SR/OIAF/2000-02

Federal Financial Interventions and Subsidies in Energy Markets 1999: Energy Transformation and End Use

May 2000

Energy Information Administration
Office of Integrated Analysis and Forecasting
U.S. Department of Energy
Washington, DC 20585

Preface

This is the second report prepared in response to a two-part request from the Office of Policy, U.S. Department of Energy, to provide an estimate of U.S. Federal energy subsidies. In its request, the Office of Policy asked the Energy Information Administration (EIA) to update a 1992 EIA report on Federal energy subsidies,[1] including any additions or deletions of Federal subsidies based on Administration and Congressional action since the 1992 report was written, and to provide an estimate of the size of each current subsidy. The initial request, in May 1999, focused exclusively on programs affecting primary energy that were specific to energy markets and provided a financial benefit. In response to that request, EIA prepared a service report, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, published in September 1999.[2] Prior to the issuance of that report, the Office of Policy made a second request, extending the May request to include Federal interventions affecting energy transformation (principally electric power generation and transmission) and energy end use. Again, the Office of Policy requested that the subsidy be specific to the identified energy markets and confer a financial benefit. This report, which addresses information relevant to the second request, is intended to complement rather than duplicate the work of the first report, which described Federal programs related to primary energy. Both request letters are provided in Appendix E.

The legislation that established EIA in 1977 vested the organization with an element of statutory independence. It is EIA's responsibility to provide timely, high-quality information and to perform objective, credible analyses in support of the deliberations of policymakers. EIA prepared this Service Report upon special request, using the assumptions specified by the requestor.

EIA would like to acknowledge the many groups that provided either formal or informal reviews of this report. The reviewers included: Department of Agriculture (Rural Utilities Service), American Public Power Association, Bonneville Power Administration, Congressional Budget Office, Edison Electric Institute, Department of Energy, General Accounting Office, PHB Hagler Bailly, Tennessee Valley Authority, Department of Treasury, and TVA Watch. Numerous discussions were held with interested parties to discuss the issues covered in this report and to clarify complex technical and financial questions. The comments that were received were carefully reviewed and incorporated where appropriate.

This report was prepared by the staff of EIA's Office of Integrated Analysis and Forecasting. General questions about the report may be directed to Mary J. Hutzler (202/586-2222, mhutzler@eia.doe.gov), Director of the Office of Integrated Analysis and Forecasting. Specific questions about the report may be directed to the following analysts:

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

[2]Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999).

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Appendix C, Federal Energy Research and Development Appropriations
for Conservation and End Use

Assistance provided by Arthur Rypinski, formerly of the Energy Information Administration, is also gratefully acknowledged. James Hewlett and Lawrence Prete, Office of Integrated Analysis and Forecasting, and Douglas Hale, Statistics and Methods Group, provided a detailed review of issues related to Federal electricity programs.

Purpose and Limitations

This report provides a snapshot of a select set of Federal subsidies in U.S. energy markets. As defined by the requestor (the U.S. Department of Energy's Office of Policy), to be included in this report a subsidy must derive from a Federal program, be specific to energy markets, and provide a financial benefit to its recipients. This subsidy definition excludes many programs that have been considered subsidies in other analyses.[a] For example, all State programs are excluded, and tax-free bonds used by municipal electric utilities are excluded because non-energy companies such as municipal water and sewer facilities can also use them. Similarly, the tax-free pollution bonds and accelerated depreciation schedules used by investor-owned utilities are also excluded because of their use by non-energy companies.

When this report is compared with other analyses, careful attention should be paid to the definition of subsidy used in each report. There is no widely accepted definition of what constitutes a subsidy, and the definition used varies depending on the objective of a particular report. With respect to electricity markets, this report is not meant to address the relative advantages or disadvantages that ownership type (public or private) provides.

[a]See the bibliography in Appendix D for a list of other analyses.

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Background

In May 1999, the Office of Policy, U.S. Department of Energy (DOE), asked the Energy Information Administration (EIA) to update EIA's 1992 Service Report on Federal energy subsidies.[1] In September 1999, the first volume of the update was released, focusing on primary energy.[2] Prior to the release of that report, the Office of Policy asked that EIA also report on subsidies in energy transformation and end use.[3] The present report responds to the latter request. Both of the Office of Policy's requests asked the EIA to focus on Federal programs that provided a "financial benefit" and were "specifically targeted" to energy markets.

Federal energy subsidies take three principal forms:

- **Direct Payments to Producers or Consumers.** These are Federal programs that directly affect the energy industry and for which the Federal Government provides a direct financial benefit. Currently, four energy programs provide direct payments to producers or consumers, three of which are addressed in this report: the Department of Health and Human Services' Low Income Home Energy Assistance Program (LIHEAP), and two DOE programs, the Weatherization Assistance Program and the State Energy Program. The fourth program, Renewable Energy Production Incentive, was addressed in EIA's September 1999 report.

- **Tax Expenditures.** Tax expenditures are provisions in the Federal tax code that reduce the tax liability of firms or individuals who take specified actions that affect energy production, consumption, or conservation in ways deemed to be in the public interest. Three tax expenditures are currently applied in transformation and end-use markets: the exclusion of interest income on bonds for certain energy facilities; the exclusion for utility-sponsored conservation measures; and the credit/deduction for clean fuel vehicles.

- **Research and Development (R&D).** R&D expenditures do not directly affect current energy production and prices, but if successful they could affect future production and prices. R&D expenditures are currently applied to four energy end uses: buildings technology, industry, transportation, and a small portion that is unallocated.[4]

Except for subsidies to electricity, this report measures subsidies on the basis of the cost of the programs to the Federal budget. Using the Federal budget has the advantage of ease of measurement; however, budget values may understate both the economic costs and the market impacts of specific programs, especially where small subsidies

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

[2]Energy Information Administration, *Federal Energy Market Interventions 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999). Primary energy is all energy consumed by end users, excluding electricity but including the energy consumed by electricity generators.

[3]Transformation refers to the production of electricity by transforming other forms of energy into electrical energy. End use refers to any application by which energy is consumed in the residential, commercial, industrial, and transportation sectors of the economy.

[4]Another R&D project, Advanced Turbine Systems, was treated as a primary energy element in the previous report because of its emphasis on efficient consumption of fossil fuels.

are applied to large existing markets. Some subsidies offer relatively large payments to producers using certain energy technologies that otherwise would be uneconomical at present. In these cases, the immediate effects on markets may be small, but the impact on specific technologies may be significant. Proponents justify subsidies by pointing to expected social benefits that may exceed the expected cost of the program. No attempt is made in this report to evaluate the social benefits that may accrue from these programs.

Summary of Results

Energy Transformation and End Use Subsidies

Federal subsidies for transformation and end-use activities are estimated to be $2.2 billion in fiscal year 1999, a decline of about 10 percent in real terms from the total found for similar items in fiscal year 1992 (Table ES1 and Figure ES1).[5] It is estimated that direct subsidies—the sum of direct expenditures and tax expenditures—totaled $1.8 billion in fiscal year 1999, of which direct expenditures totaled $1.4 billion. R&D subsidies accounted for the remainder, just over $0.45 billion.

Table ES1. Summary of Energy Transformation and End Use 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[a]				Total
	Direct Expenditures	Tax Expenditures		Research and Development	
		Income	Excise		
Oil	255	0	0	0	**255**
Gas	501	0	0	0	**501**
Renewables	40	0	0	0	**40**
Electricity[a]	459	155	0	0	**614**
Conservation[b]	166	110	0	0	**276**
End Use[b]	0	105	0	454	**559**
Total	**1,421**	**370**	**0**	**454**	**2,245**

[a]Does not include supports to TVA, the Power Marketing Administrations, and the Rural Utilities Service, which are described in Chapter 4 and summarized under Federal Electricity Support.

[b]Conservation programs are directed primarily at consumers of energy and often are supported by grants. End-use programs are oriented to the development and introduction of new technologies for use in specific sectors.

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

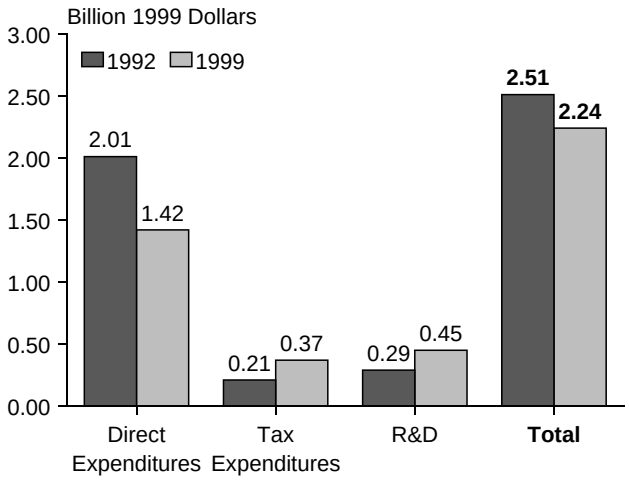
Source: Estimates presented in this report.

[5]The summary estimates shown here are for subsidies in a single year, fiscal year 1999. Comparisons with EIA's 1992 report rely on data for two years, fiscal year 1992 and fiscal year 1999. Consequently, comparisons across energy sources and uses may not adequately describe cumulative or historical effects, for which the allocations could differ.

Direct expenditures made under LIHEAP, the DOE Weatherization Assistance Program, and the State Energy Program all have declined somewhat since 1992 (Table ES2), and the share of subsidies attributable to direct expenditures has fallen from 80 percent in 1992 to 63 percent in 1999. The reductions in LIHEAP funding notwithstanding, a large portion of transformation and end use subsidies remain specifically addressed to low-income households. Tax expenditures totaled $370 million in 1999, representing a 75-percent increase since 1992.

R&D outlays for transformation and end use have also increased, from the 1992 level of $0.29 billion (1999 dollars) to $0.45 billion in fiscal year 1999. Every end-use area was found to have higher spending levels. Transportation R&D programs showed the largest increase, from $125 million in 1992 (1999 dollars) to $202 million in 1999, a 62-percent increase.

Figure ES1. Summary of Energy Transformation and End Use Subsidy Elements, 1992 and 1999



Notes: Totals for 1992 and 1999 exclude estimates of supports to Federal electricity suppliers. Totals may not equal sum of components due to independent rounding.

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

Total Energy Subsidies

The estimated value for all energy subsidies identified in this report and in EIA's September 1999 report is $6.2 billion in fiscal year 1999 (Table ES3).[6] Fossil fuels received by far the largest share of these subsidies, nearly half the total. Led by the ethanol excise exclusion, renewables received about $1.1 billion, or about 18 percent of total subsidies. Nuclear, electricity, and end-use programs each accounted for about 10 percent of total subsidies. Conservation programs received about 4 percent of total subsidies. Total subsidies have declined by nearly 16 percent since 1992, a reduction demonstrated across four broad program types (Figure ES2). LIHEAP expenditures have declined by 27 percent and R&D spending by 13 percent.

Generally, these energy subsidies are small relative to the energy economy as a whole, and to the energy companies themselves (Table ES4). The total estimate for all subsidies, $6.2 billion, is only 1.1 percent of total annual expenditures on energy in the United States. The magnitude of subsidies on a per-unit basis varies inversely with expenditures in specific energy sectors. Oil and end-use electricity, which together make up about 86 percent of all energy expenditures, receive negligible subsidies relative to their shares of the energy market. Subsidies to natural gas and coal are slightly higher in proportion to the size of the coal and natural gas sectors of the energy economy. Nuclear energy receives subsidies valued at 16 percent of the nuclear energy sector. The alcohol fuels excise tax exemption provides a substantial per-unit subsidy, valued at 26 percent of the energy sector that is represented by the renewable energy sources grouped in Table ES4.

[6]The $6.2 billion estimate represents the sum of the values for energy transformation and end use in this report and the values for primary energy published in Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999).

Table ES2. Comparison of Estimates of Federal Financial Interventions and Subsidies in Energy Transformation and End Use on a Budget Outlay Basis: 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			
LIHEAP	1,500	1,712	1,255
Weatherization Assistance and State Energy Programs	262	299	166
Subtotal (Direct Expenditures)	*1,762*	*2,010*	*1,421*
Tax Expenditures			
Interest Income Exclusion (Certain Energy Facilities)	185	211	155
Utility-Sponsored Conservation Exclusion[a]	NI	NI	110
Credit/Deduction for Clean Fuel Vehicles[a]	NI	NI	105
Subtotal (Tax Expenditures)	*185*	*211*	*370*
Research and Development			
Building Technology, State and Community Programs	45	51	81
Industry[b]	97	110	133
Transportation	109	125	202
Unallocated	3	3	38
Federal Energy Management Program Adjustment[c]	-4	-5	NA
Subtotal (Research and Development)	*249*	*285*	*454*
Total	**2,196**	**2,506**	**2,245**

NI = not included. NA = not applicable.
[a]Program not in existence in 1992.
[b]Expenditures for Advanced Turbine Systems ($33 million) were reported as primary energy.
[c]FEMP was not itemized separately in 1992 budget documents. It has been removed in this report.
Sources: Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992); *Federal Financial Interventions and Energy Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999); and estimates presented in this report.

Federal Electricity Support

The total estimate of $2.2 billion for Federal subsidies to energy transformation and end use does not include estimates of support provided through Federal electricity supply programs, because of uncertainties associated with the estimation methodologies. These agencies and programs, the Tennessee Valley Authority (TVA), the Bonneville Power Administration (BPA), the other three Power Marketing Administrations (PMAs), and the Rural Utilities Service are discussed in Chapter 4. Three alternative methods of estimating support are developed and presented there.

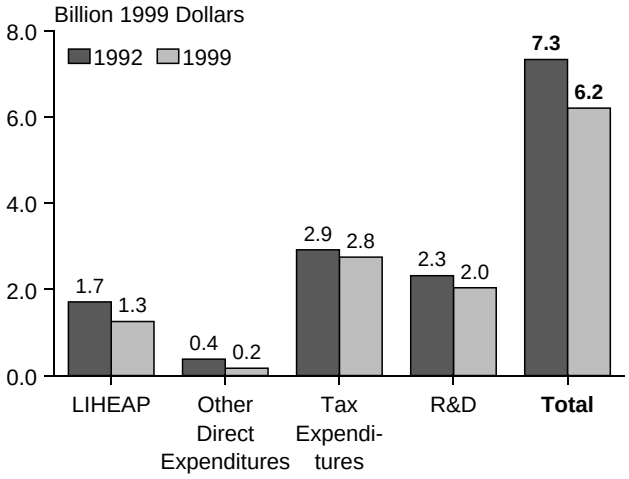
The first methodology, a market price comparison, is based on the difference between average revenues from sales for resale made by the PMAs and the average wholesale revenues for privately owned utilities in the surrounding regions. The second approach, an interest rate approach, measures the difference in borrowing costs for recipients of Federal support and what their borrowing costs would be under various benchmark rates. The third methodology, return on assets, compares cost recovery at Federal utilities with that required in the private sector, where electric utilities generally recover their operating costs plus depreciation of capital assets, plus some allowance for cost of capital.

Table ES3. Summary of Total 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	255	263	0	49	**567**
Gas	501	1,048	0	115	**1,664**
Coal	0	85	0	404	**489**
Oil, Gas, and Coal Combined[a]	0	205	0	0	**205**
Nuclear	0	0	0	640	**640**
Renewables	44	15	[b]725	327	**1,111**
Electricity[c]	459	195	0	[d]33	**687**
Conservation	166	110	0	0	**276**
End Use	0	105	0	454	**559**
Total	**1,425**	**2,026**	**725**	**2,021**	**6,198**

[a]The category Oil, Gas, and Coal Combined includes expenditures that were not allocated to any one of the three individual fuels.
[b]Alcohol fuels excise tax.
[c]Further estimates of Federal electricity supports, not included in this table, are presented in Chapter 4.
[d]Electricity research and development includes only Advanced Turbine Systems. Other generation technology research and development is distributed by fuel.
Note: Totals may not equal sum of components due to independent rounding.
Sources: Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999), and estimates presented in this report.

Figure ES2. Summary of Federal Energy Subsidy Elements, 1992 and 1999



Notes: Tax expenditures, direct expenditures, and research and development expenditures for 1992 include some amounts attributable to electricity as a fuel. Totals may not equal sum of components due to independent rounding.
Sources: Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992); *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999); and estimates presented in this report.

Table ES4. Magnitude of Energy Subsidies per Unit, 1999

Energy Use	Primary Energy					Transformation and End Use	Total
	Oil	Natural Gas	Coal	Nuclear	Biomass, Solar, Wind, Geothermal[a]	End-Use Electricity	
1998 U.S. Consumption (Quadrillion Btu)	36.57	21.84	21.62	7.16	3.48	11.05[b]	**90.67[c]**
1998 Average Wholesale Price (1998 Dollars per Million Btu)	1.88[d]	1.78[e]	0.83[f]	NA	NA	9.61	—
1995 End-Use Energy Expenditures[g] (Million 1999 Dollars)	251,025	78,690	28,559	4,102	4,333	180,562	**547,384[h]**
1999 Subsidies (Million 1999 Dollars)	661[i]	1,720[i]	544[i]	640	1,111	687	**6,198[j]**
1999 Subsidies per Unit (Percent)	0.26	2.19	1.91	15.60	25.64	0.38	**1.13**

[a]Includes utility generation attributable to the renewable energy sources listed, as well as ethanol use. Ethanol accounts for 65 percent of the total subsidy.

[b]Sales to ultimate consumers. Energy consumed as fuel input at electric utilities is represented as primary energy.

[c]Total consumption is the sum of primary energy use, excluding end-use electricity.

[d]First purchase price.

[e]Wellhead price.

[f]Value of coal produced at free-on-board mines.

[g]Petroleum expenditures are net of ethanol; renewable expenditures sum ethanol, residential and industrial biomass, and estimated revenue attributable to end-use consumption of electricity from renewable sources; end-use electricity expenditures are net of utility expenditures on renewables and fuel input at electric utilities. Total electricity revenues were $218,346 million in 1998 (nominal dollars).

[h]Total expenditures are net of expenditures for energy input at electric utilities. Total includes $114 million expended on net imports of coal coke not otherwise referenced.

[i]Values include subsidies of $205 million attributed to fossil fuels generally.

[j]Total includes subsidies to conservation and end use not referenced otherwise.

NA = not available.

Sources: Energy Information Administration, *Annual Energy Review 1998*, DOE/EIA-0384(98) (Washington, DC, August 1999); *State Energy Price and Expenditure Report 1995*, DOE/EIA-0376(95) (Washington, DC, August 1998); *State Energy Data Report 1997*, DOE/EIA-0214(97) (Washington, DC, September 1999); and Form EIA-861, "Annual Electric Utility Report" (1998).

There are inherent difficulties in making comparisons between Federal programs and private suppliers of electricity. The available wholesale price data generally do not capture the variety of power transactions—such as firm and non-firm, contract and spot transactions—that comprise the electricity marketplace. For the return on assets approach, it is difficult to determine the appropriate rate of return, if any, on assets owned ultimately by the public. For the interest rate approach, several benchmark interest rates are compared with the rates paid on debt held by Federal utilities; however, the appropriate selection of a comparison rate is largely a matter of judgment. Because of these uncertainties, the values developed by these methods should be seen as a rough indication of the magnitude of Federal support.

