forms of energy.⁴ Past studies of subsidies have been motivated by concern that Federal intervention in energy markets “tilts the playing field.”⁵ Most Federal Government policies have the potential to affect energy markets. Policies supporting economic stability or economic growth have energy market consequences, as do those that support highway development or affordable

¹Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992).

²U.S. House of Representatives, *Appropriations Committee Report: Department of Interior and Related Agencies Appropriation Bill*, Report 102-116 (June 19, 1991), p. 115.

³See C. Shoup, *Public Finance* (Chicago, IL: Aldine Publishing Company, 1969), p. 145.

⁴Amory Lovins, in “Four Revolutions in Electric Efficiency,” *Contemporary Policy Issues*, Vol. VIII (July 1990), p. 123, states: “[E]lectricity is about eleven times as heavily subsidized as direct fuels (as of 1984)”

⁵For example, this argument is made by H.R. Heede et al., in *The Hidden Costs of Energy* (Washington, DC: Center for Renewable Resources, October 1985).

housing. The energy impacts of such policies are incidental to their primary purpose, however, and they are not examined here.

This report describes the current status of U.S. Government energy policies affecting various energy sources and uses. The focus is on Government programs that have the effect of increasing or reducing costs and prices in energy markets through direct financial commitments. The report does not seek to make policy recommendations nor to evaluate the effectiveness of existing policy, and it covers only those energy subsidies that meet the strictly defined criteria cited by DOE's Office of Policy. This chapter describes the types of subsidies covered and the methods used to estimate their value. The overall results are summarized and compared with the results of the 1992 EIA study.

Scope of the Report

Federal Energy Subsidies Quantified in This Analysis

Direct Subsidies

Energy subsidies may be either "direct" or "indirect." Direct subsidies include (a) payments from the Government directly to producers or consumers and (b) tax expenditures. Tax expenditures are provisions in the tax code that reduce the Federal tax liability of qualifying firms or individuals who have undertaken particular actions. Energy-related examples include tax credits for certain kinds of activity (e.g., drilling coalbed methane wells) or favorable treatment of capital recovery (e.g., percentage depletion for independent oil producers). When such payments or tax expenditures are made exclusively to recipients engaged in energy production or consumption, they are considered direct energy subsidies.

Indirect Subsidies

There are also many indirect subsidies, which consist of Federal Government actions that do not involve direct payments to producers or consumers. Indirect energy subsidies consist of other forms of Federal financial commitment that affect the cost of consumption or production of some form of energy. Indirect subsidies include provision of energy or energy services at below-market prices; loans or loan guarantees; insurance services; research and development activities and expenditures; and the unreimbursed provision by the U.S. Government of environmental, safety, or regulatory services. Only one type of indirect subsidy—funding for research and development—is quantified in this report.

The budgetary cost of Government-funded research and development (R&D) is easy to measure. Determining the extent to which Government energy R&D is a subsidy is more problematic. Although R&D funding often consists of direct payments to producers or consumers, the payments are not tied to the actual production or consumption of energy in the present and, thus, do not fall within the definition of direct energy subsidies. Federal funding for energy R&D may, however, act as a subsidy to the extent that it substitutes for private R&D expenditures that would have been made in the absence of Government outlays. Because Government-funded R&D programs, if successful, will affect future energy prices and costs, they are considered to be indirect energy subsidies.

Other Subsidies Discussed in This Analysis: Excess Liabilities of Trust Funds

When the Federal Government assumes actual or potential liabilities of private-sector industries, the funds needed to cover the liability may be collected through a levy on the industry. If the expected present value of the cost of the

liability assumed by the Government exceeds the present value of the levy on the industry, it is considered to be an indirect subsidy.

Historically, there have been a class of future liabilities characterized by large, but uncertain, future costs for such actions as remediating leaking underground storage tanks, cleaning up oil spills, shutting down retired nuclear power plants, or paying health benefits for coal miners with black lung disease. Policymakers have feared that if private firms were assigned liability for these future costs, they might fail to make adequate current provision today, and then evade the costs in the future through bankruptcy. Alternatively, there might be health or environmental liabilities for which no current responsible party could be identified.

The public policy response to this situation has taken two forms:

- The Government assigns liability to private firms, but requires them to make payments into public or private trust funds to assure that funds will be available to meet future liabilities.
- The Government assumes legal responsibility for the liability, but levies an excise tax on the products of the industry deemed responsible and accrues the monies into a public trust fund, which is dedicated to meeting future liabilities.