All three methods of valuation suggest that Federal support to selected electricity consumers has declined since 1990 (Tables ES5 and ES6). Estimates of support identified through the return on assets approach show the steepest decline, from $3.3 billion in the high estimate for 1990 (in 1999 dollars) to about $1.6 billion in 1998. The estimates developed under the market price methodology fell from $1.9 billion in 1990 to $1.4 billion in 1998. Interest rate

supports to the TVA, BPA, and the three smaller PMAs in 1990 could not be reestimated, because certain historical data were not available. Supports provided through direct loans and loan guarantees administered by the Rural Utilities Service do not appear to have declined. Explicit supports have remained about the same, ranging from $1 billion to $1.6 billion, and implicit liabilities may be much larger.[7] Despite the nominal magnitude of these estimates, they are small when compared to total electricity revenues. The highest estimate, $2.145 billion, amounts to only 1 percent of total electricity revenues in 1998; and the low estimate, $325 million, amounts to only 0.1 percent of total electricity revenues in 1998.

Table ES5. Summary of Federal Support to Electricity Estimated by Three Valuation Methods, 1998
(Million 1999 Dollars)

Program	Method				
		Interest Rate		Return on Assets	
	Market Price	Low Estimate	High Estimate	Low Estimate	High Estimate
Tennessee Valley Authority	—	77	248	228	557
Bonneville Power Administration	732	24	116	190	466
Western Area Power Administration	407	4	90	167	335
Southeastern Power Administration	152	54	94	45	128
Southwestern Power Administration	106	23	41	25	66
Rural Utilities Service	—	144	1,557	—	—
Total	**1,397**	**325**	**2,145**	**655**	**1,553**

Note: Totals may not equal sum of components due to independent rounding.
Sources: Estimates presented in Chapter 4.

Table ES6. Summary of Federal Support to Electricity Estimated by Three Valuation Methods, 1990
(Million 1999 Dollars)

Program	Method				
		Interest Rate[a]		Return on Assets	
	Market Price	Low Estimate	High Estimate	Low Estimate	High Estimate
Tennessee Valley Authority	440	—	—	1,257	1,993
Bonneville Power Administration	357	—	—	481	671
Western Area Power Administration	704	—	—	315	435
Southeastern Power Administration	260	—	—	76	118
Southwestern Power Administration	150	—	—	51	74
Rural Utilities Service[b]	—	—	—	—	—
Total	**1,912**	**—**	**—**	**2,179**	**3,290**

[a]Interest rate estimates for 1990 could not be reestimated using the methodology in this report due to lack of some historical data.
[b]Estimates of supports conferred through the Rural Utilities Service could not be reestimated due to lack of some historical data.
Note: Totals may not equal sum of components due to independent rounding.
Sources: Estimates presented in Chapter 4.

[7]See Chapter 5 of this report, page 61.

Energy Trust Fund Outlays

Energy trust funds were described in detail in EIA's September 1999 report on primary energy. The results are briefly summarized in this volume to consolidate all findings. Total outlays for certain energy trust funds have increased since 1992.[8] Four show percentage increases, led by the Aquatic Resources Trust Fund (359 percent) and the Pipeline Safety Fund (157 percent). Three show percentage decreases, the largest of which is the Nuclear Waste Fund (down 39 percent). Altogether, outlays from the seven trust funds increased by 19 percent, from $1.95 billion (1999 dollars) in fiscal year 1992 to $2.3 billion in fiscal year 1999. The ultimate costs associated with these programs, storing high-level nuclear waste or repairing damage caused by leaking underground storage tanks, cannot be known with precision, and many of the costs may be realized far in the future. Therefore, costs associated with these programs are not included in summary totals.

[8]Neither EIA's September 1999 report nor EIA's report of November 1992 evaluated the full costs of trust fund programs because of the difficulty in determining the actuarial sufficiency of the excise taxes.

1. Introduction

Background

In May 1999, the Office of Policy, U.S. Department of Energy (DOE), asked the Energy Information Administration (EIA) to:

> ". . . 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's initial request focused exclusively on programs affecting primary energy that were specific to energy markets and provided a financial benefit.[1] In response, EIA prepared a service report, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, published in September 1999.[2]

Prior to the issuance of that report, the Office of Policy extended its May request to include Federal interventions affecting energy transformation (principally, electric power generation and transmission) and energy end use.[3] This report, prepared in response to the Office of Policy's further request, is intended to complement the findings of the first report, which described Federal programs related to primary energy.

Together, the two reports update a 1992 EIA report on energy subsidies.[4] In 1992, Congress requested that 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. The 1992 request required a broad survey of Federal interventions in energy markets. The current reports, which use a more narrowly focused definition of "subsidy," do not address all energy interventions that some might consider to be subsidies. Rather, it focuses only on programs that are specific to energy markets and provide a direct financial benefit. For example, accelerated depreciation policies that are applied throughout the economy both in the energy sector and in other activities are not evaluated in this report. Similarly, the impacts of regulatory programs are excluded. The reports do not make policy recommendations, evaluate the effectiveness of existing policy, or advocate or criticize any particular policy position—either those in effect when certain programs were established or those that are the subject of current policy debates.

This report incorporates several key changes that affect comparisons with EIA's 1992 report on energy subsidies. With regard to electricity, prior methodologies, developed in 1992 and applied to the electricity industry as a whole,

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[1]Primary energy is all energy consumed by end users, excluding electricity but including the energy consumed by electricity generators.

[2]Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999).

[3]Transformation refers to the production of electricity by transforming other forms of energy into electrical energy. End use refers to any application by which energy is consumed in the residential, commercial, industrial, and transportation sectors of the economy.

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

have been modified; the discussion of electricity supply first disaggregates the industry by its chief supply components and then analyzes the impacts that are realized by each portion of the industry. Moreover, because of their indirect nature and various uncertainties in quantification, no attempt is made to provide an estimate of the "total subsidy" to electricity supply. In the 1992 report, subsidies to electricity supply were quantified by reference to Federal budget outlays. That method is not applied here to electricity programs, because it fails to capture the full range of Federal support.

Several programs estimated in the 1992 report are no longer in existence, and several new programs have been introduced in the interim.[5] The broader definition of subsidy used in 1992 required an analysis of regulations affecting the conduct of energy markets. The 1992 report quantified a portion (about one-third) of Federal excises levied mostly on petroleum products and earmarked for General Fund application, then applied their sum as an offset to total energy subsidies; current Federal excises on energy products are estimated in this report but are not applied as an offset to the total estimate, because virtually all excises levied on motor gasoline are directed to the Highway Trust Fund.[6]

Definition of Subsidy and Subsidies Addressed

There is no universally accepted definition of subsidy. For the purposes of this analysis, a subsidy is a transfer of economic resources by the 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. A subsidy is conditioned on a particular economic performance. The net effect of such a subsidy is to stimulate the production or consumption of a commodity over what it would otherwise have been.[7]

Because all Government programs have costs and benefits, however, there has been a tendency for the term "subsidy" to lose specificity and acquire derogatory connotations. This study does not ascribe any normative values (negative or positive) to any subsidies. It does not weigh the costs and benefits of each subsidy, nor does it revisit the original considerations—correcting perceived market problems, achieving social objectives—which are the domain of policymakers. It should be noted that in the U.S. economy a wide array of industries and individuals benefit from various subsidies, not just energy producers and consumers.[8] This study identifies and, where it is both possible and feasible, quantifies certain energy subsidies, but it does not evaluate their merit.

The definition of subsidy used in this report is similar to that used by the Department of Commerce's International Trade Administration, an agency that monitors subsidies and coordinates a national response to the Subsidies Agreement of the World Trade Organization (WTO), of which the United States is a member. The International Trade

[5]Summary tables presented in the Executive Summary and Chapter 5 of this report include only those programs that are specified in the 1999 request. The estimates have been adjusted as noted in order to facilitate comparisons with the 1992 EIA report.

[6]At 18.4 cents per gallon, the motor gasoline portion alone would approach $21 billion, far offsetting all subsidies identified here. The 1992 EIA report applied only the 4.3 cents diverted to the General Fund, yielding an offset of $3.1 billion (1992 nominal dollars). Small portions of the excise go to the Leaking Underground Storage Tank Trust Fund, the Aquatic Resources Trust Fund, and the General Fund.

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

[8]For 1999, the Budget of the United States reports a loss of $87 billion associated with the exclusion of pension contributions and earnings; a loss of $76 billion associated with the exclusion of employer contributions for medical insurance premiums and medical care; and a loss of $53 billion resulting from the deductibility of mortgage interest on owner-occupied housing. See Office of Management and Budget, *Budget of the United States Government, Fiscal Year 1999* (Washington, DC, 1998), Table 33-4.

Purpose and Limitations

This report provides a snapshot of a select set of Federal subsidies in U.S. energy markets. As defined by the requestor (the U.S. Department of Energy's Office of Policy), to be included in this report a subsidy must derive from a Federal program, be specific to energy markets, and provide a financial benefit to its recipients. This subsidy definition excludes many programs that have been considered subsidies in other analyses.[a] For example, all State programs are excluded, and tax-free bonds used by municipal electric utilities are excluded because non-energy companies such as municipal water and sewer facilities can also use them. Similarly, the tax-free pollution bonds and accelerated depreciation schedules used by investor-owned utilities are also excluded because of their use by non-energy companies.

When this report is compared with other analyses, careful attention should be paid to the definition of subsidy used in each report. There is no widely accepted definition of what constitutes a subsidy, and the definition used varies depending on the objective of a particular report. With respect to electricity markets, this report is not meant to address the relative advantages or disadvantages that ownership type (public or private) provides.

[a]See the bibliography in Appendix D for a list of other analyses.

Administration's definition is relatively broad,[9] but it does emphasize that "countervailable" subsidies, those for which remedies may be sought, must be "specific," that is, provided to a limited number of companies that may be engaged in the same endeavor, and must have caused adverse trade effects. The International Trade Administration adds that subsidies can take a variety of forms, and illustrates two in particular: export financing at preferential rates and tax exemptions for favored companies or industries. Subsidies provided for certain research and development, regional development, and environmental compliance purposes are non-actionable practices, as long as the assistance meets the criteria specified in the Subsidies Agreement.

Three broad categories of energy programs are considered: direct subsidies, indirect subsidies, and electricity support programs. Direct subsidies are characterized either by direct payments from the Federal Government to producers or consumers or by tax expenditures, which are provisions in the tax code that reduce the liability of persons or corporations undertaking certain actions.[10] Included in this report are:

- Direct payments under the Department of Health and Human Services' Low Income Home Energy Assistance Program (LIHEAP)
- Direct payment under two DOE programs—the Weatherization Program and the State Energy Program
- Three tax expenditures quantified by the Department of Treasury and reported by the Office of Management and Budget (OMB)—exclusion of interest on energy facility bonds from Federal taxation; exclusion of conservation subsidies provided by public utilities from the taxable income of the recipients; and tax credits and deductions for clean-fuel, alternative-fuel, and electric vehicles.

[9]"A subsidy can be almost anything a government does, if . . . a financial contribution is made . . . and a benefit is received." See web site www.ita.doc.gov/esel/e-splash.htm.

[10]Shoup characterizes tax expenditure generally as an imputed subsidy but argues that the firm will respond similarly whether the subsidy takes the form of a direct cash transfer or a reduction in taxable basis. Both should be recorded as "explicit subsidies," as firms, in effect, exercise discretion over the amount of the transfer. C. Shoup, *Public Finance* (Chicago, IL: Aldine Publishing Company, 1969), pp. 145-151.

Energy subsidies may also be indirect in character. Examples include the provision of energy or energy services at below-market prices, loans or loan guarantees, insurance services, and research and development activities. Research and development programs targeted to energy end use are quantified in this report, as are loans and loan guarantees.[11] Of loan guarantees, Shoup writes that, although "no money may in fact need to be paid by the government, it has nevertheless granted a subsidy."[12]

Several Federal programs that indirectly support the electricity industry are discussed and quantified in Chapter 4, but they are not included in summary numbers. Through the Tennessee Valley Authority (TVA), the Bonneville Power Administration, and the three other Federal Power Marketing Administrations (PMAs), the Federal Government brings to market large amounts of electricity, stipulating that "preference in the sale of such power and energy shall be given to public bodies and cooperatives."[13] Power generated at Federal facilities, many of which are hydroelectric dams built and operated by the Army Corps of Engineers and the U.S. Bureau of Reclamation, is sold on the wholesale market. This practice constitutes a direct rent subsidy by the Federal Government that results in a consumer surplus subsidy for preference customers and others[14] who consume the power, assuming that the PMAs are "inframarginal" producers.[15] The financial structure of Federal electricity suppliers may result in lower capital costs than would otherwise prevail in private markets.[16] The Federal Government indirectly supports portions of the electricity industry by sponsoring universal service in relatively high-cost areas through the Rural Utilities Service. The PMAs and TVA have also received congressional support in declaring certain costs to be "sunk." Any discussion of these support programs rests entirely on the assumption that certain aspects of a public enterprise may legitimately be compared with a private counterpart, an assumption that is not necessarily shared by all reasonable observers.

Several programs that could be included as subsidies under a different definition of that term are not addressed here. For example:

- Investor-owned utilities take advantage of accelerated depreciation of machinery and equipment (normal tax method), which is among the largest tax expenditures provided under law.[17] For property placed in service after 1980 and before 1987, the Accelerated Cost Recovery System (ACRS) provided accelerated depreciation schedules of 10 to 15 years. Since 1986, depreciation allowances have been determined under the Modified Accelerated Cost Recovery System (MACRS). It is believed that both the ACRS and MACRS often recover the cost of property faster than predecessor depreciation schedules.[18] However, because many other industries also have access to this tax provision, the accelerated depreciation allowance is not an energy-specific subsidy.[19]

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[11]An important insurance provision, the Price-Anderson Act, was detailed in *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, p. 42.

[12]C. Shoup, *Public Finance* (Chicago, IL: Aldine Publishing Company, 1969), p. 149.

[13]Flood Control Act of December 2, 1944 (58 Stat. 887, 890; 16 U.S.C.A. 825s), Section 5.

[14]Surplus power is made available to all consumers; investor-owned utilities also purchase it.

[15]D.N. Hyman, *Public Finance: A Contemporary Application of Theory to Policy* (New York, NY: Harcourt Brace College Publishers, 1999), pp. 250-255.

[16]Typically 100 percent debt financed, they bear no equity costs.

[17]Estimated at $32.5 billion in 1999. Office of Management and Budget, *Analytical Perspectives, 2000* (Washington, DC, 1999), Table 5-1.

[18]U.S. Congress, Joint Committee on Taxation, *Federal Tax Issues Relating to Restructuring of the Electric Power Industry*, JCX-72-99 (Washington, DC, October 15, 1999), pp. 26-27.

[19]A wide variety of public utility property may be eligible for favorable depreciation allowances, including property used primarily in furnishing electrical energy, water, sewage disposal, gas or steam distribution, telephone services, other communications services if furnished or sold by the Communications Satellite Corporation, or transportation of gas or steam by pipeline under certain circumstances. See U.S. Congress, Joint Committee on Taxation, *Federal Tax Issues Relating to Restructuring of the Electric Power Industry*, JCX-72-99 (Washington, DC, October 1999), p. 31.

- Private firms, including investor-owned utilities, also realize enhanced cash flows stemming from "deferred taxes," which are temporary differences arising from Federal income tax accounting and financial accounting treatment of a property item. Deferred taxes are substantial, but they are not addressed here because the same regulatory procedure is applied widely to gas, water, and telephone utilities in addition to electric utilities.

- Municipal electric utilities, rural electric cooperatives, the four PMAs, and the TVA are exempt from Federal income tax; this type of support is addressed, but only indirectly.[20]

- Because municipal utilities acquire their capital through tax-exempt bonds, they realize lower capital costs than private markets would otherwise provide.[21] Because this financing arrangement is available for a wide variety of public purposes, it is not "energy-specific."[22]

- A wide variety of regulatory procedures applied by the Federal Energy Regulatory Commission, the Securities and Exchange Commission, the Environmental Protection Agency, State-level regulators, and others may bestow benefits and disadvantages unevenly across the electricity industry and throughout the energy economy. In EIA's 1992 report, these types of interventions were included and categorized as "Regulation and Resource Management," estimated nominally at $523 million.[23]

Methods for Evaluating Costs of Subsidy and Support Programs

There are several approaches to measuring the effects of subsidies. Budget costs, the costs incurred or the revenue forgone by the Federal treasury as a consequence of implementing a program, are the most direct. Market impacts can also be examined, measuring the effects on energy prices and quantities associated with particular programs. A third method, measuring economic costs, involves partitioning budget costs into three parts—producer surplus, consumer surplus, and deadweight loss. Measuring economic costs can also be extended to consider net social costs or benefits, weighing such costs against the net economic cost of the program.

In this report, EIA has elected to use the measure of budget cost or revenue forgone to the greatest extent possible; in most cases, budget outlays—the actual expenditures by Federal agencies—are cited. For many research and development (R&D) programs, however, the available outlay data are more aggregated than the appropriations data. In certain cases, it is necessary to use the appropriations data. There are also several programs for which the Federal budget itself is not a meaningful measure of the concept of budget costs. Tax expenditures do not appear directly as line items in the budget. The U.S. Department of the Treasury estimates the cost of tax expenditures, which can be measured either as revenue losses or as outlay equivalents. This report uses outlay equivalents as the measure, in order to facilitate comparison with other sources of information.

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[20]See Chapter 4, specifically the discussion of historical costs absent any tax obligation.

[21]Investor-owned utilities also realize some reductions in their cost of capital by this means. The tax expenditure for certain energy facilities engaged in "local furnishings" is realized to some extent by investor-owned utilities. Along with other non-energy industries, investor-owned utilities benefitted from tax-exempt bonds issued in the 1980s for "pollution control devices"; the associated tax expenditure was valued at $440 million in 1999. See Office of Management and Budget, *Analytical Perspectives, 2000* (Washington, DC, 1999), Table 5-1.

[22]The Treasury Department estimates that if taxable bonds were used by municipal utilities, the U.S. Treasury would realize an additional $1.69 billion in 1998. Correspondence, Office of Tax Analysis, U.S. Department of Treasury, January 27, 2000.

[23]Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992), Table 2, p. 12.

In the case of electricity support programs, EIA believes that transactions appearing in the Federal budget indicate only selected capital expenditures or borrowing and repayment by Federal agencies, reflecting a small and unrepresentative fraction of the various agencies' financial positions and activities.[24] Federal electricity programs are indirect; the benefits are distributed widely, and the costs are incurred through a series of indirect transactions, most of which are stipulated by Congress, and all of which can be revisited at any time by Congress. Generally, these programs indirectly reduce the cost of electricity by reducing the underlying capital costs that are incurred when new power generation, distribution, and transmission facilities are built. Thus, evaluation of the programs rests on a comparison between the implicit price of capital for electricity suppliers and the price of capital incurred by companies not eligible for the programs. Ultimately, the comparison must somehow envision a hypothetical world where the programs have never existed.

Finally, this report cannot be read as an evaluation of the relative financial, operating, or productive merits or liabilities of different portions of the electricity industry. The question of relative efficiency between the publicly owned and investor-owned sectors of the industry has been examined in some detail by academics and by others,[25] with different assumptions and modeling approaches leading to divergent conclusions. This report is not intended to address that debate, only to identify elements of support that meet the criteria specified. Therefore, readers will find no conclusion, either explicit or implicit, regarding the relative productive efficiencies achieved by publicly owned and investor-owned electric utilities.

[24]For example, the Rural Utilities Service appropriation for fiscal year 1998 was $67 million, some portion of which is applied to electricity programs (the agency's responsibilities also include water and telecommunications. See Office of Management and Budget, *Analytical Perspectives, 2000* (Washington, DC, 1999), p. 438. The Service either approved or guaranteed loans to distribution and power supply cooperatives in the nominal amount of $1.245 billion in 1998. See U.S. Department of Agriculture, Rural Utilities Service, *1998 Statistical Report, Rural Electric Borrowers*, IP 201-1 (Washington, DC, August 1999), Table 1.

[25]Two important contributions are J.E. Kwoka, *Power Structure: Ownership, Integration, and Competition in the U.S. Electricity Industry* (Boston, MA: Kluwer Academic Publishers, 1996), and L.L. Peters, "Non-Profit and For-Profit Electric Utilities in the United States: Pricing and Efficiency," *Annals of Public and Cooperative Economics* (1993), pp. 575-604.

2. Direct Expenditures and Tax Expenditures

Overview

This chapter discusses Federal programs through which the Federal Government provides direct financial benefits to energy producers or consumers, with receipt of the benefits directly linked to energy production or consumption. Two types of Federal programs are considered in this chapter: direct expenditures and tax expenditures. Direct expenditures are payments made by the Federal Government to particular energy producers or consumers because they are economically disadvantaged or have undertaken to produce or consume energy in a way that has desirable social consequences. Energy tax expenditures are broadly defined as provisions of the tax code that permit special, beneficial tax treatment to taxpayers who produce, consume, or save energy in ways that are judged to be in the public interest.

Direct expenditures do not involve large sums of money in comparison with the Federal civilian budget or the value of U.S. energy consumption. Federal direct expenditures in this chapter include two grant programs: the Low Income Home Energy Assistance Program (LIHEAP), administered by the U.S. Department of Health and Human Services (DHHS), and the Building Technology Assistance Program (which consists of the Weatherization Assistance Program and the State Energy Program), administered by the U.S. Department of Energy. In 1999, total annual appropriations for the two programs are about $1.4 billion, compared with annual U.S. expenditures for end-use energy of $547 billion in 1995 (1999 dollars).[26] Given that these subsidies are grants, their value is clearly stated in Federal budget documents.

Three types of tax expenditures are included in this chapter: the exclusion of interest on energy facility bonds from Federal income taxes, the exclusion from income of conservation subsidies provided by public utilities, and a Federal income tax credit for clean-fuel vehicles and property. The total value of the three subsidies amounted to $270 million in 1999 in terms of revenue losses. A more comprehensive group of tax expenditures is discussed in the Energy Information Administration's September 1999 report, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*. The current report focuses on tax expenditures related to electricity and other non-primary energy.

Direct Expenditures

Low Income Home Energy Assistance Program

LIHEAP, originally established in 1981, is a block grant program under which the Federal Government gives States, the District of Columbia, U.S. territories, and Indian tribal organizations annual grants to provide home energy assistance for needy households. It is administered through DHHS, but most of the important decisions about the

[26]This is the most recent year for which data are available. Energy Information Administration, *State Energy Price and Expenditure Report 1995*, DOE/EIA-0376(95) (Washington, DC, August 1998).

program's implementation are left to the grantees. LIHEAP assistance does not reduce eligibility or benefits under other aid programs.[27]

For fiscal year 1999, LIHEAP is the largest program among direct expenditure energy subsidies, with an expenditure of $1.255 billion (Table 1), including $155 million in emergency funds for cooling assistance. LIHEAP disburses block grants to the States, which in turn provide assistance to low-income households for payment of utility bills and for weatherization of residences.[28] The precise eligibility criteria vary from State to State. In general, recipients must have income that is less than 150 percent of the poverty level for their State, or less than 60 percent of the State's median income. No household with income below 110 percent of the poverty guidelines may be excluded.

Table 1. Funding for Direct Expenditure Energy Subsidies, Fiscal Year 1999
(Million 1999 Dollars)

Program	Expenditure
Low Income Home Energy Assistance Program[a]	1,255
Building Technology Assistance Program	
Weatherization Assistance Program	133
State Energy Program	33
Total	**1,421**

[a]In 1999, an additional $155 million in emergency funds was made available to States with LIHEAP recipients that experienced severe heat. The funds were released from an appropriation of $300 million for energy emergency contingency purposes.

Source: Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2000* (Washington, DC, 1999).

The effects of LIHEAP are difficult to quantify, in part because the actual administration of the program is in the hands of the States, which do not apply uniform eligibility criteria or collect uniform information from recipients. Based on sample survey data, about 46 percent of LIHEAP recipients heat their homes with natural gas, 28 percent with electricity, 23 percent with petroleum products, and the balance (4 percent) with other fuels.[29] Table 2 shows the estimated division of direct expenditures for LIHEAP and DOE's Building Technology Assistance Program by fuel type. (In addition, $155 million used for emergency cooling assistance is allocated to electricity.)

In fiscal year 1997, the average LIHEAP household consumed about 7.8 percent less energy than the national average but 5.7 percent more energy than the average low-income household (Figure 1). Consumption of natural gas was 3.4 percent below the national average but 6.2 percent above the average for low-income households. LIHEAP households consumed 16.7 percent less electricity than the national average but had the same rate of consumption as the average low-income household. For fuel oil, LIHEAP households consumed less than both the national average

[27]Federal rules also require outreach activities, coordination with DOE's Weatherization Assistance Program, and annual audits. Grantees decide the mix and dollar range of benefits, choose how benefits are provided, and decide what agencies will administer program components. In addition to funds used for heating and/or cooling assistance, a reasonable amount of the funds must be set aside by grantees for energy crisis intervention. Up to 15 percent of grantees' allotments (up to 25 percent with a waiver) may be used for low-cost residential weatherization or other energy-related home repair.

[28]Information on LIHEAP is drawn from the following sources: Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2000* (Washington, DC, 1999); CRS Issue Brief for Congress, *94-211: The Low-Income Home Energy Assistance Program: A Fact Sheet* (updated October 23, 1998); Fax from Leon Litow, *LIHEAP Home Energy Notebook, Fiscal Year 1997* (draft report, 1999); and material accessed from web sites www.acf.dhhs.gov/programs/liheap and www.ncat.org/liheap.

[29]Home Energy Data, web site www.acf.dhhs.gov/programs/liheap.

and the average for low-income households. Excluding weatherization grants, LIHEAP functions as a subsidy to energy consumption.

Table 2. Estimated Funding for Direct Expenditure Energy Subsidies by Fuel Type, Fiscal Year 1999
(Million 1999 Dollars)

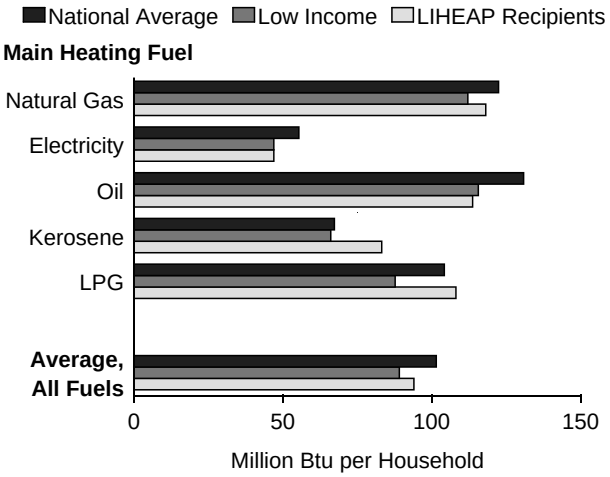
Fuel	Low Income Home Energy Assistance Program	Building Technology Assistance Program
Oil	255	0
Natural Gas	501	0
Coal	0	0
Nuclear	0	0
Renewables	40	0
Electricity[a]	459	0
Conservation	0	166
Total	**1,255**	**166**

[a]Includes an emergency expenditure of $155 million for cooling assistance that is allocated to electricity.

Sources: Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2000* (Washington, DC, 1999). The LIHEAP total was separated by fuel using data from web site www.acf.dhhs.gov/programs/liheap.

In fiscal year 1996, the average annual LIHEAP benefits per recipient ranged from $54 to $403 for heating assistance, from $77 to $623 for winter crisis aid, and from $15 to $145 for cooling assistance.[30] The national average annual benefit for households receiving heating and/or winter crisis aid was estimated at $180, a 9-percent decrease from the fiscal year 1995 average. In fiscal year 1996, benefits accounted for 91 percent of LIHEAP spending and administrative costs 9 percent. Fewer than 25 percent of eligible households received LIHEAP benefits. In fiscal year 1996, more than 4.3 million recipients received heating assistance, 109,000 households received cooling assistance, 31,000 households received summer crisis aid, and 59,000 households received weatherization assistance. LIHEAP recipients used only about 0.4 percent less energy than the national average household for heating but 48 percent less energy for cooling, mirroring the pattern of LIHEAP assistance.

Figure 1. Annual Energy Consumption of the Average U.S. Household, Average Low-Income Household, and LIHEAP Recipients by Main Heating Fuel, 1997



Source: Fax from Leon Litow, *LIHEAP Home Energy Notebook, Fiscal Year 1997* (draft report, 1999).

Building Technology Assistance Program

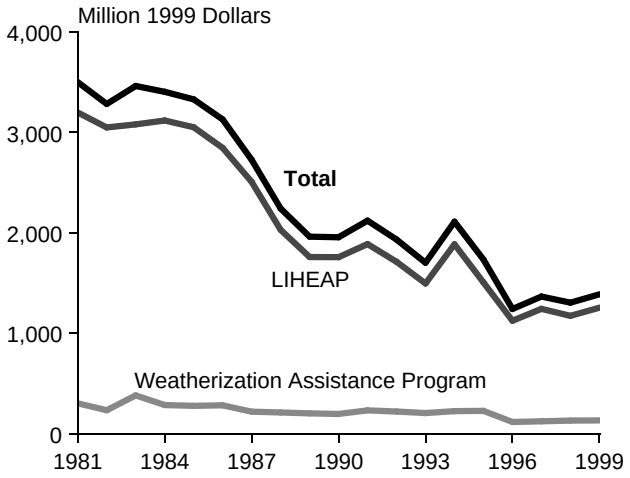
Also included in the direct expenditure category is DOE's program of grants for conservation and technical assistance, with fiscal year 1999 funding of $166 million (nominal dollars) (Table 1). The Building Technology Assistance Program supports two grants programs. The Weatherization Assistance Program supports the weatherization of 76,900 low-income homes, with an appropriation of $133 million for fiscal year 1999 and $154

[30]Home Energy Data, web site www.acf.dhhs.gov/programs/liheap.

million for fiscal year 2000 (approximately $1,700 to $2,000 per household minus overhead and administration costs). The State Energy Program, which supports grants to promote innovative State energy efficiency and renewable energy activities, is funded at $33 million for fiscal year 1999 and $37 million for fiscal year 2000. In contrast to LIHEAP, the DOE program subsidizes energy conservation and is designed to reduce energy consumption.[31]

Figure 2 shows the time profile of appropriations for LIHEAP and the DOE Weatherization Assistance Program. The total appropriations for the two programs have declined from $3.50 billion (1999 dollars) in fiscal year 1981 to $1.33 billion in fiscal year 1999.

Figure 2. Annual Expenditures for LIHEAP and DOE's Weatherization Assistance Program, Fiscal Years 1981-1999



Note: Figure does not include funding for DOE's State Energy Program.

Source: Low-Income Energy Programs Funding History, web site www.ncat.org/liheap/tables/lhhist.htm.

Tax Expenditures

Definitions

Tax expenditures are reductions in Government revenues resulting from preferential tax treatment for particular taxpayers. They are termed "tax expenditures" because their objectives could also be reached by a direct expenditure of Government funds. In this report, the term "tax expenditures" is applied to preferential tax treatment provided by Federal income tax laws, as requested in the study definition. The concept could also be applied to the income tax laws of other jurisdictions, such as States and municipalities, and it could be extended to include other taxes, such as excise taxes. The tax expenditure provisions reviewed in this chapter are Federal income taxes that are applied preferentially to energy.

Many tax expenditure programs are functionally equivalent to direct expenditure programs. The basis for selecting one or the other approach to provide benefits to taxpayers is not always clear. It is not obvious why the Congress chooses to adopt tax expenditures for some programs and direct expenditures for others, but political and policy considerations as well as the specific characteristics of the programs may play a role.[32] For instance, tax expenditures may be less subject to annual review in the normal budget cycle and may be less visible than direct expenditure programs in the budget process.

[31]Information on the DOE Weatherization Assistance Program and the State Energy Program is drawn from Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2000* (Washington, DC, 1999), and U.S. Department of Energy, *Fiscal Year 2000 Congressional Budget Request*.

[32]Some of the factors related to the two approaches are discussed in M. Feldstein, "A Contribution to the Theory of Tax Expenditures: The Case of Charitable Giving," in H.J. Aaron and M.J. Boskin, *The Economics of Taxation* (Washington, DC: The Brookings Institution, 1980), pp. 99-122.

Tax expenditures occur when actual tax treatment for particular kinds of taxpayers deviates from standard tax treatment. There is disagreement as to what constitutes standard treatment, both in principle and in practice. As a result, lists of tax expenditure items and associated values can and do differ. With minor modification, the list and values used in this report are those prepared by the U.S. Treasury Department and reported by the Office of Management and Budget (OMB) in the budget of the U.S. Government.[33]

Individual Energy Tax Expenditures

The largest source of tax expenditures for end-use energy is the exclusion from gross income of interest on private activity bonds issued by State or local governments to finance certain energy facilities, often built by investor-owned utilities, from Federal taxation (Table 3).[34] The resulting loss of tax revenues in 1999 amounted to $110 million—the amount of Federal income tax that would have been paid on interest earnings from taxable bonds for energy facilities that are otherwise similar to those that are tax free. The outlay equivalent of the tax expenditure amounted to $155 million. Outlay equivalents measure "the amount of outlay that would be required to provide the taxpayer the same after tax income as would be received through the tax preference."[35]

Table 3. Estimated Federal Energy Tax Expenditures by Type of Expenditure, Fiscal Year 1999
(Million 1999 Dollars)

Expenditure	Revenue Loss	Outlay Equivalent
Exclusion of Interest on Energy Facility Bonds	110	155
Exclusion from Income of Conservation Subsidies Provided by Public Utilities	80	110
Tax Credit and Deduction for Clean-Burning Vehicles	80	105
Total	**270**	**370**

Source: Office of Management and Budget, *Analytical Perspectives, 2000* (Washington, DC, 1999).

The second largest tax expenditure for end-use energy in 1999 consisted of a Federal tax exemption for subsidies provided by public utilities to non-business customers to reduce the costs of energy conservation measures. The value of the revenue loss associated with this subsidy was $80 million, and the outlay equivalent value was $110 million.

The third tax expenditure included here consists of a tax credit of 10 percent for purchases of electric vehicles. The credit is capped at $4,000. Owners of clean-fuel storage facilities are also eligible for the credit. The value of this subsidy in 1999 was $80 million in terms of revenue lost and $105 million in terms of outlay equivalent.

Unreported Tax Expenditures

The reporting of tax expenditures was mandated by the Congressional Budget Act of 1974 (Public Law 93-344). The Budget of the U.S. Government defines tax expenditures as "revenue losses due to preferential provisions of the

[33]Office of Management and Budget, *Analytical Perspectives, 2000* (Washington, DC, 1999), pp. 105-126.
[34]These bonds are distinct from the tax-exempt bonds issued by State and municipal electric utilities to fund ordinary capital investments.
[35]Office of Management and Budget, *Analytical Perspectives, 2000* (Washington, DC, 1999), p. 116.

Federal tax laws, such as special exclusions, exemptions, deductions, credits, deferrals, or tax rates."[36] Although the concept behind what constitutes a tax expenditure is clear, the determination of what exactly is a preferential provision is subject to interpretation. In preparing this section on energy-related tax expenditures, the Energy Information Administration relied entirely on the definitions of tax expenditures presented in OMB documents. Expenditures below the U.S. Treasury's *de minimis* amount ($5 million) are not reported in standard OMB budget documents and therefore are not included in this report.

[36]Office of Management and Budget, *Analytical Perspectives, 2000* (Washington, DC, 1999), p. 105.

3. Research and Development Spending for Energy End Use and Electricity

Overview

According to the Office of Management and Budget (OMB), the Federal Government spent $34.5 billion on civilian research and development (R&D) in fiscal year 1999.[37] Outlays for energy R&D (as defined by OMB) accounted for 4 percent of civilian R&D expenditures. "Atomic energy general science" (consisting mainly of basic research conducted by the Department of Energy) accounted for an additional 7 percent of fiscal year 1999 civilian R&D outlays.[38]

Research and development is in an ambiguous position as an energy subsidy, because of its indirect connection with future market outcomes.[39] Whereas the tax expenditures described in Chapter 2 benefit selected fuel producers, and programs such as LIHEAP benefit selected consumers, the beneficiaries of R&D spending are more diffuse. In principle, the product of R&D is knowledge, and the presumed users of the knowledge are typically manufacturers of energy-producing or consuming capital equipment. Future energy producers and consumers will benefit only if equipment manufacturers apply the knowledge gained to commercially successful products in the future.

Some observers argue that Federal Government R&D funding is a subsidy because it substitutes for private R&D.[40] If this view were applied specifically to the energy industries, it would imply that Federal R&D relieves capital equipment producers of a competitive requirement to invest in R&D, and that consequently costs (and, to some extent prices) of capital goods are lower than would otherwise be the case. The extent to which Government R&D substitutes for private R&D would be difficult to determine.

This chapter focuses on Federal R&D spending aimed at energy end use and electricity. Federal end-use R&D is generally aimed at innovations that use *less* energy, rather than more. Thus, to the extent that they constitute a subsidy, the programs subsidize technologies that improve energy efficiency rather than promoting consumption of a particular type of energy.[41] Federal energy end-use R&D appropriations were estimated to be $453.6 million in fiscal year 1999 (Table 4). About 45 percent of the money was spent on transportation-related energy R&D, concentrating on technologies that eventually could be instrumental in building vehicles that use alternative fuels, produce low or zero emissions of pollutants, or have higher fuel efficiencies.

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[37]Office of Management and Budget, *Budget of the United States Government FY 2000: Historical Tables* (Washington, DC, 1999), p. 159.