In the former case, there is no subsidy, inasmuch as the liability remains with the private sector. In the latter case, however, if the Federal Government collects taxes that are insufficient to meet the liability assumed on behalf of the private sector, there may be an element of subsidy in the arrangement because the value of the tax is less than the cost of the liability. Analysis of such trust funds for actuarial sufficiency is beyond the scope of this study. This report lists and describes trust funds that can be considered to have a subsidy component and provides an overall estimate of the size of each fund, but it does not attempt to quantify the subsidy component.

Energy Subsidies Not Included

Because this report focuses exclusively on subsidies that involve direct intervention in markets for primary energy sources, U.S. Government activities of a regulatory nature and activities involving non-internalized externalities are excluded from the analysis, as are failures by the Federal Government to intervene when an externality is unknown or unidentified. State and local government programs are excluded by definition. Also excluded are programs that cover end-use energy and electricity, which will be addressed in a later report.

Studies of energy subsidies have varied widely in purpose, scope, definition, and methods of estimation (see Appendix A). For instance, because the U.S. Government raises and spends vast sums of money on transportation infrastructure projects, studies that view transportation spending as an energy subsidy tend to have larger estimates of subsidies than those that do not. Similarly, because the Government spends large sums of money on defense, studies that view military spending—whether directed toward the Persian Gulf or elsewhere—as energy subsidies also tend to produce considerably larger estimates than those that do not.

There are other ways in which the scope of energy subsidies can be broadened. For instance, one study completed in the mid-1980s concluded that subsidies to the U.S. electricity industry amounted to \$80 billion per year because of the U.S. regulatory practice of pricing electricity at average rather than marginal cost.⁶ Another study estimated

⁶M. Kosmo, *Money to Burn? The High Costs of Energy Subsidies* (Washington, DC: World Resources Institute, 1987).

subsidies to U.S. motor gasoline producers alone at \$84 billion per year, based on the inclusion of such costs as defense-related expenditures and energy-related health care costs.⁷

It is clear that Federal Government intervention in energy industries generally has declined over the past two decades. Price controls for domestic oil and natural gas production were largely eliminated by the mid-1980s. The Tax Reform Act of 1986 reduced or eliminated many tax expenditures, several of which figured prominently in earlier studies. The Energy Policy Act of 1992, while introducing incentives for renewable energy and alternative transportation fuels, set the stage for the eventual privatization of the DOE's uranium enrichment activities.

Past studies addressing the question of energy subsidies identify a host of programs with potentially significant effects on energy prices and uses. Although the specific quantitative findings of earlier studies are of limited current interest, given the manner in which energy policy has evolved, they illustrate the following tendencies:

- At any point in time, large variations in estimates of subsidy values are possible (both for specific programs and in total), depending on the array of programs included when the valuation methodology is developed.
- The potential for variations can be greatly compounded, depending on the methodology used in calculating the subsidy value attributed to each program.

Measuring the Cost of Subsidies

Measuring the cost of subsidies presents a number of difficult problems. Direct subsidies and many indirect subsidies can involve payment or receipts of money dispensed or collected by the Government and accounted for in Federal budget documents. On the other hand, the costs or benefits of many indirect subsidies are not reflected in budget documents but rather in the financial accounts of affected energy consumers and producers. This report attempts to measure subsidies using, to the greatest extent possible, Federal Government outlays and/or near equivalents, including the outlay equivalent value of tax expenditures.

The costs of a subsidy to the Government may differ from the benefits that accrue to the recipients. Administrative costs drive a "wedge" between costs and benefits. Subsidies can also take forms that are costly to the Government but provide smaller benefits to recipients. A more common phenomenon is that a Federal program will incur costs to produce social benefits that are difficult, and controversial, to value in monetary terms. This report focuses only on the costs of subsidies. The concept of cost becomes more difficult to apply to indirect subsidies, however. Consequently, this analysis uses fiscal measures of cost primarily for programs implemented through Federal outlays, tax expenditures, or excise taxes.

The valuation of benefits is much more difficult than that of spending. First, for a variety of reasons discussed later in this report, it is difficult to know what value consumers place on the benefits that subsidies provide. Second, determining such matters as the net present value of the subsidy, the incidence of its benefit, and how it affects production and consumption choices at the margin would add further complications.

⁷J.B. Wahl, *Oil Slickers: How Petroleum Benefits at the Taxpayer's Expense* (Washington, DC: Institute for Local Self-Reliance, 1996), web site www.ilsr.org.