[38]The general science funding is not included in the tables in this chapter or in the Executive Summary. This chapter focuses on applied energy research and development.

[39]In addition to directly funded R&D, the Natural Gas Policy Act of 1978 mandated the creation of a private sector natural gas research and development agency, the Gas Research Institute (GRI). Because the funding for GRI is collected from the industry and not provided by the Government, it is not a subsidy. The Electric Power Research Institute (EPRI) performs similar research for the electric power industry. The funding for EPRI comes from organizations that elect to participate, not from the Government, and thus is not a subsidy.

[40]P. Stoneman, *The Economic Analysis of Technology Policy* (London, UK: Oxford University Press, 1987), p. 203.

[41]Conservation programs are directed primarily at consumers of energy. End-use programs are oriented to the development and introduction of technologies for use in specific sectors.

This report does not include a category of R&D programs specifically aimed at electricity production or consumption. In practice, most of the programs related to electricity production are attributed to the form of fuel to be consumed (and hence included in the previous report),[42] or attributed to an end-use category such as buildings, transportation, or industry (and included in this report), rather than to electricity as a separate category.

Research and Development Spending for Energy End Use and Conservation

U.S. Department of Energy (DOE) R&D programs aimed at conserving energy were funded at $453.6 million in fiscal year 1999 (Table 4). The conservation programs target buildings, industries, and the transportation sector. In addition, other Federal agencies (particularly the National Aeronautics and Space Administration and the Department of Transportation) operate large R&D programs not aimed directly at energy consumption, but which may significantly affect energy consumption in the future. Figure 3 illustrates trends in conservation R&D spending.

Table 4. Federal Research and Development Subsidies for Energy End Use, Fiscal Years 1992 and 1999
(Million 1999 Dollars)

Category	Fiscal Year 1992		Fiscal Year 1999 Estimated
	Appropriations[a]	Expenditures[b]	
Building Technology, State and Community Programs	54.1	51.4[c]	81.0[c]
Industrial Sector	111.2	110.3	165.9
(Minus Advanced Turbine Systems)[d]	([e])	([e])	-33.0
Industrial Sector, Net	111.2	110.3	132.9
Transportation Sector	125.7	124.7	202.1
Unallocated	3.1	3.1	37.7
Federal Energy Management Program Adjustment[f]	NA	-4.6	NA
Total	**294.1**	**284.9**	**453.6**

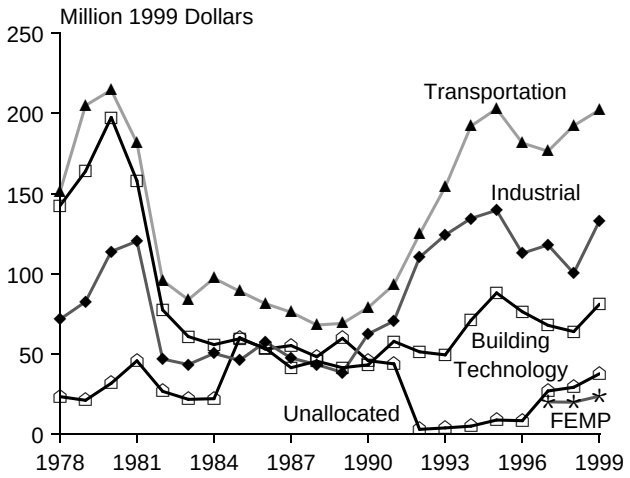
[a]Appropriations taken from the 1992 EIA report (see sources below), adjusted for inflation (14 percent).
[b]Expenditures taken from the 1992 report, adjusted to reflect the revised definition of subsidy used in this report, revisions in appropriations after the 1992 EIA report was published, and changes in the definitions of end-use categories based on a reassessment of where programs should be assigned.
[c]Adjustments were made to exclude expenditures for regulatory programs (codes and standards).
[d]Included in EIA's September 1999 subsidy report.
[e]Included in "Natural Gas R&D" in the fiscal year 1992 budget.
[f]FEMP was included in the 1992 expenditures but is removed here because it is not considered a subsidy.
NA = not applicable.
Note: Totals may not equal sum of components due to independent rounding.
Sources: U.S. Department of Energy, *U.S. Department of Energy Fiscal Year 2000 Budget Request*, DOE/CR-0059 (Washington, DC, May 21, 1999); Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999); and Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992). U.S. Department of Energy, Office of Building Technologies and State and Community Programs, e-mail from Gale Kabat (February 28, 2000).

[42]Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999).

Building Technology, State and Community Programs (BTS)

The mission of the DOE building technology R&D program is to develop, promote, and integrate energy practices and technologies to make buildings more efficient and affordable and communities more livable. The Building Research and Standards program accelerates the introduction of highly efficient building technologies and practices through R&D and increases minimum energy efficiency of buildings and equipment through appliance standards, building codes, and guidelines. Building technology R&D (non-grant) programs complement DOE grant programs that help to deploy energy-efficient technologies and increase consumer awareness of their benefits and costs. The appropriation in fiscal year 1999 was $96.2 million. The funding level included $15.3 million for regulatory expenditures that are not considered subsidies in this report. The regulatory funding included $6.5 million for lighting and appliance standards, $7.7 million for training and assistance for State energy codes, and $1.1 million for residential and commercial building energy codes. Therefore, the adjusted funding level for fiscal year 1999 is $81.0 million.

Figure 3. Principal Appropriations for U.S. Department of Energy Research and Development on Energy End Use, Fiscal Years 1978-1999



Notes: Industrial sector R&D appropriations exclude funding for Advanced Turbine Systems. Funding for the Federal Energy Management Program (FEMP) is included in this figure because it is included as a line item in the DOE energy conservation R&D appropriations. It is not considered a subsidy. Before 1997, FEMP expenditures were included in other end-use programs. Building technology appropriations exclude codes and standards funding for fiscal years 1992-1999.

Source: U.S. Department of Energy, Office of the Chief Financial Officer, "Budget Authority History Table by Appropriation" (Washington, DC, 1998); *U.S. Department of Energy Fiscal Year 1999 Budget Request*, DOE/CR-0050 (Washington, DC, February 1998); and *U.S. Department of Energy Fiscal Year 2000 Budget Request*, DOE/CR-0059 (Washington, DC, May 21, 1999).

Federal Energy Management Program

The Federal Energy Management Program (FEMP) was established in 1974 to provide direction, guidance, and assistance to Federal agencies in planning and implementing energy management programs.[43] The mission of FEMP is to reduce the cost of Government by advancing energy and water efficiency, promoting renewables, and managing utility costs. Section 543 of the National Energy Conservation Policy Act, as amended by the Energy Policy Act of 1992 (EPACT), requires each agency to achieve: a 10-percent reduction in energy consumption in its Federal buildings by fiscal year 1995, when measured against a fiscal year 1985 baseline on a Btu-per-gross-square-foot basis; and a 20-percent reduction in Btu per gross square foot by fiscal year 2000. In addition, Executive Order 12902, issued in 1994, required Federal agencies to achieve a 30-percent reduction by fiscal year 2005.

Executive Order 13123, "Greening the Government Through Efficient Energy Management" supersedes Executive Order 12902. Executive Order 13123 encourages effective energy management in the Federal Government and builds on work begun under EPACT and previous Executive Orders. The program was funded at $23.8 million in fiscal year 1999. Expenditures for FEMP are not included in Table 4, because the funds are invested by the Federal Government to reduce energy consumption in its own facilities, and only public benefits accrue from those investments.

[43]FEMP was initially included in end-use programs for budget purposes. Separate accounting for FEMP began in 1997. Details are provided in Appendix C of this report.

Industrial Sector

The mission of DOE's Office of Industrial Technologies (OIT) is to improve the energy efficiency, environmental performance, and productivity of energy-intensive industries by developing and delivering advanced science and technology options that will lower raw material and energy use per unit of output, improve labor and capital productivity, and reduce generation of wastes and pollutants. OIT's R&D portfolio concentrates on cooperative projects with nine of the major process and extraction industries in the industrial sector. These industries, referred to as Industries of the Future (IOF) include forest products, steel, aluminum, metal casting, glass, chemicals, petroleum, mining, and agriculture.

In addition, the OIT portfolio includes crosscutting R&D efforts on technology needs, which have been identified in "technology roadmaps" across multiple industries and form technology bases from which more industry-specific developments can derive. The crosscutting activities also include technical information and outreach programs, demonstrations, training, and tool development to assist industry in evaluating and adopting new energy-efficient and pollution-preventing technologies and techniques. The industrial R&D program was funded at $132.9 million in fiscal year 1999 (excluding $33 million for the Advanced Turbine Systems program, which was included as a primary energy subsidy in the September 1999 EIA report).[44]

Transportation Sector

U.S. Department of Energy

The DOE transportation sector R&D program funds activities directed at improving vehicle technology, fuel utilization, technology deployment, materials technologies, and related management and planning activities. The mission of the program is to support the development of advanced transportation vehicles and fuels that will reduce energy demand, particularly for petroleum; reduce criteria pollutant emissions; and reduce greenhouse gas emissions. The transportation R&D program includes support to the Partnership for a New Generation of Vehicles (PNGV), which involves major U.S. vehicle manufacturers and multiple Federal agencies. The goal is to develop a mid-size family sedan with a fuel economy of up to 80 miles per gallon by 2004 without sacrificing comfort or safety. Research for the PNGV is directed at fuel cells, advanced direct-injection engines, exhaust systems, advanced batteries, and electronic power controllers. The funding level for these programs was $202.1 million in fiscal year 1999, of which $128.1 million was allocated to the PNGV program.

Other U.S. Government Agencies

Other Departments also have extensive transportation R&D programs, notably the National Aeronautics and Space Administration and the Department of Transportation. As this report excludes transportation expenditures because they are not specifically targeted to energy,[45] they are not discussed here.[46]

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[44]Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999), p. 33.

[45]See Chapter 1 for additional discussion of subsidies.

Utility

In the early 1990s, R&D on utility conservation was directed to promoting "integrated resource planning"—the concept that utilities should plan their investment programs on the basis of the full costs of energy services provided, from the customer's light bulb to the coal mine's reclamation cost, rather than focusing simply on electricity production and supply. The DOE program was aimed both at promoting integrated resource planning and at developing analytical tools (such as fuel cycle cost analysis) intended to help utilities undertake integrated resource planning. Funding for the program was discontinued in fiscal year 1996. Expenditures for this program are included under Advanced Turbine Systems in the 1992 estimates presented in Table 25 of this report (see Chapter 5) and are included in the "Electric Utility" category for 1992 in Table 8 of the September 1999 EIA report, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*.

Unallocated

Unallocated includes funds for policy and management of R&D programs. It includes management activities at DOE headquarters, the Golden (Colorado) Field Office, and regional support offices. It also supports technical and economic studies and scientific evaluations of issues related to crosscutting program activities. Increases in funding relative to 1992 levels reflect revisions in the categorization of the activities, which in prior years were included in the programs themselves but in the current budget are explicitly accounted for. The funding level for fiscal year 1999 was $37.7 million.

[46]The National Aeronautic and Space Administration allocated $768.9 million in fiscal year 1999 to Aeronautical Research & Technology and $5 million for "Global Observations to Benefit the Environment." See National Aeronautics and Space Administration Budget Summary. The Federal Aviation Administration requested $55 million for systems security research and $35 million for research in aircraft structures and materials in fiscal year 1999. The Federal Highway Administration requested $496 million for R&D in 1999, including $250 million for intelligent transportation systems. The Coast Guard received $12 million in fiscal year 1999 for technologies, materials, and human factors R&D. There are additional R&D programs requested by the National Highway Traffic Safety Administration ($53 million) for safety systems and data collection in fiscal year 1999. The Federal Transit Administration requested $44 million in fiscal year 1999 for methods and technologies for accessibility, hybrid electric buses, fuel cells, and battery-powered propulsion systems. The Federal Railroad Administration spending request for fiscal year 1999 included $21 million for safety-related R&D. An additional $4 million was requested for R&D by the Research and Special Programs Administration. See U.S. Department of Transportation, Office of the Secretary, *Budget in Brief—FY 1999* and *FY 2000 Budget in Brief*.

4. Federal Electricity Programs

Introduction

This chapter looks at support provided by the Federal Government to certain electric power customers. This support differs in some notable respects from the subsidies provided to other energy sectors described in Chapters 2 and 3. For one, the Federal support outlined in the following discussion does not include any direct expenditures provided to electricity producers by the Federal Government, as was the case for other programs (such as the LIHEAP expenditures discussed in Chapter 2). The support provided to electricity producers is not measured by the U.S. Treasury, and it is not reported in Federal budget documents.

In the following discussion, Federal support to the electricity generation sector is estimated from data published by the Federal Energy Regulatory Commission (FERC), the North American Electricity Reliability Council (NERC), bond rating agencies, and various company financial documents. The values provided in this chapter should be treated as estimates of support, not given to the same precision as the values provided in earlier chapters, which were generally taken directly from budget documents. The methodology used to estimate the support provided by the Federal Government to particular segments of the electric power industry includes two measures—market price support and interest rate support—that are commonly used in subsidy studies.[47] A third measure is used to estimate the value of Federal revenues forgone when returns on Federal electricity assets fall short of the returns on similar assets held by investor-owned utilities (IOUs). This measure is comparable to the standard method used by electricity regulatory bodies to determine the appropriate ratebase in reviews of IOU rate filings.

Background

The electric power industry in the United States is composed of approximately 3,200 electric utilities and 2,100 nonutility power producers.[48] Electric utilities are generally classified as either investor-owned, rural cooperative, publicly owned, or Federal utilities. The classes operate under different legal, financial, and tax environments. The main focus of this chapter is on the Federal utilities, which consist of four Power Marketing Administrations (PMAs) and the Tennessee Valley Authority (TVA). A discussion of Federal financial assistance through the Rural Utilities Service (RUS) is also included at the end of the chapter. Support to the Federal utilities is emphasized over RUS support to rural electric cooperatives, because much of the support directed at the Federal utilities is related to their Federal ownership. Hence, the Federally owned utilities are—precisely due to their ownership status—provided both price and asset advantages. In contrast, although RUS-supported entities derive support from the Federal Government in the form of interest subsidies, their non-Federal ownership status means that no direct Federal price or asset support is provided to them. Hence, this study details three means by which the Federal Government

[47]See, for example, Congressional Budget Office, *Should the Federal Government Sell Electricity?* (Washington, DC, November 1997). Appendix A provides brief summaries of this study and others produced by the General Accounting Office and the Office of Management and Budget.

[48]Energy Information Administration, *Electric Power Annual 1998*, Volume 2, DOE/EIA-0348(98/2) (Washington, DC, December 1999), p. 1.

provides support to the Federal utilities (price, interest, and asset) and the one means by which the Federal Government provides support to RUS loan recipients.

Federal electric utilities are primarily producers and wholesalers of electric power. As required by law, they are nonprofit and provide certain classes of customers preference in purchasing their power. In general, preference customers include municipal utilities, cooperatives, State utilities, and irrigation districts. For some PMAs, they may also include State governments and Federal agencies. After meeting commitments for electricity to preference customers, the Federal utilities can and do sell their excess electricity to IOUs or directly to industry. Only about 16 percent of Federal power (in megawatthours) is sold to ultimate consumers, accounting for about 1.4 percent of all electricity sales to ultimate consumers.[49]

The ownership and operation of Federal electricity generation facilities fall under the responsibilities of the U.S. Department of the Interior's Bureau of Reclamation, the Army Corps of Engineers, and the International Boundary and Water Commission.[50] Most of the electricity produced by these Federal agencies is marketed by the four PMAs: Bonneville Power Administration (BPA), Southeastern Power Administration (SEPA), Southwestern Power Administration (SWPA), and Western Area Power Administration (WAPA). The Tennessee Valley Authority (TVA), the largest producer of Federal power, markets its own electricity.

Rural cooperative electric utilities are privately owned by their members (customers) and are established in rural areas to provide electricity to those members. Cooperatives, incorporated under State law, usually are directed by an elected board of directors. Cooperatives generally are nonprofit and tax-exempt, with access to low-cost Federal Government loans. Cooperatives accounted for almost 9 percent of electricity sales to ultimate consumers in 1998.[51]

Publicly owned electric utilities are State and local government agencies established to serve their communities and nearby consumers. Publicly owned electric utilities include municipals, public power districts, State authorities, irrigation districts, and other State organizations. Publicly owned electric utilities are tax-exempt and nonprofit, returning excess funds to the consumers in the form of community contributions and/or reduced rates. There are more than 2,000 publicly owned electric utilities in the United States, which in 1998 accounted for 17 percent of U.S. electricity sales for resale and 15 percent of sales to ultimate consumers.[52] Publicly owned utilities can borrow through the issuance of bonds whose interest is exempt from Federal taxation, but because the same exemption is available to all State and local government agencies (electric and otherwise) it does not meet the definition of subsidy used in this report. In addition to income tax exemptions on their bonds, publicly owned utilities are themselves exempt from Federal income taxes; however, both exemptions are also available to providers of municipal services, such as water and sewage, and hence are excluded from this report. Furthermore, as nonprofit enterprises, these companies would not, on average, realize positive income, and their tax liabilities would be minimal.

Some aspects of government support for electricity providers are not addressed in this chapter. For example, many States and localities provide various types of support to electricity producers within their jurisdictions, and some rural electricity companies and public power companies derive benefits from State and local governments similar

[49]Energy Information Administration, *Financial Statistics of Major U.S. Publicly Owned Electric Utilities 1998*, DOE/EIA-0437(98) (Washington, DC, December 1999), p. 3.

[50]Federal utilities provide consolidated financial and operational data for their own operations as well as the operations of related Bureau of Reclamation and Army Corps of Engineers power facilities.

[51]Energy Information Administration, *Financial Statistics of Major U.S. Publicly Owned Electric Utilities 1998*, DOE/EIA-0437(98) (Washington, DC, December 1999), p. 3.

[52]Energy Information Administration, *Financial Statistics of Major U.S. Publicly Owned Electric Utilities 1998*, DOE/EIA-0437(98) (Washington, DC, December 1999), p. 3.

to those derived by Federal utilities from the U.S. Government. By definition, however, such subsidies do not constitute support from the Federal Government, which is the subject of this report.

IOUs also receive some types of Federal Government support. For instance, Federal tax advantages provided to IOUs include such items as the ability to apply accelerated depreciation to assets. These advantages, however, are available not only to IOUs but also to other industries, and as such they fall outside the scope of this report, which is limited to the study of Federal interventions directed solely at a particular form of energy, or a particular energy producer or consumer. IOUs also benefit from tax exemptions applied to bonds funding certain forms of pollution abatement, but similar tax-free bonds are also used to fund a variety of traditional municipality-provided non-energy activities, such as water and sewage. Because the Federal tax exemption for interest on these industrial development bonds is available to non-electric utilities in addition to IOUs, it is not included in this analysis.

In a number of instances, this chapter compares the operating environment of the Federal utilities and rural cooperatives with that of IOUs. IOUs are privately owned but publicly regulated electric utilities. Like all private businesses, they seek to produce a return (profit) on investment to their investors. IOUs are granted service monopolies. In return, they are obligated to serve all customers in their service areas. Although the electric power industry is undergoing deregulation, most sales by IOUs still are regulated. The Federal Government regulates wholesale transactions (sales among utilities), and State agencies regulate retail sales (sales to ultimate consumers) within each State. The 239 IOUs accounted for 75 percent of all U.S. electric utility retail sales in 1998.[53]

Historically, the structure of the electric utility industry has been predicated on the concept that the industry was a natural monopoly. The result was traditional ratebase regulation for IOUs, designed to protect consumers by ensuring reliability and a fair revenue requirement to the electric utility. The revenue requirement was based on operating costs and a reasonable return on the ratebase (invested capital) of the utility. Rate schedules were based on the cost of service for different customer classes and projected sales in each customer class to capture the revenue requirement.

The issue of what constitutes a government benefit is not without controversy. It should be noted that the intention of this analysis is not to assess all the cost differences faced by Federal utilities and the IOUs. Nor is it to assess the desirability of publicly provided power versus privately provided power. Rather, the purpose is to measure any advantage conferred to consumers of electricity as a result of specific Federal Government interventions. According to this criterion, the actions must be directly targeted to a particular group of energy consumers or producers and not conferred to others. Interventions that affect not only certain electricity producers but also a host of other companies or industries (even if they may disproportionately affect electricity companies) are not covered in this report.

[53]Energy Information Administration, *Electric Sales and Revenue 1998*, DOE/EIA-0540(98) (Washington, DC, October 1999), pp. 4 and 9.

Federal Policies Affecting Power Costs and Pricing

Programs

The prices charged by Federal utilities are in general lower than those charged by IOUs. Federal utilities and rural cooperatives are affected by their legal status and the benefits derived from the following long-established Federal programs:

- **Access to Low-Cost Generation.** Federal utilities are required to sell their electricity preferentially to certain users. By law, PMA electricity is sold "at the lowest possible rates consistent with sound business principles,"[54] which today are typically less than the cost of alternative supplies. The "lowest possible rates" require Federal utilities to price electricity so as not to earn a profit. Essentially, taxpayers are forgoing returns they might receive if these entities were operated as competitive businesses, in exchange for lower electricity prices to particular classes of customers and economic benefits to particular regions.

- **Access to Low-Cost Credits.** As a result of a number of Federal Government programs (some of which date back to the inception of Federal power), in some instances, Federal utilities have been able to borrow funds at interest rates below prevailing Treasury rates; in some instances, their interest rates are closely tied to the Treasury's own rates; and in other instances, Federal utilities borrow at private-sector interest rates, but their creditworthiness is enhanced by an implicit Federal guarantee that they will not default on their borrowings. All these interest rate advantages constitute Federal support to the Federal utilities. Rural electrification cooperatives, under a program dating from 1935, are eligible for low-interest long-term loans from the Federal Government, which were made at a 2-percent interest rate through 1973. Loans made between 1973 and 1993 carry a 5-percent interest rate, with loan periods up to 35 years.[55] In 1993, the 5-percent interest rate was replaced with a new interest rate structure tied to the interest rates on municipal bonds. At the end of 1998, some $33 billion (1999 dollars) in Federal loans and guarantees were outstanding to cooperatives.[56]

Measuring the Support

Three frameworks were chosen for the valuation of support conferred to Federally supported power as a result of the programs cited above. The first method is based on a comparison between the prices charged for electricity under Federal programs and an estimate of relevant "market" prices—a price advantage that is, in turn, conferred to the utilities' preference customers. The second method quantifies the benefits of favorable borrowing rates that are made available to Federal utilities and RUS borrowers. The third method answers the following question: if Federal utilities were required to achieve a competitive rate of return (similar to IOUs), how much higher would their revenues (and associated electricity prices) have to be in order to achieve that return? Of the three, the second measure of support is the most direct, because favorable interest rates directly reduce the utilities' borrowings costs.

Each of the valuation approaches has strengths and weaknesses. For example, the market price approach assumes that a fully competitive market price for wholesale power exists when, in fact, fully competitive prices do not exist

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[54]U.S. General Accounting Office, *Federal Electricity Activities: The Federal Government's Net Cost and Potential for Future Losses*, GAO-AIMD-97-110A (Washington, DC, September 1997), Vol. 2, p. 18.

[55]U.S. Department of Agriculture, Rural Utilities Service, *1998 Statistical Report, Rural Electric Borrowers*, IP 201-1 (Washington, DC, August 1999), Preface and pp. 9-13.

[56]U.S. Department of Agriculture, Rural Utilities Service, *1998 Statistical Report, Rural Electric Borrowers*, IP 201-1 (Washington, DC, August 1999), pp. 9 and 13.

today. The interest rate approach assumes that Federal utilities and RUS borrowing practices can be fairly compared with the practices of private-sector borrowers when, in fact, there are substantial differences between the two. Knowing exactly which benchmark interest rate to compare with the Federal utility rate is largely a matter of judgment. The return on asset measure assumes that taxpayers (or the owners of these facilities) are entitled to a market rate of return on their assets,[57] comparing the IOU rate of return against the Federal utility rate of return; however, the Federal utility assets in place today were not developed under fully competitive market conditions. Only the interest rate measure is applied to RUS borrowers, which, because they are not Federally owned, receive no Federal support in the areas of prices or returns on assets.

Market Price Support

There are a number of different measures of wholesale electricity prices. The one used in this analysis, "sales for resale," was the only available measure that could be readily derived from published data.[58]

In a competitive market the prices charged by different companies for the same commodity would be similar, with some variation resulting from such factors as transportation costs. Competitive forces would not allow significant price differences to persist over time. Where well-functioning markets exist, market prices can be observed directly. If Federal utilities sell power at below-market prices, the value of their preferential rates is the difference between the revenues that would be earned by selling electricity at the market price and the actual revenues of the utility. For several reasons, however, caution should be exercised in estimating competitive market prices for electricity. First, although U.S. electricity markets are becoming more competitive, they still are heavily regulated. Because the prices charged by IOUs for wholesale transactions are often based on their embedded costs, a true competitive price cannot be derived. Currently, Federal utilities are required to sell electricity at rates that cover both power and nonpower costs.

In addition, electricity is not entirely a commodity. The data available for wholesale power sales do not specify all the terms of each transaction. In some cases, a utility may be selling on the spot market power it does not need to serve its own customers. In other cases, a utility may have a contract to provide all the power generation capacity and other services (spinning reserves, reactive power support, etc.) essential to wholesale customers. Essentially, these two transactions involve different goods, and the prices for them are not directly comparable. The market price approach implicitly assumes that Federal utility wholesale power sales are directly comparable to private utility power sales within the same regions; however, this may not always be the case. Because of the large degree of uncertainty associated with this effort, the values derived using this methodology are labeled in this chapter as "support" rather than subsidies. Further, EIA has elected not to include them in the summary tables for national energy subsidies in this report. Nevertheless, they are an important aspect of Federal intervention in energy markets and, consequently, are considered here.

Apart from any government support discussed in this chapter, Federal power today is often low-price power because much of it comes from relatively cheap hydroelectricity. In a purely rate-regulated environment, conventional ratemaking policy allows low-cost producers to pass on the benefits of cheap power to their customer base. In a regulated environment, selling relatively cheap power at below-market prices does not involve a form of government

[57]Although there is some overlap between the ownership and the beneficiaries of Federal utility power, many taxpayers do not benefit from low-cost Federal utility power. For instance, most of the Midwest and all of New England derive no benefit from low-price Federal utility power sales, even though as citizens of the United States they are in part owners of the power. It should be noted, however, that not all Federal power is low cost, as explained later in this chapter.

[58]Compiled from data provided by the Federal Energy Regulatory Commission, FERC Form 1.

support, as long as the power is sold without preference. Thus, one could argue that it is the preference, not the price, that is the conveyance of Federal Government support. However, this conveyance has a value in any environment, whether rate-regulated or free market, but it can more readily be estimated in a market where prices are freely set by supply and demand.

As electricity markets make the transition to full competition (a transition that has been in effect for a number of years), market forces play a greater role. In contrast to the rate-regulated environment, in a pure market-based environment, low-cost power producers become profit maximizers. Whatever cost advantage these producers possess relative to their competitors could be captured in the form of rents. Low-cost producers would have little incentive to price their power at anything other than market clearing rates, which in a competitive environment would be equal to the industry's marginal cost of power. Moreover, in a pure market environment, producers would be free to sell their electricity to the highest bidders without the constraints of a preference customer class. In a purely competitive environment the extent to which Federal power prices fell below the prices charged for similar power by competing utilities would constitute Federal support to the buyers of Federal power. Current efforts to deregulate U.S. electricity markets should work to further reduce the spread between Federal power prices and IOU power prices.

A comparison is made in this chapter between wholesale power prices charged by the four PMAs (along with the TVA) and wholesale prices charged by nearby IOUs[59] (see box below). The intent of the comparison is to ascertain whether Federal utilities provide power at rates below those charged by neighboring IOUs, thus providing their customers with an advantage unavailable to other consumers. However, although industry regulators have become increasingly inclined to approve rates that reflect contemporaneous market conditions, U.S. wholesale electricity prices remain regulated to a significant degree. Accordingly, the value of the price differential between rates charged by Federal utilities and those charged by neighboring IOUs should be seen as only a rough estimate of any price advantage enjoyed by the customers of Federal utilities. Still, it should also be noted that the value of the price differential has fallen since the Energy Information Administration (EIA) prepared its 1992 report on Federal energy subsidies. The narrowing of the wholesale price gap reflects two related developments: first, electricity markets have grown more competitive over the past decade; and second, as IOU prices have fallen, the measured value of Federal support received by utility customers has also fallen.

Electricity Markets

The electricity market has two distinct segments—wholesale and retail power markets. Wholesale markets comprise the resale and purchase of electricity among utilities and nonutility power producers for sale to ultimate consumers. Wholesale trade transactions are categorized by the service provided: full or partial requirements, firm or non-firm, etc. Generally, different services have different associated costs of service and, under cost-of-service regulation, have different prices. Prices of wholesale electricity sales are subject to approval by the Federal Energy Regulatory Commission, with the exception of the TVA.[a]

[a]The TVA and its regulatory exception are discussed later in this chapter.

[59]The comparison prices are the average prices of utilities operating in nearby States. For TVA, a comparison was made against prices of utilities operating in all the States in the SERC region. For BPA, the comparison States were Idaho, Oregon, and Washington. For the Southeastern Power Administration, the comparison States were Alabama, Florida, Georgia, Kentucky, Missouri, North Carolina, South Carolina, Tennessee, and Virginia. For the Southwestern Power Administration, the comparison States were Arkansas, Kansas, Louisiana, Missouri, Oklahoma, and Texas. For the Western Area Power Administration, the comparison States were Arizona, California, Colorado, Iowa, Minnesota, North Dakota, Nebraska, New Mexico, South Dakota, Utah, and Wyoming.

Federal utilities as a group have only 347 end-use customers, none of which is classified as residential or commercial.[60] In general, their end-use customers are bulk purchasers, such as the U.S. Department of Energy's national laboratories and aluminum smelters in the Pacific Northwest.

Interest Rate Support

One element of Federal aid to public power is low-cost credit. Rural cooperatives receive RUS loans, and some Federal utilities receive appropriations to be repaid at the 30-year Treasury bond rate. Even when Federal utilities borrow through publicly issued debt, the debt receives much higher credit ratings than would be attained if it were not for the widely held view in the financial community that this debt carries an implicit U.S. Treasury guarantee to prevent any default. This form of support is more direct than the price-based support measure just discussed. The magnitude of the resulting support can be computed by comparing the actual interest rates paid with various market interest rates. When Federal utilities are able to raise funds in capital markets at interest rates lower than those at which they could borrow were it not for their Federal Government status, a measure of support is conferred.

Although some Federal power producers borrow at various rates under various legal authorities, on balance they pay lower rates than privately owned utilities and, in some cases, lower than the Treasury itself. Credit markets view Federal utility debt as having an implicit Treasury guarantee, although no guarantee in fact exists. In its appraisal of a 1998 TVA bond underwriting, Standard and Poor's assigned the debt a AAA rating. In doing so, Standard and Poor's noted that "the rating reflects the implicit support of the U.S. Government and Standard & Poor's view that, without a binding legal obligation, the Federal Government will support principal and interest payments on certain debt issued by entities created by Congress. The rating does not reflect TVA's underlying business or financial condition."[61]

As a result, Federal utilities are able to float debt at rates well below those paid by all but the most highly rated of IOUs. The three smaller PMAs (SEPA, SWPA, and WAPA) have average financing costs below that of the U.S. Treasury itself, because DOE requires them to repay higher cost debt early whenever possible, a privilege not held by the Treasury.[62] Moreover, before 1983, the three smaller PMAs were allowed to finance capital projects at rates actually lower than the Treasury's rate.[63]

This analysis uses both public-sector and private-sector interest rates as benchmarks against which to measure the value of interest rate support. The public-sector benchmark is the U.S. Treasury's cost of funds for 30-year borrowings. For the private-sector rates, the benchmarks used are the rates paid by utilities using various utility bond ratings ranging from Aaa down to Baa. These ratings indicate two different measures of support. When Federal agencies achieve lower borrowing costs than the U.S. Treasury itself, the underlying advantage can be viewed as support provided directly to the borrower by the U.S. Treasury or by the public at large. The second measure of support assumes that Federal utilities are advantaged to the extent that their borrowing costs are less than they would be if they were private entities. This may be viewed as a form of indirect support from the Treasury. This measure of support compares the borrowing costs of the Federal utilities with the cost of funds realized by select

[60]Energy Information Administration, *Financial Statistics of Major U.S. Publicly Owned Electric Utilities 1998*, DOE/EIA-0437(98) (Washington, DC, December 1999), Table 36.

[61]"S&P Rates Tennessee Valley Authority $1 Billion Global Power Bonds AAA," *Business Wire* (November 2, 1998).

[62]The Treasury can decide, and recently has decided, to retire high-priced debt early; however, it must pay the market value of the debt and not its face value.

[63]U.S. General Accounting Office, *Power Marketing Administrations: Cost Recovery, Financing, and Comparison to Nonfederal Utilities*, GAO/AIMD-96-145 (Washington, DC, September 1996), p. 7.

groups of private utilities. The comparison rate (e.g., the A utility rating) may or may not be appropriate, depending on the presumed creditworthiness a Federal utility would command were it to lose the borrowing benefits derived from Federal ownership or its implicit financial backing from the U.S. Treasury.

Table 5 shows the 30-year Treasury bond rate and various utility bond rates for 1990 and 1998. The intent of the presentation is to illustrate that the level of estimated support varies directly with the benchmark interest rate chosen. In 1998, the average yield on 30-year Treasury bonds was 5.58 percent, and the average yield on Baa-rated utility bonds was 7.26 percent. The estimate will be higher when the Aaa IOU rate is used than when the Treasury rate is used for comparison and will increase as the comparison is graduated downward to the IOU Baa rate. The average interest rate spread between the 30-year Treasury bond and IOU Aaa bonds was 119 basis points over the 1980-1998 period, and the average spread between the 30-year Treasury bond and the Baa IOU bond rates was 168 basis points.[64]

Table 5. Interest Rates Used for Comparisons with Federal Utility Borrowing Costs, 1990 and 1998

Rate	1990	1998
30-Year Treasury	8.61	5.58
Investor-Owned Aaa	9.45	6.77
Investor-Owned Aa	9.66	6.91
Investor-Owned A	9.87	7.04
Investor-Owned Baa	10.06	7.26
Municipal Aaa	6.97	4.92
Municipal Aa	7.07	4.99
Municipal A	7.16	5.08
Municipal Baa	7.30	5.15

Note: Municipal bond yields are significantly lower than similar maturity IOU yields because of the Federal income tax exemption for municipal bonds. Municipal bonds also usually have an exemption from State and local taxes in the jurisdictions in which they are issued. BPA's cost of funds on its appropriated and long-term debt were estimated at 78 basis points above the Treasury's own cost of funds in 1998, as explained later in this chapter.

Source: Moody's Investor Service, *Utility Manual 1998*, and Federal Reserve, Form H-15.

Because the financial accounts of the four PMAs, TVA, and cooperatives borrowing from the RUS differ considerably, different calculations of Federal interest rate support are used in this analysis. One method is to measure the interest paid by Federally supported power entities against the interest paid on similar debt issued by the Treasury or by IOUs in the same year. However, several difficulties are involved. One problem is that debt maturities cannot always be matched. For instance, TVA has issued debt with maturities as great as 50 years, for which there are no similar Treasury or IOU issues. Another difficulty is that some debt is callable, which means it may never be held to maturity and therefore commands a different interest rate than debt which is not. Still another problem is lack of data. Although some of the debt on the books of the PMAs date back to the 1940s, there is little in the way of comparative interest rate data available. For instance, the U.S. Treasury did not start to issue 30-year debt until 1978. Further, much of the information provided to EIA by the Federal utilities and the RUS on their respective loan portfolios was insufficient to reconstruct their debt at market rates.

Interest rate support for BPA and TVA can be directly tied to market interest rates; therefore, a simplified calculation was used in their cases. BPA borrows at a premium to the Treasury rate for its long-term debt and appropriated

[64]A basis point is one-hundredth of a percentage point.

debt. For its non-Federal debt, BPA borrowed essentially at the Aa municipal rate in 1998. TVA, as explained later, is currently borrowing at the Aaa IOU rate. In measuring the interest rate support provided by the Federal Government to TVA and BPA, these rates are measured against other private-sector borrowing rates. For instance, TVA's Aaa-rated borrowings are compared to what the company would have to pay in interest if it borrowed at the Aa, A, or Baa rate. The difference in borrowing costs constitutes the level of support. To calculate the difference in borrowing costs that involves moving from the Aaa rating down through the Aa, A, and Baa ratings, the average spread was calculated between interest rates on these debt instruments between the years 1980 and 1998. As an example, the average spread over this period between the Aaa and Aa rates was 33 basis points. An average spread was calculated over several years to abstract from year-to-year variations in interest rate differentials.

The three smaller PMAs have average interest rates that fall below the 30-year Treasury rate. Although currently all new debt issued by the three smaller PMAs is at the Treasury rate, much of their unretired old debt bears interest well below that of similar Treasury issues. Further, unlike TVA, the three smaller PMAs have an advantage unavailable to the Treasury in that DOE requires them to retire high-interest debt first whenever possible. As such, a different approach to measuring Federal interest rate support was taken for the three smaller PMAs. This approach attempted to compare the loan portfolio of the three smaller PMAs against a similar portfolio of Treasury and utility debt instruments. More specifically, a loan-by-loan comparison was made, going back to debt issued in the early 1940s. All debt that is currently on the books of the three smaller PMAs was compared to similar debt (i.e., debt having the same or similar maturity) issued by the U.S. Treasury or by IOUs. Where similar Treasury or IOU debt was unavailable for comparison, estimates were based on the average spread between Treasury and private-sector securities. An estimate of Federal support to RUS borrowers was undertaken in a similar fashion.