Main Findings

The intent of this study is to identify Federal Government programs that intentionally seek to influence the allocation and pricing of primary energy resources. Where possible, a quantitative assessment of costs is presented. Given the definitions used, it is estimated that direct Federal energy subsidies—nearly all of which are tax expenditures—total about \$2.4 billion in fiscal year 1999 (Table 1). EIA's 1992 report, by comparison, estimated direct subsidies in 1992 equivalent to \$2.8 billion in 1999 dollars (Table 2 and Figure 1). Income tax expenditures related to primary energy in 1999 total \$1.7 billion on an outlay equivalent basis, along with another \$0.7 billion for the ethanol exemption from Federal excise taxes. EIA's 1992 report showed higher income tax expenditures (\$2.2 billion in 1999 dollars) but slightly lower Federal excise tax expenditures (\$0.5 billion). In 1999, the largest single energy-related tax expenditures are the alternative fuels production tax credit, largely used to develop nonconventional natural gas, and the percentage depletion allowance for the oil, gas, and coal industries. Tax deferrals on enhanced oil recovery are the third largest expenditure. Table 3 indicates just how small the value of all primary energy subsidies, both direct and indirect, is relative to total energy spending. In 1995, consumers spent \$363.4 billion (1999 dollars) on end-use energy from oil, natural gas, coal, and nuclear power. Primary energy subsidies are about 1 percent of that figure.

Federal energy-related R&D appropriations unrelated to basic research are estimated at a total of about \$1.6 billion in fiscal year 1999—down from \$2.0 billion in 1992 (in 1999 dollars). Federal spending on coal and nuclear power research has declined substantially since 1992. The decrease in nuclear energy R&D expenditures has resulted largely from declines in spending directed at treatment and storage of nuclear waste and in R&D for the decommissioning of obsolete nuclear power plants. Coal R&D expenditures have declined as a result of cuts in spending on clean coal technologies.

Basic research accounts for \$2.8 billion of DOE's energy R&D appropriations in 1999, compared with \$4.2 billion in 1992 (in 1999 dollars). Basic research expenditures include Government funding for fusion research and the superconducting supercollider, which represent subsidies for the development of scientific knowledge in general, rather than for energy in particular. They are not treated as direct energy subsidies in this analysis and do not appear in Tables 1 and 2.

Energy trust funds are Federal funds earmarked for a particular public purpose, financed by excise taxes or similar levies on energy commodities—particularly, gasoline and coal. Total energy-related trust fund tax receipts were \$2.2 billion in fiscal year 1999. Trust funds are not included as direct subsidies and thus do not appear in Tables 1 and 2. The largest trust funds are the Nuclear Waste Fund and the Black Lung Disability Fund, each funded at \$600 million.

The estimated total value of 1999 Federal subsidies to oil, natural gas, and coal is \$2.2 billion (Table 1), compared with wholesale purchases in 1998 valued at \$126.9 billion (1999 dollars) and end-use expenditures of \$363.4 billion (1999 dollars) for purchases of those fuels in 1995 (Table 3). Although the value of energy subsidies is low relative to total energy expenditures, some forms of energy receive subsidies that are substantial relative to the value of the fuels. Of the primary fossil fuels, natural gas has benefitted most from Federal subsidies in 1999—a total of \$1.2 billion, almost all of which comes from a tax credit on the production of alternative fuels, primarily gas from tight sands and coalbed methane. Although no production data are available on natural gas production from tight sands, coalbed methane accounted for 6 percent of all natural gas production in 1997. The \$1.2 billion alternative fuel credit in 1999 can be compared with natural gas sales valued at \$39 billion (1999 dollars) at the wholesale level in 1998 and \$79 billion (1999 dollars) at the retail level in 1995 (Table 3).

Table 1. Summary of Primary Energy Subsidy Elements in Federal Programs by Fuel and Program Type on a Budget Outlay Basis, Fiscal Year 1999
(Million 1999 Dollars)

Fuel	Type of Subsidy				Total
	Direct Expenditures	Tax Expenditures		Research and Development	
		Income	Excise		
Oil	0	263	0	49	312
Gas	0	1,048	0	115	1,163
Coal	0	85	0	404	489
Oil, Gas, and Coal Combined ^a	0	205	0	0	205
Nuclear	0	0	0	640	640
Renewables	4	15	^b 725	327	1,071
Electricity	0	40	0	^c 33	73
Total	4	1,656	725	1,567	3,953

^aThe category Oil, Gas, and Coal Combined includes expenditures that were not allocated to any one of the three individual fuels.

^bAlcohol fuels excise tax.

^cElectricity research and development is for advanced turbine technology. Other generation technology research and development is distributed by fuel.

Sources: Most information drawn from Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2000* (Washington, DC, February 1999). See also the subsequent chapters of this report.