Return on Asset Support

Over the long term, in competitive markets IOUs must earn a sufficient return on invested capital to satisfy their shareholders. Historically, U.S. regulators have taken this into account when setting the price of electricity for private utilities. Regulators have set the price of electricity at a level that would allow IOUs to recover operating costs and earn a market-based return on the assets they have invested to meet their customers needs. If sales of services provided by Government-owned assets provide a below-market return on the assets, a preferential benefit is being conferred to customers. This approach measures the value of forgone Federal utility revenue that would have been needed for the Federal utilities to realize a market rate of return on their assets.

A typical textbook definition of cost for a private-sector electric utility is operating cost plus depreciation of capital assets plus some allowance for cost of capital. The extent to which actual Federal utility earnings from electricity sales fall below what they would have earned charging market rates constitutes a support to the purchasers of Federal power, with the amount of the support equal to the difference between revenues sufficient to recover costs and revenues at the actual selling price.

Like the estimates of market price and interest rate support, estimates of return on asset support are not perfect measures of the support provided to the preferred customers of Federal utilities. As stated above, U.S. electricity markets are heavily regulated, and the assets utilities have in place today were not fully developed under competitive market conditions.

Federal Power Programs

Federal power producers are themselves not the intended recipients of the advantages the Federal Government confers to this group of electricity suppliers. Their preference customers are the primary target of low-cost Federal power. Those preference customers that are electricity providers, in turn, sell their power to households, businesses, and other customers. Federal utilities themselves have no residential or commercial customers, and their direct sales of electricity in 1998 accounted for only 16 percent of their total sales.[65]

In the early years of Federal power, its proponents asserted that publicly supported electricity was essential in order to provide electrification to large parts of rural America that were then not connected to the grid. Critics at the time argued that Federal power was a subsidy from urban to rural areas.[66] Federal power producers are mandated by law to provide power preferentially to public power entities such as State and municipal providers and consumer-owned cooperatives.[67] The remainder may, however, be sold to privately owned entities such as IOUs and industrial customers. TVA, for instance, sold 76 percent of its power to municipalities and cooperatives, 13 percent to Federal agencies and others, and 11 percent directly to industrial customers in 1998.[68] WAPA sold 46 percent of its power to municipalities and cooperatives, 26 percent to State agencies, 11 percent to IOUs, 10 percent to public utility districts, 5 percent to Federal agencies, and the remaining 2 percent to others.[69] Roughly half of BPA's power is sold to public utility districts, city light departments, and rural electric cooperatives, another 15 percent is sold to IOUs, and roughly one-quarter is sold to aluminum companies and other large industrial concerns.[70] RUS electricity distribution borrowers provided 58 percent of their electricity to farm and non-farm residences, 21 percent to large commercial and industrial customers, 18 percent to small commercial and industrial customers, 2 percent to irrigation users, and another 2 percent to other users.[71]

Tennessee Valley Authority

TVA was established in 1933 under the Tennessee Valley Act. Its original purpose was to promote economic development in the Tennessee Valley, to improve navigation, and to aid in flood control. TVA is far and away the largest of the Federal utilities, having an asset base greater than that of the four PMAs combined. TVA is operated as an independent Government-owned corporation. Its three-member board of directors is solely responsible for setting rates and for policymaking. The board is appointed by the President of the United States.

TVA's service territory covers nearly all of Tennessee and parts of Alabama, Kentucky, North Carolina, Mississippi, Georgia, and Virginia. Its wholesale customers include 159 municipal and cooperative distributors. The company's retail customers include 63 large industrial concerns and Federal agencies.[72] It operates 17,000 miles of transmission

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[65]Energy Information Administration, *Financial Statistics of Major U.S. Publicly Owned Electric Utilities 1998*, DOE/EIA-0437(98) (Washington, DC, December 1999), p. 457.

[66]D. Shapiro, "Public Power Policy: The Controversial Origins," in *Generating Failure* (New York, NY: University Press of America, 1989).

[67]U.S. General Accounting Office, *Power Marketing Administrations: Cost Recovery, Financing, and Comparison to Nonfederal Utilities*, GAO/AIMD-96-145 (Washington, DC, September 1996).

[68]Tennessee Valley Authority, *Annual Report 1999* (2000), p. 42.

[69]Western Area Power Administration, *Annual Report 1998* (1999), Appendix, p. 23. Excludes project use and interdepartmental and interproject exchanges.

[70]Bonneville Power Administration, web site www.bpa.gov/corporate/kc/who/watsbpax.shtml.

[71]U.S. Department of Agriculture, Rural Utilities Service, *1998 Statistical Report, Rural Electric Borrowers*, IP 201-1 (Washington, DC, August 1999), Table 3.

[72]U.S. House of Representatives, Subcommittee on Water Resources and Environment, "TVA: Electricity Restructuring and General Oversight," web site www.house.gov/transportation/water/09-22-99/09-22-99memo.html.

lines and 29 hydropower dams and provides electricity to 8 million customers.[73] TVA has 28,498 megawatts of generating capacity and is the Nation's largest wholesaler of electricity, with sales of 163 billion kilowatthours in 1998.[74]

A number of explicit and implicit benefits are conferred upon TVA by the Federal Government. For example, TVA receives implicit interest rate support. The debt rating service, Moody's, assigns TVA its highest credit rating, Aaa.[75] Standard and Poor's assigns TVA a similar AAA credit rating. If TVA borrowed funds in capital markets without the Treasury's implicit guarantee, it undoubtedly would pay higher interest rates. As noted earlier, according to Standard and Poor's, its TVA rating "reflects the implicit support of the U.S. Government and Standard & Poor's view that, without a binding legal obligation, the Federal Government will support principal and interest payments on certain debt issued by entities created by Congress. The rating does not reflect TVA's underlying business or financial condition."[76] In general, TVA borrows at rates comparable to those for other U.S. Government agencies.

TVA also benefits from a captive market. Its customers are required to provide 10 years notice before they are allowed to switch their service to another utility.[77] It is also exempt from antitrust laws and exempt from the wheeling provisions required by the Energy Policy Act of 1992.[78] Its rates are not regulated by the FERC or by State utility commissions. These benefits are, however, regulatory in nature.[79]

In 1959, the U.S. Congress placed restrictions on TVA's ability to sell power outside its prescribed territory and, in addition, established a debt ceiling for the TVA at $750 million. This ceiling has been raised four times since then and was capped at $30 billion in 1979.[80]

TVA's Prices Relative to Neighboring IOUs

TVA is unique among the Federal utilities in that its electricity prices generally exceed those of neighboring utilities. In 1998, TVA's average wholesale revenues were 4.6 cents per kilowatthour, compared with an average of 4.0 cents for nearby utilities operating in the SERC (Southeastern Electric Reliability Council) region as a whole.[81] As a result, there is no explicit Federal price support provided to TVA's electricity customers. Even though the TVA has not brought deferred assets and terminated nuclear assets of $8.3 billion (1999 dollars) into its ratebase,[82] interest payments on the underlying borrowings are passed on to ratepayers and thus serve to elevate TVA's electricity prices. In 1990, however, TVA's average wholesale revenues fell beneath those of surrounding utilities, providing $440 million (1999 dollars) in Federal support to its customers.

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[73]Tennessee Valley Authority, *Annual Report 1998* (1999), p. 3.

[74]Tennessee Valley Authority, *Annual Report 1998* (1999), p. 42.

[75]According to Moody's: "Bonds which are rated Aaa are judged to be of the best quality. They carry the smallest degree of investment risk and are generally referred to as "gilt edged." Interest payments are protected by a large or by an exceptionally stable margin and principal is secure. While the various protective elements are likely to change, such changes as can be visualized are most unlikely to impair the fundamentally strong position of such issues." Source: Moody's Investors Service Ratings and Ratings Action, web site www.moodys.com/ratings/ratdefs.htm.

[76]"S&P Rates Tennessee Valley Authority $1 Billion Global Power Bonds AAA," *Business Wire* (November 2, 1998).

[77]U.S. General Accounting Office, *Tennessee Valley Authority: Financial Problems Raise Questions About Long-Term Viability*, GAO/AIMD/RCED-95-134 (Washington, DC, August 1995), p. 57.

[78]As long as the power is to be consumed inside TVA's territory.

[79]Federal regulatory support lies outside the framework of this report's analysis.

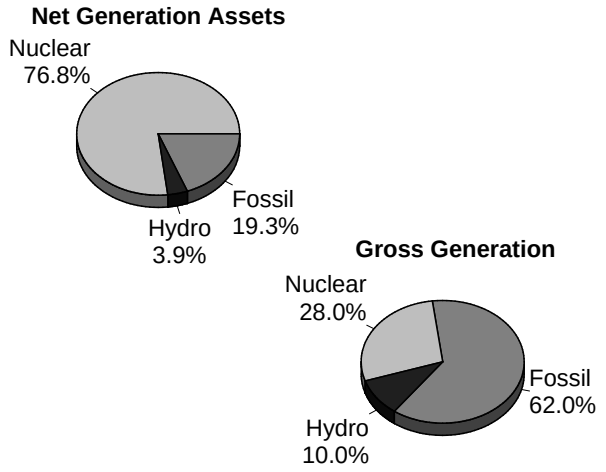
[80]U.S. General Accounting Office, *Tennessee Valley Authority: Financial Problems Raise Questions About Long-Term Viability*, GAO/AIMD/RCED-95-134 (Washington, DC, August 1995), pp. 17 and 18.

[81]Compiled from data provided by the Federal Energy Regulatory Commission, FERC Form 1.

[82]Tennessee Valley Authority, *Annual Report 1998* (1999), p. 26.

Nuclear power accounted for 77 percent of TVA's investment in generating assets in 1998, while nuclear power plants provided 28 percent of its gross generation in 1998 (Figure 4). In contrast, fossil fuels and hydropower, which account for 23 percent of the utility's generation assets, provided 72 percent of its generation.

Figure 4. Tennessee Valley Authority Net Generation Assets and Power Generation by Fuel Type, 1998



Note: Nuclear assets include $11.9 billion in completed plant and $6.4 billion in deferred assets.

Source: Tennessee Valley Authority, *Annual Report 1998* (1999), pp. 33, 34, and 42.

TVA's Borrowing Costs

TVA has a much higher concentration of nonperforming assets and debt than do the IOUs on average. TVA's ratio of debt to capital is 68 percent, and its interest payments take up 29 percent of its revenue.[83] For IOUs as a whole, the debt/assets and interest payment/revenue ratios in 1998 were 30 percent and 6 percent, respectively.[84] However, TVA's bonds are given the highest credit rating available from Moody's and Standard and Poor's.[85] Although the U.S. Government is not required to provide TVA support in the event of default, the investment community views TVA's debt as having an implicit Federal guarantee (see box on pages 31 and 32). This allows the TVA an advantage in raising capital in financial markets over any private-sector utility with a comparable financial condition. As stated earlier, rating agencies' appraisal of TVA's debt is contingent on the belief that the Federal Government would prevent any default.

TVA currently pays interest on deferred debt underlying assets that have yet to be brought into its ratebase. Most of the deferred assets and debt were accumulated by investing in a large-scale nuclear power program. During the 1950s, TVA moved from building dams to building coal-fired power plants. In 1966, it launched what became the largest nuclear power program in the United States, announcing plans to build 17 nuclear power units. By 1984, 8 of the proposed units had been canceled, despite investments that totaled $4.6 billion at the time of their cancellation.[86] Of the 9 remaining units, 5 are currently in operation, 3 are listed as deferred, and 1 is listed as inoperative.[87] About one-third of the value of TVA's utility plant is in currently completed nuclear assets. Unlike the dams, these projects were largely funded during the 1970s and 1980s when interest rates were relatively high, and those high interest charges have been passed on to TVA's customers.

[83]Tennessee Valley Authority, *Annual Report 1998* (1999), p. 1.

[84]Energy Information Administration, *Electric Power Annual 1998*, Volume 2, DOE/EIA-0348(98/2) (Washington, DC, December 1999), p. 26.

[85]According to Moody's: "Although TVA's debt is not an obligation of the U.S. government, the company's status as an agency and the fact that the government is TVA's only shareholder, indicates strong 'implied support' [that] would afford assistance in times of difficulty."

[86]Moody's Investor Service, *Utility Manual 1998*, p. 4665.

[87]Tennessee Valley Authority, *Annual Report 1998* (1999), p. 33.

The Issue of Implicit Support

A longstanding issue in financial markets has been the degree to which the U.S. Government would prevent a default of the debt of Government agencies, such as the TVA, and government-sponsored entities (GSEs), such as the Federal National Mortgage Association (FNMA) and the Farm Credit System (FCS). The debt of these agencies carries no explicit guarantee by the U.S. Treasury. In fact, TVA bonds explicitly state that their debt is not a legal obligation of the U.S. Government.[a] However, financial markets have strongly assumed otherwise, believing that the U.S. Government would not (and could not) allow any of this unbacked debt to ever default. Although the financial community's assumptions are subject to debate, there is evidence suggesting that their view is correct.

For example, according to a study completed by the Federal Reserve Bank of Richmond, Virginia,[b] during the 1980s the U.S. Treasury twice initiated actions that were designed to provide support to two GSEs—the FNMA and the FCS—during times of financial difficulty. The Federal Reserve Bank study noted that in both cases action was undertaken because the GSEs saw a sharp widening of the spread on their debt instruments against similar Treasury debt, thus significantly raising their cost of funds. In both cases, the Treasury made the "implicit guarantee explicit by providing Federal Government loans to the GSEs. Once the loans were made, the interest spread of the GSE securities and comparable U.S. Treasury securities narrowed."

When rating TVA's debt, major credit agencies assume that the government would provide support if needed. According to Moody's Credit Service: "Although TVA's debt is not an obligation of the U.S. government, the company's status as an agency and the fact that the government is TVA's only shareholder, indicates strong 'implied support' [that] would afford assistance in times of difficulty . . . . This implied support provides important bondholder protection." Similarly, according to Standard and Poor's: "The [AAA] rating reflects the U.S. government's implicit support of TVA and Standard and Poor's view that, without a binding legal obligation, the federal government will support principal and interest payments on certain debt issued by entities created by Congress. The rating does not reflect TVA's underlying business or financial conditions." Standard financial texts also describe Federal agency debt as carrying a "de facto backing from the federal government."[c]

In addition, TVA's chairman has also made note of the implicit guarantee arising from potential pressure on the Treasury to prevent any agency default. According to a quote appearing in a March 5, 1997, *Wall Street Journal* article, TVA chairman Craven Crowell stated: "If Congress does anything that devalues us, you always have the potential for the Treasury having to get involved."[d]

Were the Federal government to allow a default on one agency's (or one GSE's) debt, the ability of *all* Federal agencies and GSEs to borrow money at favorable rates could be affected. An unchallenged default could cause financial markets to downgrade the value of all agency and GSE debt, an action that could greatly affect their borrowing costs and their ability to carry out their government mandates. In all likelihood this potential hazard weighs heavily on the U.S. Government to prevent even one default. TVA may have an even closer relationship with the U.S. Government than do the GSEs, which may increase whatever implicit support its debt derives. For instance, unlike the GSEs, the U.S. Treasury carries TVA debt as gross Federal debt. In fact, TVA's borrowings accounted for 92 percent of $24 billion in U.S. Government agency debt outstanding in 1998.[e] GSEs had, however, $2.0 trillion in debt (1999 dollars) outstanding at the end of 1998, which makes them a considerable component of total U.S. credit markets.[f] Total U.S. Treasury debt, for instance, equaled $5.5 trillion in 1998. *(continued on page 32)*

[a]U.S. General Accounting Office, *Tennessee Valley Authority: Financial Problems Raise Questions About Long-Term Viability*, GAO/AIMD/RCED-95-134 (Washington, DC, August 1995), p. 29.
[b]T.Q. Cook and R.K. Laroche, eds., *Instruments of the Money Market* (Richmond, VA: Federal Reserve Bank, 1993).
[c]M. Stigum, *The Money Markets: Myth, Reality, and Practice* (Homewood, IL: Dow Jones-Irwin, 1978), p. 161.
[d]J. Ball, "TVA Plan Seen by Critics as Unfair Grab for Power," *Wall Street Journal* (March 5, 1997), p. 1.
[e]Office of Management and Budget, *Analytical Perspectives, 2000* (Washington, DC, 1999), p. 264.
[f]Office of Management and Budget, *Analytical Perspectives, 2000* (Washington, DC, 1999), p. 202.

The Issue of Implicit Support (Continued)

In this report, "implicit support" is included in the estimates of total support provided by the Federal Government to TVA and the PMAs, because the ratings and yields on their debt instruments would be different if the Federal Government did not support them.

Alternative viewpoints on the issue of implicit interest support may exist. These viewpoints question whether a support without any binding legal basis is really a support. According to these views, market expectations that the Federal Government would act to prevent a default, should that possibility ever arise, are just expectations and not necessarily a reality. Although the market views a TVA debt default as "highly unlikely," there is no absolute guarantee that the market view is infallible. On the other hand, the U.S. Government remains the sole equity owner of the TVA, and the fact that TVA's government ownership status has a substantial impact on the utility's borrowing costs is an advantage that EIA believes constitutes support.

In 1998, TVA had outstanding long-term debt of almost $24 billion (Table 6), which consisted of $20 billion in public bonds and $3 billion in borrowings from the Federal Financing Bank (FFB).[88] Although the $3 billion in FFB debt is unrated, for reasons described below this analysis assumes that it carried the same degree of Federal support as the $20 billion in bonds that were publicly traded. TVA's FFB debt carried a much higher interest rate in 1998 than prevailing market rates. The presence of this high-price debt on TVA's books stems from the fact that the TVA issued several billion dollars of noncallable debt during the late 1980s when interest rates were exceptionally high (see box on page 33). The noncallable debt was refinanced in late 1998, and in 1999 all of TVA's debt was publicly held and carried the AAA rating.[89] Had TVA's noncallable debt been refinanced before 1998, it is reasonable to assume that all of its debt in 1998 would have carried the AAA rate, as did its non-FFB debt.

Table 6. Computation of Implied Interest Rate Support to the Tennessee Valley Authority

Item	TVA	Aa IOU Rate	A IOU Rate	Baa IOU Rate
Outstanding Debt (Million 1999 Dollars)	23,717	23,717	23,717	23,717
Interest Paid/Implied (Million 1999 Dollars)	1,605.6	1,682.7	1,759.1	1,853.2
Average Rate Differential, 1980-1998 (Percent)	—	0.325	0.647	1.044
Implied Support (Million 1999 Dollars)	—	77.1	153.4	247.6

Note: Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Sources: Tennessee Valley Authority, *Annual Report 1998* (1999), and Moody's Investor Service, *Utility Manual 1998*.

One method of calculating the value underlying TVA's high credit rating would be to compare TVA's total interest costs (assuming a rate on its FFB debt similar to the rate on its publicly held debt) against what TVA would pay if it had an inferior credit rating. To determine the different levels of borrowing costs under various credit ratings, an estimate of the spread between different interest rates was calculated. The spread is the average difference in yield on these rates against the Aaa rate between 1980 and 1998.[90] The average spreads were calculated over a number

[88]Tennessee Valley Authority, *Annual Report 1998* (1999), p. 27. TVA's Federal Finance Bank loans were not rated.

[89]Tennessee Valley Authority, *Annual Report 1999* (2000), p. 36.

[90]For this period, the average spread between the Aaa rate and the Aa rate equaled 33 basis points. Source: Standard and Poor's *DRI* database. This spreadsheet can be made available from EIA upon request.

of years to abstract from year-to-year vicissitudes in interest rate differentials. The spread between TVA's borrowing costs and alternative borrowing costs presents a measure of the value of TVA's subsidy. In other words, if TVA borrowed money at the Aa rate rather than the Aaa rate, its borrowing costs in 1998 would be 33 basis points, or $77 million, higher (Table 6). This $77 million is one measure of Federal support. The A rating would raise TVA's 1998 borrowing costs by $153 million and the Baa rating by $248 million.

TVA's 1998 Debt Cost Reduction

Interest on TVA's Federal Financing Bank debt was unusually high relative to market rates in 1998, when it had an outstanding $3.2 billion (nominal dollars) in relatively high-priced debt held by the Federal Financing Bank.[a] From 1985 to 1989, TVA issued a nominal $6.2 billion in noncallable debt to the Federal Financing Bank[b] at rates between 8.5 percent and 11.7 percent, or an average interest rate of 9.7 percent. As a result of the sharp decline in interest rates since the late 1980s, those rates were significantly higher than TVA's average 1998 borrowing costs. Market interest rates in 1998 reached their lowest level since at least the mid-1970s. The Treasury's 30-year bond, for instance, averaged 5.58 percent in 1998, its lowest level since the instruments were first introduced by the Treasury in 1978. In 1998, passage of the Fiscal Year 1999 Omnibus Appropriations Bill (H.R. 4328) allowed TVA to refinance its $3.2 billion in high-interest debt at par value. The yield on the newly issued debt averaged 6 percent. As a result of the refinancing, TVA expects to save $1.6 billion in borrowing costs out to the year 2016.[c] TVA estimates that its savings from the refinancing in the first year will save the utility $117 million.[d] This saving can be viewed as Federal support to the TVA to the extent that it reduced the interest on TVA's overall indebtedness to the U.S. Treasury.

[a]Tennessee Valley Authority, *Annual Report 1998* (1999), p. 35.

[b]The Federal Financing Bank is an agency under the supervision of the U.S. Treasury. Its role is to provide financing assistance to selected Federal agencies (such as TVA) in order to lower their borrowing costs. In essence, the Bank raises money through the sale of Treasury securities and then lends the money to Federal agencies.

[c]A General Accounting Office study estimated that TVA's $14 billion of nonproductive nuclear assets accounted for $833 million of its $1.9 billion in annual interest expense in 1994. See U.S. General Accounting Office, *Tennessee Valley Authority: Financial Problems Raise Questions About Long-Term Viability*, GAO/AIMD/RCED-95-134 (Washington, DC, August 1995).

[d]Tennessee Valley Authority, "TVA Pays Off $3.2 Billion in High Interest Debt, Savings Begin Immediately," Press Release (October 23, 1998).

TVA's Return on Capital

Measuring operating costs and depreciation is straightforward, as the relevant information can be extracted from Federal utility financial statements; however, deciding what the appropriate rate of return on assets for a Federal utility ought to be is not so obvious. This report uses several simplified measures of comparative financial performance to measure TVA's return on capital against the return on capital realized by IOUs. The first measure is net income before interest and taxes divided by net utility assets, without consideration of deferred assets. For the comparative IOUs, this rate equaled 11.63 percent, compared with a 9.65-percent return for TVA (Table 7).[91] The next two measures incorporate the deferred assets of IOUs into the denominator. One uses IOU returns on capital before taxes, and the other uses the returns after taxes. (The before-tax measure is used because Federal utilities do not pay Federal income taxes.)

[91]The operating return on assets measures were chosen, rather than the more familiar net income or return on equity, in order to abstract from the differing roles of debt for public-sector versus private-sector utilities. Public-sector utilities sometimes have debt that equals or exceeds their assets, and they set prices so that there is little or no net income remaining after interest payments.

Many utilities carry substantial sums of deferred assets on their books. In 1998, the IOUs listed a total of $84 billion in regulatory assets as deferred.[92] When those deferred assets are included, IOUs as a group earned a 6.79-percent operating rate of return on an after-tax basis and a 9.45-percent rate of return before taxes (Table 7). In contrast, TVA, including its deferred assets, earned a 7.55-percent rate of return in 1998. In the case of TVA, the utility carried on its books $8.3 billion (1999 dollars) in terminated nuclear facilities and deferred regulatory assets, which were not a part of its ratebase.[93] TVA's rate of return was also calculated both with and without its deferred nuclear power and regulatory assets.

Table 7. Tennessee Valley Authority Return on Assets Compared with Hypothetical Equivalent Investor-Owned Utility Returns, 1990 and 1998

IOU Comparison	Net Plant and Equipment (Million 1999 Dollars)	Actual Revenue (Million 1999 Dollars)	Operating Income (Million 1999 Dollars)	Average Return (Percent)	Adjusted Revenue (Million 1999 Dollars)	Implied IOU Rate of Return (Percent)	Federal Government Support (Million 1999 Dollars)
1990							
No Deferred Assets	23,882.5	6,502.9	1,193.6	5.00	7,759.6	10.26	1,256.7
Deferred Assets Before Taxes . .	31,056.6	6,502.9	1,193.6	3.84	8,495.7	10.26	1,992.8
Deferred Assets After Taxes . . .	31,056.6	6,502.9	1,193.6	3.84	7,765.8	7.91	1,262.9
1998							
No Deferred Assets	20,935.4	6,812.1	2,206.9	10.54	7,040.0	11.63	227.9
Deferred Assets Before Taxes . .	29,247.8	6,812.1	2,206.9	7.55	7,369.1	9.45	557.0
Deferred Assets After Taxes . . .	29,247.8	6,812.1	2,206.9	7.55	6,591.1	6.79	—

Notes: Because TVA does not pay Federal taxes, the after-tax and pre-tax net income values are the same. Calculated values may differ slightly from the values shown due to independent rounding. Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Source: Tennessee Valley Authority, *Annual Report 1990* (1991) and *Annual Report 1998* (1999).

Generating revenues sufficient to earn an 11.63-percent operating return for TVA would require that TVA increase its average price by 5 percent, implying a revenue gain of $227.9 million (Table 7).[94] To generate a before-tax rate of return equal to the 9.45-percent return for IOUs (including their regulatory utility assets), TVA would have to raise its prices by 7 percent and increase revenues by $557 million. This calculation indicates that TVA is more heavily affected by its deferred regulatory costs than is the IOU industry. On an after-tax basis, however, the IOU rate of return on assets (including deferred regulatory assets) falls short of the TVA rate of return, in part because TVA is not required to pay Federal taxes. By this measure, there is no government support to the TVA.

Table 7 indicates that the value of Federal support to TVA underlying the historic cost differential has declined since 1990. In 1990, the three measures of return on plant and equipment provided TVA with respective gains of $1.3 billion, $2.0 billion, and $1.3 billion.

[92]Compiled from data provided by the Federal Energy Regulatory Commission, FERC Form 1. Note: Regulatory assets are mainly deferred expenses that appear as assets on the balance sheet in return for the regulatory promise that the utilities will be allowed to recover them in the future. See Energy Information Administration, *The Changing Structure of the Electric Power Industry: An Update*, DOE/EIA-0562(96) (Washington, DC, December 1996), p. 78.

[93]Tennessee Valley Authority, *Annual Report 1998* (1999), p. 24.

[94]Assuming that no loss of sales resulted from the increase in prices.

Bonneville Power Administration

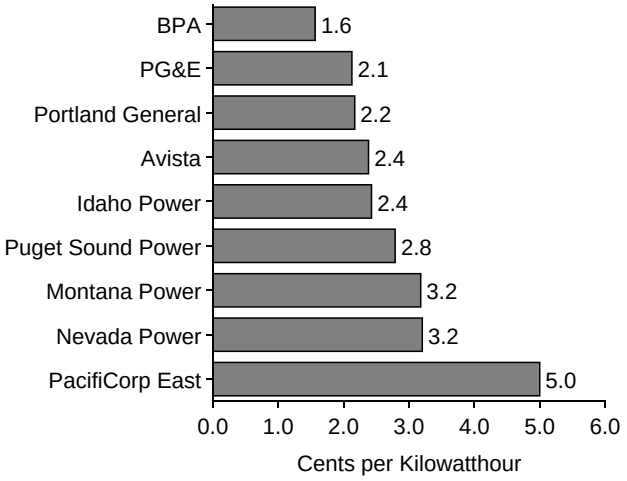
BPA is the largest of the Federal PMAs and the second largest Federal utility in terms of assets after TVA. BPA serves 3 million customers and supplies about half of all power in the Northwest.[95] Its transmission network accounts for 75 percent of the bulk transmission system in the Northwest.[96] BPA markets power from 29 dams and 1 nuclear power plant, which in 1998 produced a total of 90 billion kilowatthours of electricity.[97] Its service territory includes Oregon, Washington, Idaho, Western Montana, and small parts of California, Eastern Montana, Nevada, Utah, and Wyoming.[98]

BPA was created by the Bonneville Project Act of 1937. The purpose of the Act was to market power produced in the Columbia River basin and promote economic development in the Pacific Northwest. Currently a part of the U.S. Department of Energy, BPA is responsible for the Federal Columbia River Power System. BPA receives no direct payment from the U.S. Treasury, although the operating agencies do. Rather, the support it receives from the U.S. Government is embodied in the prices it charges its customers for electricity, the interest it pays on its debt, and the lack of return it realizes on its assets.

BPA's Prices Relative to Neighboring Investor-Owned Utilities

More than 90 percent of the electricity sold by BPA is produced from Federal hydropower facilities, and the remainder comes from one nuclear power plant. The average revenues derived from BPA's wholesale electricity sales are, in general, lower than those of competing utilities in BPA's operating region and much lower than those of IOUs operating outside the Pacific Northwest. Figure 5 shows that BPA has the lowest wholesale average revenue of utilities operating in the Pacific Northwest region. Clearly, BPA's lower average revenue is due to its heavy dependence on relatively inexpensive hydroelectric power. No other major utility in the Pacific Northwest region sold as much hydroelectricity as BPA, although in general other utilities in the region also tend to be heavily dependent on hydropower (Table 8). The ample hydroelectric resources in the Pacific Northwest also allow neighboring utilities to charge rates substantially lower than those in the rest of the Nation. Although BPA sells power mainly in the wholesale market, end users (industrial, commercial, and residential) benefit substantially from its lower cost power (Table 9).

Figure 5. Average Wholesale Electricity Revenues for the Bonneville Power Administration and for Investor-Owned Utilities Operating in the Pacific Northwest Region, 1998



Source: Federal Energy Regulatory Commission, FERC Form 1; and Energy Information Administration, *Financial Statistics of Major U.S. Publicly Owned Electric Utilities 1998*, DOE/EIA-0437(98) (Washington, DC, December 1999), p. 457.

[95]Bonneville Power Administration, web site www.bpa.gov/corporate/kc/who/watsbpax.shtml.
[96]Bonneville Power Administration, web site www.bpa.gov/corporate/kc/who/watsbpax.shtml.
[97]BPA's 1998 power production was obtained via a phone conversation with BPA's Accounting Department.
[98]Bonneville Power Administration, *Annual Report 1998* (1999), p. 52.

Table 8. Hydroelectric Share of Net Power Generation for Utilities in the Pacific Northwest, 1996
(Percent)

Utility	Hydropower Generation as a Percentage of Net Power Generation
Bonneville Power Administration	91.0
PG&E	30.6
Portland General	37.5
Avista[a]	64.6
Idaho Power	69.1
Puget Sound Power	24.1
Montana Power	43.2
PacifiCorp	9.7
Nevada Power	0.0

[a]Formerly, Washington Water Power.

Note: BPA's 91-percent share equals the utility's share of sustained peak capacity coming from hydroelectricity.

Sources: Bonneville Power Administration and Energy Information Administration, *Financial Statistics of Major U.S. Investor-Owned Electric Utilities 1996*, Volume 1, DOE/EIA-0437(96/1) (Washington, DC, December 1997), Table 43.

Table 9. Average Revenue per Kilowatthour for U.S. Electric Utilities by State and End-Use Sector, 1998
(1999 Dollars)

State	All Sectors	Residential	Commercial	Industrial	Other
Washington	4.08	5.09	4.87	2.67	3.65
Oregon	4.96	5.89	5.06	3.54	6.75
Idaho	4.07	5.35	4.39	2.80	4.65
Nationwide	6.82	8.36	7.50	4.54	6.71

Note: Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Source: Energy Information Administration, *Electric Power Annual 1998*, Volume 2, DOE/EIA-0348(98/2) (Washington, DC, December 1999), p. 22.

As electricity reform continues, an increasing portion of the wholesale market is becoming deregulated. In a fully competitive environment, the extent to which BPA's nonregulated sales into the wholesale market reflect the utility's cost advantage (related to its low-cost hydropower assets) could be viewed as a measure of Federal support to the recipients of its power. In 1998, electricity revenues averaged 6.82 cents per kilowatthour for the United States as a whole, 4.07 cents per kilowatthour in Idaho, 4.08 cents per kilowatthour in Washington, and 4.96 cents per kilowatthour in Oregon (Table 9). Kentucky and Wyoming were the only other States with comparably low electricity rates.

Residential users in the Pacific Northwest are also among the beneficiaries of BPA's low-cost hydropower production. Residential electricity prices in Washington State averaged 5.09 cents per kilowatthour in 1998, lower than in any other State. In contrast, the average revenue per kilowatthour for residential users in the United States as a whole was 8.36 cents. Similar price benefits were realized by commercial and industrial electricity consumers in the Pacific Northwest.

To measure the value of BPA's relative price advantage, a comparison can be made between BPA's average wholesale revenue per kilowatthour and those of nearby utilities. In 1998, BPA's average revenue per wholesale kilowatthour was 1.6 cents (1999 dollars), as compared with 2.6 cents for surrounding utilities (Table 10). If the BPA were able to sell its electricity at the same prices as surrounding utilities, its revenues would increase by $732 million. The difference in revenue provides a measure of the price support provided to the recipients of BPA's low-cost Federal power. In 1990, BPA's average wholesale revenue was only 0.6 cents lower per kilowatthour than those of neighboring utilities, resulting in $357 million in Federal support (Table 10).

Table 10. Computation of Implied Support for the Bonneville Power Administration on a Market Price Basis, 1990 and 1998

Year	Wholesale Revenues (Million 1999 Dollars)	Revenues at Implied Market Prices (Million 1999 Dollars)	Implied Revenue Loss (Million 1999 Dollars)	Revenues from Wholesale Electricity Sales (1999 Cents per Kilowatthour)		Revenue Loss per Unit of Electricity Sold (1999 Cents per Kilowatthour)
				WSCC Regional Average	BPA Average	
1990	1,556.9	1,914.3	357.4	3.4	2.8	0.6
1998	1,098.1	1,829.6	731.5	2.6	1.6	1.1

Notes: Totals may not equal sum of components due to independent rounding. Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Source: Form EIA-861, "Annual Utility Report," and Bonneville Power Administration, *Annual Report 1998* (1999).

BPA's price advantage is in large measure due to its low-cost hydroelectric power plants, which were built with relatively cheap Federal Government financing. Although its prices are among the lowest in the region, the utility has a high concentration of nonperforming assets and debt, which elevates its prices. For the most part, BPA's nonproductive assets and debt, like those of TVA, were accumulated in the pursuit of a large-scale nuclear power program. BPA guaranteed much of the debt of the Washington Public Power Supply System (WPPSS), which was owned by a group of municipal utilities in Washington State. WPPSS began construction of five nuclear power plants in the mid-1970s, but the projects were beset with cost overruns, schedule delays, and mudslides. BPA is currently financing debt on three of the five nuclear power plants. In 1998, BPA carried $4.2 billion in partially completed nuclear power plants on its balance sheet.[99]

BPA's Borrowing Costs

Although in large measure BPA's lower prices are the result of its access to low-cost generation from Federal hydropower facilities, artificially low borrowing costs add to its price advantage. BPA has, since its inception, benefitted from substantial Federal intervention in the way of interest support. The size of BPA's estimated Federal interest support is a function of the interest rate chosen to reflect the appropriate "market" interest rate. Table 11 illustrates a computation of Federal utility interest support, making alternative assumptions about the appropriate market interest rate. In one case it is assumed that the appropriate "unsupported rate," for comparison with the rate

[99]Bonneville Power Administration, *Annual Report 1991* (1992), pp. 26-32. BPA did not guarantee the debt issued to pay for two plants (WNP-4 and WNP-5), and bondholders lost their investments in those plants.

actually paid, is the 1998 average Federal long-term bond rate of 5.58 percent. In the other case it is assumed that if Federal utilities were independent entities, then the unsupported rate would be a "private sector" borrowing rate, which would include a greater allowance for default risk. The comparison rate in this case is the rate paid by IOUs with credit ratings running from Aaa to Baa.

Table 11. Assumed Additional Borrowing Costs for the Bonneville Power Administration Under Different Credit Ratings, 1998

Type of Debt and Support Values Underlying Interest Rate Differentials	Assumed Additional Borrowing Costs (Thousand 1999 Dollars)			
Appropriated Debt				
Treasury(+)/Aaa Utility Rate	5,399.4	—	—	—
Treasury(+)/Aa Utility Rate	—	20,022.6	—	—
Treasury(+)/A Utility Rate	—	—	34,465.8	—
Treasury(+)/Baa Utility Rate	—	—	—	52,373.7
Long-Term Debt				
Treasury(+)/Aaa Utility Rate	3,034.8	—	—	—
Treasury(+)/Aa Utility Rate	—	11,254.0	—	—
Treasury(+)/A Utility Rate	—	—	19,372.1	—
Treasury(+)/Baa Utility Rate	—	—	—	29,437.4
Non-Federal Projects Debt				
Municipal Aa/Municipal A	15,682.3	—	—	—
Municipal Aa/Municipal Baa	—	—	—	34,458.8
Total	**24,116.5**	**31,276.6**	**53,837.9**	**116,269.9**

Notes: Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value. The Treasury(+) rate includes BPA's 78 basis point premium over the corresponding Treasury securities in 1998.

Sources: Bonneville Power Administration, *Annual Report 1998* (1999); Moody's Investor Service, *Utility Manual 1998*; and Federal Reserve, Form H-15.