Table 2. Summary of Primary Energy Subsidy Elements in Federal Programs by Fuel and Program Type on a Budget Outlay Basis, Fiscal Year 1992
(Million 1999 Dollars)

Fuel	Type of Subsidy				Total
	Direct Expenditures	Tax Expenditures		Research and Development	
		Income	Excise		
Oil	0	451	0	80	531
Gas	0	1,215	0	29	1,244
Coal	82	354	0	629	1,065
Nuclear	0	0	0	1,015	1,015
Renewables	0	91	^a 525	278	894
Electricity	0	74	0	^b 5	79
Total	82	2,185	525	2,037	4,829

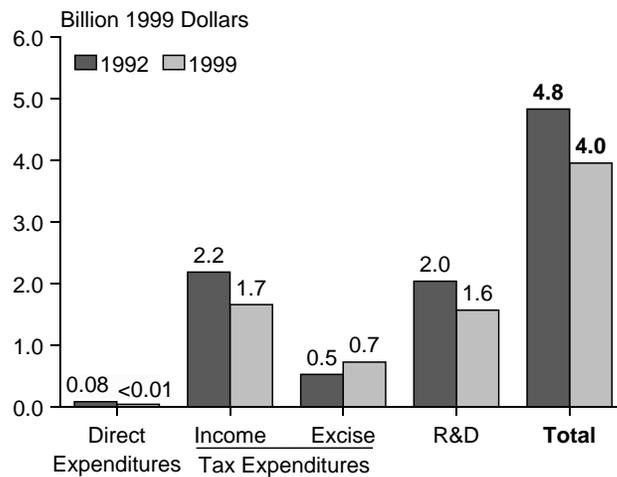
^aAlcohol fuels excise tax.

^bElectricity research and development is for advanced turbine technology. Other generation technology research and development is distributed by fuel.

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

Source: Most information drawn from Office of Management and Budget, *Budget of the United States Government, Fiscal Year 1993* (Washington, DC, February 1992).

Figure 1. Summary of Primary Energy Subsidy Elements in Federal Programs by Program Type on a Budget Outlay Basis, 1992 and 1999



Source: Tables 1 and 2.

Table 3. Estimated Quantity and Value of U.S. Energy Consumption by Fuel

Energy Use	Oil	Natural Gas	Coal	Nuclear	Biomass, Solar, Wind, and Geothermal	Total
1998 U.S. Consumption (Quadrillion Btu)	36.57	21.84	21.62	7.16	3.48	90.67
1998 Average Wholesale Price (1998 Dollars per Million Btu)	^a 1.88	^b 1.78	^c 0.83	NA	NA	NM
1998 Total Fuel Expenditures (Million 1999 Dollars)	69,455	39,272	18,128	NA	NA	126,855
1995 End-Use Energy Expenditures (Million 1999 Dollars)	252,033	78,690	28,559	4,102	NA	363,384

^aFirst purchase price.

^bWellhead price.

^cValue of coal produced at free-on-board mines.

NA = not available. NM = not meaningful.

Source: Energy Information Administration, *Annual Energy Review 1998*, DOE/EIA-0384(98) (Washington, DC, August 1999).

Comparisons With the 1992 EIA Report

This report differs in many ways from EIA's 1992 report on Federal energy subsidies, which was broader in scope. Table 4 compares the Federal primary energy market interventions included as subsidies in this report with the same categories of subsidies from the 1992 report. The estimated values of primary energy subsidies in the two reports are compared in Table 4 after conversion of the 1992 estimates to 1999 dollars. The comparison indicates that the total monetary value of Federal interventions in primary energy markets has fallen from \$4.8 billion (1999 dollars) in 1992 to \$4.0 billion in 1999.

An obvious difference between the results in this report and those from the 1992 EIA report is that a number of Federal programs have been eliminated over the past 8 years, while others have been created. For instance, the Energy Policy Act of 1992, while introducing tax incentives for renewable energy and alternative transportation fuels, also set the stage for the eventual privatization of DOE's uranium enrichment activities. The Enhanced Oil Recovery Credit was not included in the 1992 report, because the credit, which resulted from the Omnibus Budget Reconciliation Act of 1980, was not reported in the Federal budget until 1994. Subsidies for synthetic fuels were included in the 1992 report but have since been terminated. The Renewable Energy Production Incentive has been added since 1992 as a direct expenditure subsidy. Expensing of Tertiary Injectants, included in 1992, is not included in this report because its value is below the Treasury Department's *de minimis* reporting level (roughly \$5 million). Finally, three R&D programs have been terminated since the 1992 report: the Interagency National Acid Precipitation Assessment Program, Shale Oil Research and Development, and U.S. Geological Survey Energy Research and Development.

Organization of the Report

In addition to this introductory chapter, this report contains three chapters. Chapter 2 reports on programs listed in the Federal budget, using budget computations as the valuation method for energy-related tax expenditures. Chapter 3 evaluates energy-related R&D expenditures, and Chapter 4 discusses energy excise taxes and trust funds.

The report also includes five appendixes. Appendix A reviews a number of other studies of Federal energy subsidies. Appendix B presents information, in the form of Fact Sheets, on a range of Federal programs that were considered candidates for inclusion in this report. Appendix C contains tabular listings of Federal appropriations for energy R&D overall and specifically for nuclear power, fossil fuels, renewable energy, and energy conservation. Appendix D provides a bibliography, and Appendix E contains the letters from DOE's Office of Policy setting out the assumptions and definitions used for the study.

Table 4. Comparison of Estimates of Federal Financial Interventions and Subsidies in Primary Energy Markets: Values for Corresponding Categories From the 1992 and 1999 EIA Reports

Subsidy Category	1992 Estimate (Million 1992 Dollars)	1992 Estimate (Million 1999 Dollars)	1999 Estimate (Million 1999 Dollars)
Direct Expenditures			
Renewable Energy Production Incentive	NI	NI	4
Synthetic Fuel Subsidies	72	82	^a NI
<i>Subtotal (Direct Expenditures)</i>	72	82	4
Tax Expenditures			
Capital Gains Treatment of Royalties in Coal	10	11	85
Expensing of Exploration and Development Costs	-55	-63	-90
Exception From Passive Loss Limitation for Working Interests in Oil and Gas Properties	100	114	35
Enhanced Oil Recovery	^b NI	^b NI	245
Expensing of Tertiary Injectants	20	23	NI
Alternative Fuel Production Credit	670	764	1,030
New Technology Credit	65	74	40
Alcohol Fuel Credit	80	91	15
Excess of Percentage Over Cost Depletion	1,025	1,170	295
<i>Subtotal (Income Taxes)</i>	1,915	2,185	1,656
Excise Taxes	460	525	725
<i>Subtotal (Tax Expenditures)</i>	2,375	2,710	2,381
Research and Development			
Nuclear Power			
New Nuclear Plants	122	139	30
Waste/Fuel/Safety	620	707	467
Unallocated	148	169	143
<i>Subtotal (Nuclear Power)</i>	890	1,015	640
Coal			
Preparation/Mining	81	93	^c NI
Coal Conversion	51	58	^d NI
Power Generation	148	168	^e NI
Clean Coal Technology Program	415	474	183
Interagency National Acid Precipitation Assessment Program	31	35	^a NI
Advanced Clean Efficient Power Systems	NI	NI	^f 88
Advanced Clean Fuels	NI	NI	^g 16
Advanced Research and Technology Development	NI	NI	^h 20
Unallocated	79	90	97
<i>Subtotal (Coal)</i>	804	918	404
Other Fossil Energy			
Oil	51	59	49
Natural Gas	13	14	115
Shale Oil	6	7	^a NI
U.S. Geological Survey Energy Research and Development	26	30	^a NI
<i>Subtotal (Other Fossil Energy)</i>	96	109	164
Renewable Energy			
Photovoltaic/Wind/Other Solar	137	156	134
Biomass	21	24	96
Geothermal	27	31	29
Hydroelectric	1	1	3
Electricity Technologies	38	43	44
Unallocated	19	22	22
<i>Subtotal (Renewable Energy)</i>	244	278	327
Electricity			
Advanced Turbine Systems	5	5	33
<i>Subtotal (Research and Development)</i>	2,039	2,326	1,567
Clean Coal Technology Adjustment ⁱ	253	289	—
<i>Subtotal (Research and Development, Including Clean Coal Technology)</i>	1,786	2,037	1,567
Total	4,233	4,829	3,953

NI - not included. ^aProgram terminated. ^bNot reported in the Federal budget until 1994. ^cReclassified as Advanced Research and Technology Development. ^dReclassified as Advanced Clean Fuels. ^eReclassified as Advanced Clean and Efficient Power Systems. ^fReplaces Power Generation category from 1992 EIA report. ^gReplaces Coal Conversion category from 1992 EIA report. ^hReplaces Preparation/Mining category from 1992 EIA report. ⁱValue of appropriations from 1992 EIA report (1992) and value of outlays from this report (1999).

Sources: This report and Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992).