BPA carries three forms of debt on its books. In 1998 its debt consisted of:

- **Appropriated Debt.** What BPA calls its appropriated debt was, before 1992, extended by the Congress to fund the construction and replacement of Army Corps of Engineers generation facilities. Since passage of the National Energy Policy Act, BPA has been required to fund these operations directly. BPA's appropriated debt was restructured in 1996. The utility's compliance with the BPA Appropriations Refinancing Act (16 U.S.C. 8381) reduced the principal of the debt by $2.5 billion and required that a portion of the debt be reset and assigned prevailing market rates as of September 1996.[100] The prevailing market rates, however, were based on rates corresponding to the prevailing Treasury yield curve plus the average spread between BPA's outstanding long-term debt and treasuries of similar maturity—not the rates of private-sector utilities.[101] Still, this led to a significant reduction of support on BPA's appropriated debt. Before 1996, the interest rate on BPA's debt was a

[100]Bonneville Power Administration, *Annual Report 1998* (1999), p. 38.

[101]BPA borrows at a rate on its appropriated debt that is slightly above the Treasury rate. BPA's *Annual Report 1998*, p. 37, lists its outstanding long-term debt and respective interest rates. A spread was calculated between those rates and the corresponding Treasury rates to provide an estimate of BPA's Treasury premium, which was estimated at 78 basis points in 1998.

weighted average of 3.5 percent.[102] The Act also required the BPA to pay the Treasury an additional $100 million, prorated over the course of the appropriations. This value was incorporated by BPA into its interest payment on appropriated debt and captured in the interest support estimated in this chapter.[103] In 1998, BPA's appropriated debt stood at $4.5 billion (1999 dollars).

- **Long-Term Debt.** BPA's long-term debt primarily funds its transmission system. In 1974, the Congress allowed BPA an amount limited to a nominal $3.75 billion in direct borrowing authority from the Treasury to fund the utility's capital program. Of the total, $1.2 billion was earmarked for conservation and renewable energy investments, and $2.5 billion was earmarked for transmission and other capital investments.[104] The appropriations are to be repaid to the Treasury by BPA. This long-term debt is actually of medium- as well as long-term maturity. The debt is held by the Treasury at interest rates set by the Treasury, which approximate the interest rates paid by Government agencies. The rates are adjusted to reflect the cost of specific features of BPA's bonds. In 1998, BPA's long-term debt equaled approximately $2.5 billion (1999 dollars).[105]

- **Non-Federal Projects Debt.** Non-Federal projects debt stems from BPA's financing of the three WPPSS nuclear projects and several smaller generation and conservation investments.[106] Approximately $4.2 billion of BPA's debt is devoted to nuclear power assets that have never been brought into service. Although the Federal Government does not guarantee BPA's non-Federal debt, the financial community treats the debt as though it did. BPA is a Federally owned utility, and Standard and Poor's assigns the company's bonds their AA- rating and Moody's Aa1 rating.[107] Non-Federal projects debt is not actually issued by BPA but rather is issued under the name of WPPSS. The value of BPA's non-Federal projects debt was roughly $7.0 billion (1999 dollars) in 1998.[108]

Table 11 compares BPA's current interest costs at its 78 basis point spread over the 30-year Treasury rate with what the utility might have paid if its borrowings had been priced at various IOU rates or municipal utility rates. BPA's appropriated long-term debts are essentially borrowings from the Treasury at rates which averaged 78 basis points above the Treasury's own cost of funds. For comparison, this analysis measures what BPA's cost of capital on its appropriations or long term debt would be if BPA had raised the funds in private capital markets rather than through the Treasury. The spread between the adjusted 30-year Treasury rate (including BPA's 78 basis point spread) and the Aaa IOU rate averaged 13 basis points between 1990 and 1998.[109] Had BPA borrowed its appropriated debt and long-term debt at Aaa rates in 1998 (or at 13 basis points higher), its cost of funds would have been $8 million higher ($3.0 million for long-term debt and $5.4 million for appropriated debt). Had BPA borrowed the same funds at the Baa rate, its cost of funds would have been $82 million.

BPA also raises funds in private capital markets through its WPPSS bonds, which are used to fund BPA's non-Federal power projects. BPA's non-Federal power project borrowing was roughly $7 billion in 1998. These borrowings are equivalent to tax-free municipal debt. In 1998, BPA maintained a Moody's credit rating of Aa1 on its non-Federal

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[102]U.S. General Accounting Office, *Federal Electricity Activities, The Federal Government's Net Cost and Potential for Future Losses*, GAO/AIMD-97-110 (Washington, DC, September 1997), p. 108.

[103]Bonneville Power Administration, *Annual Report 1998* (1999), p. 36.

[104]U.S. General Accounting Office, *Federal Electricity Activities, The Federal Government's Net Cost and Potential for Future Losses*, GAO/AIMD-97-110 (Washington, DC, September 1997), p. 109.

[105]Bonneville Power Administration, *Annual Report 1998* (1999), p. 29.

[106]Bonneville Power Administration, *Annual Report 1998* (1999), p. 22.

[107]Bonneville Power Administration, *Annual Report 1998* (1999), p. 22.

[108]Bonneville Power Administration, *Annual Report 1998* (1999), p. 29.

[109]A basis point is one-hundredth of a percentage point. Source: Compiled from data appearing in Federal Reserve, Form H15, and Standard and Poor's *DRI* database.

projects debt, very close to this report's comparison Aa municipal utility rating. Table 11 illustrates how BPA's borrowing costs would rise if the utility carried the A or Baa municipal utility rating. At the A rate, BPA's borrowing costs on its non-Federal project debt would be $16 million higher; at the Baa rate, its costs would be $34 million higher. For BPA's total debt, the borrowing costs at less desirable interest rates would be anywhere from $24 million to $116 million higher.

It should be kept in mind that were it not for the implicit backing of the Federal Government, BPA's interest costs would be substantially higher. BPA's non-Federal debt receives Moody's rating of Aa1.[110] In all likelihood, BPA's credit rating would be negatively affected in the event of a loss of the Federal implicit guarantee. Further, BPA's almost entire reliance on debt financing would also detrimentally affect its creditworthiness were it to raise funds in private capital markets. In 1998, BPA's debt accounted for 79 percent of its total assets.[111] Average IOU debt, in contrast, accounted for 30 percent of total assets.[112]

BPA's Return on Capital

The final measure of Federal Government support to the Federal utilities concerns the forgone rate of return to the owners of the utilities' assets. To determine the relevant ratebase for IOUs, for instance, regulators assume an appropriate return on assets. For illustrative purposes, an assumption is being made here that if BPA were to realize the same rate of return on assets as IOUs, then an appropriate adjustment to its prices, revenues, and operating income would be needed. Like the other Federal utilities, BPA is not expected, on average, to realize a positive rate of return. Rather, its rates are expected to cover costs and no more. A positive rate of return is possible, however, given unforeseen changes in the operating environment. For instance, all the PMAs are hydropower-intensive electricity producers. With rates set in advance, income can vary considerably with annual precipitation.

The first measure of operating rate of return uses net income before interest and taxes divided by net utility assets.[113] The IOUs realized an 11.63-percent rate of return in 1998, as compared with a 7.6-percent rate for BPA (Table 12). The second measure includes deferred regulatory assets as plant and equipment. For the IOUs, roughly $84 billion in assets were listed as deferred in 1998.[114] Using this measure, the comparative IOU group realized a 9.45-percent return on investment in 1998 before taxes, against a 7.6-percent rate for BPA. Because, as stated earlier, Federal utilities do not pay Federal income taxes, the second comparison measure uses the IOU pre-tax rate of return. The third measure also includes deferred regulatory assets but on an after-tax basis. For the comparative IOU group, this rate equaled 6.79 percent after taxes versus a 5.6 percent rate for BPA. In the case of BPA, the utility carried $4.2 billion (1999 dollars) in terminated nuclear facilities on its books in 1998. Although a part of BPA's ratebase, these facilities provide limited if not negative value to the utility's asset base. Therefore, BPA's rate of return was also calculated both with and without its non-operating nuclear power assets.

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[110]Bonneville Power Administration, *Annual Report 1998* (1999), p. 22.

[111]Bonneville Power Administration, *Annual Report 1998* (1999), p. 29. Debt equals Federal appropriations, long-term debt, and non-Federal projects debt.

[112]Energy Information Administration, *Electric Power Annual 1998*, Volume 2, DOE/EIA-0348(98/2) (Washington, DC, December 1999), p. 27.

[113]The operating return on assets measures were chosen, rather than the more familiar net income or return on equity, in order to abstract from the differing role of debt for public-sector versus private-sector utilities. Public-sector utilities usually have debt that equals or exceeds their assets, and they set prices so that there is little or no net income remaining after interest payments.

[114]Compiled from data appearing in Federal Energy Regulatory Commission, FERC Form 1.

Table 12. Bonneville Power Administration Return on Assets Compared with Hypothetical Equivalent Investor-Owned Utility Returns, 1990 and 1998

IOU Comparison	Net Plant and Equipment (Million 1999 Dollars)	Actual Revenue (Million 1999 Dollars)	Operating Income (Million 1990 Dollars)	Average Return (Percent)	Adjusted Revenue (Million 1999 Dollars)	Implied IOU Rate of Return (Percent)	Federal Government Support (Million 1999 Dollars)
1990							
No Deferred Assets	12,135.1	2,534.4	764.4	6.3	3,015.0	10.26	480.6
Deferred Assets Before Taxes . .	12,135.1	2,534.4	764.4	6.3	3,015.0	10.26	480.6
Deferred Assets After Taxes . . .	18,142.8	2,534.4	764.4	4.2	3,205.0	7.91	670.7
1998							
No Deferred Assets	11,607.6	2,080.8	883.6	7.6	2,547.0	11.63	466.3
Deferred Assets Before Taxes . .	11,607.6	2,080.8	883.6	7.6	2,294.0	9.45	213.3
Deferred Assets After Taxes . . .	15,810.1	2,080.8	883.6	5.6	2,270.6	6.79	190.0

Notes: EIA's *Financial Statistics of Major U.S. Investor-Owned Utilities* did not report any deferred regulatory assets in 1990. Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Sources: Bonneville Power Administration, *Annual Report 1990* (1991) and *Annual Report 1998* (1999); Energy Information Administration, *Financial Statistics of Major U.S. Investor-Owned Electric Utilities 1992*, Volume 1, DOE/EIA-0347(92/1) (Washington, DC, December 1993), Tables 6 and 8; *Financial Statistics of Major U.S. Investor-Owned Electric Utilities 1996*, Volume 1, DOE/EIA-0347(96/1) (Washington, DC, December 1997), Tables 6 and 8; and FERC Form 1.

Generating revenues sufficient to earn an 11.63-percent return on operating income for BPA would require that BPA increase its average price by 22 percent, implying a revenue gain of $466 million (Table 12). For BPA to realize a 9.45-percent rate of return on its combined assets (i.e., including the deferred assets) it would need to increase its prices by 10 percent, suggesting a revenue increase of $213 million. On an after-tax basis, BPA would need to raise prices by 9 percent to achieve a rate of return comparable to the 6.79-percent rate for IOUs (assuming that their deferred assets are also incorporated into their ratebase), suggesting a level of Federal support to the BPA of $190 million.

Table 12 also shows that the real value of Federal support to BPA underlying the three historic cost measures has fallen since 1990. In 1990, the three measures of return on plant and equipment provided BPA with respective gains of $481 million, $481 million, and $671 million.

The Smaller Power Marketing Administrations

The three smaller PMAs are the Southeastern Power Administration (SEPA), the Southwestern Power Administration (SWPA), and the Western Area Power Administration (WAPA). Each is headed by a single administrator appointed by the Secretary of Energy. More so than either BPA or TVA, the three smaller PMAs benefit from low-cost hydropower dams that were built as long as 60 years ago. For instance, WAPA's Hoover Dam came on line in 1936.[115] Perhaps more importantly, their only non-hydro generation assets consist of one thermal plant. The PMAs receive appropriations from the U.S. Treasury for most of their operations and maintenance expenses as well as for capital expenses. The former is expected to be paid off in the year it was received; the latter can be paid back with interest over the service life of the investment, for a period not to exceed 50 years.

[115]Western Area Power Administration, *Annual Report 1998* (1999), p. 9.

Before 1983, the three smaller PMAs were allowed interest rates below prevailing Treasury rates. In 1983, the U.S. Department of Energy modified the interest rates available for new projects requiring the PMAs to pay a rate equal to the average Treasury yield during the previous fiscal year. In addition, DOE requires the PMAs to retire their high-price debt first whenever possible (an advantage unavailable to the Treasury itself). As a result, over time, they can realize an average cost of funds below that of the Treasury itself.

Southeastern Power Administration

SEPA was created in 1950 in response to the Flood Control Act of 1944,[116] and in 1977 it was transferred to the Department of Energy. SEPA markets electricity in 11 States: Alabama, Florida, Georgia, Illinois, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. In 1998, the utility had 3,092 megawatts of generating capacity,[117] almost entirely hydropower, and sold 8.8 billion kilowatthours of electricity.[118] It provides electricity to 127 electric cooperatives, 1 Federal utility, 176 public bodies, and 2 IOUs. SEPA markets power from 23 hydroelectric power stations, all of which are operated by the Army Corps of Engineers.[119]

Southwestern Power Administration

SWPA markets power from 24 hydroelectric power plants operated by the Army Corps of Engineers to customers in Arkansas, Kansas, Louisiana, Missouri, Oklahoma, and Texas. SWPA has 2,158 megawatts of generation capacity and operates 1,380 miles of transmission lines. In 1998 it sold 6.7 billion kilowatthours of electricity, 70 percent of which went to electric cooperatives, 27 percent to municipalities, 2 percent to Federal agencies, and 1 percent to utilities and others.[120]

Western Area Power Administration

WAPA was established by the Congress in the 1977 Department of Energy Organization Act to manage power marketing and transmission operations that previously were under the responsibility of the U.S. Department of Interior's Bureau of Reclamation. WAPA markets power in Arizona, California, Colorado, Iowa, Kansas, Montana, Minnesota, Nebraska, Nevada, New Mexico, North Dakota, South Dakota, Texas, Wyoming, and Utah. It operates 17,000 miles of transmission lines and sells power from 55 hydroelectric generation facilities and 1 thermal plant. In 1998, WAPA sold 45 billion kilowatthours of electricity, 26 percent of which went to State agencies, 25 percent to municipalities, 21 percent to cooperatives, 11 percent to IOUs, 10 percent to public utility districts, 5 percent to Federal agencies, and the remaining 2 percent to power marketers, irrigation districts, and other users.[121]

WAPA derives about 24 percent of its electricity revenues from municipalities, 22 percent from cooperatives, 22 percent from State agencies, 12 percent from public utility districts, 11 percent from IOUs, and 5 percent from Federal agencies. The remaining 4 percent is derived from a variety of users. The utility receives annual appropriations from

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[116]Southeastern Power Administration, *Annual Report 1998* (1999), p. 6.
[117]Southeastern Power Administration, *Annual Report 1998* (1999), p. 18.
[118]Southeastern Power Administration, *Annual Report 1998* (1999), p. 17.
[119]Southeastern Power Administration, *Annual Report 1998* (1999), p. 1.
[120]Southwestern Power Administration, *Annual Report 1998* (1999), pp. 24 and 25. Excludes losses, interchange, and contract exchange.
[121]Western Area Power Administration, *Annual Report 1998* (1999), p. 23. Excludes project use and interdepartmental and interproject exchanges.

the Congress to cover all expenses associated with its power and other activities. Its power rates are set to recover those costs, along with all costs associated with debt servicing.

PMA Prices Relative to Neighboring Investor-Owned Utilities

The prices charged by the three smaller PMAs are among the lowest available in the United States. The legislation that created the three smaller PMAs[122] requires them to charge rates that adequately cover costs, but it does not fully explain which costs should be recovered in the ratebase. In 1944, the Congress established SEPA and SWPA and mandated that their power be sold at the "lowest possible rates consistent with sound business principles."[123] Like BPA and TVA, the three smaller PMAs are required to provide certain classes of customers with preference power.

Average wholesale revenues charged by the three smaller PMAs are considerably below those charged by nearby IOUs. The average revenue realized by SEPA in 1998 was 1.9 cents per kilowatthour, compared with 3.6 cents for surrounding IOUs (Table 13). For SWPA, the average wholesale revenue was 1.4 cents per kilowatthour, compared with 3.0 cents for neighboring IOUs. For WAPA, average wholesale revenues equaled 1.6 cents per kilowatthour, compared with 2.6 cents for neighboring IOUs. If the three smaller PMAs could charge the same prices as those of competing IOUs, their combined average wholesale revenues would climb by $666 million or 1.2 cents per kilowatthour. These differences in revenue and price can be viewed as a form of Federal support to the customers of the three smaller PMAs. Since 1990, the differentials between the average wholesale revenues of the three smaller PMAs and those of their surrounding IOUs have fallen considerably. As a result, the calculated Federal price support for the three entities has fallen from $1,115 million in 1990 to $666 million in 1998 (Table 13).

PMA Borrowing Costs

Because the three smaller PMAs have historically borrowed at rates considerably lower than the Treasury's own cost of funds, the calculations used to measure the value of the interest rate support provided to TVA and BPA are not appropriate. Instead, hypothetical interest rate payments for the three PMAs were estimated in the following manner. Power repayment schedules record the timetables for recovering the costs of each power project and report the annual investment incurred for each project through 1998. SWPA's earliest project began in 1936, SEPA's in 1949, and WAPA's in 1944. Cumulative investment in power projects was allocated on an annual basis. A weighted average cost of capital for total investment was developed by applying annual benchmark rates to the annual incremental investment, summing over the project history, and then dividing by total cumulative interest. The range of interest rates is provided because it is unclear what rates similar private enterprises would pay. Any outstanding debt not scheduled for repayment was assigned an average rate for the appropriate period. The reported subsidy, then, is the difference between a hypothetical interest payment based on this weighted average and the actual interest payment reported by the PMA. An inverse relationship between principal investment levels and interest rates would yield the lowest level of support, so to the extent that debt was incurred during the late 1970s and 1980s, the methodology indicates a higher level of support. Table 14 shows the implied yield curves for outstanding debt for each of the PMAs. Depending on the comparative interest rate benchmarks, the three smaller PMAs received Federal support ranging from $80 million to $224 million in 1998.

[122]The Reclamation Project Act of 1939, the Flood Control Act of 1944, and the Department of Energy Reorganization Act of 1977.
[123]Southwestern Power Administration, *Annual Report 1998* (1999), p. 6.

Table 13. Computation of Implied Support for the Three Smaller Federal Power Marketing Administrations on a Market Price Basis, 1990 and 1998

Federal Utility	Wholesale Revenues (Million 1999 Dollars)	Revenues at Implied Market Prices (Million 1999 Dollars)	Implied Revenue Loss (Million 1999 Dollars)	Revenues from Wholesale Electricity Sales (1999 Cents per Kilowatthour)		Revenue Loss per Unit of Electricity Sold (1999 Cents per Kilowatthour)
				Nearby NERC Regional Average[a]	Federal PMA Average	
1990						
Southeastern	166.3	426.7	260.3	4.1	1.6	2.5
Southwestern	104.6	254.9	150.3	3.1	1.3	1.9
Western Area	517.0	1,221.2	704.2	3.6	1.5	2.1
1998						
Southeastern	171.1	323.2	152.2	3.6	1.9	1.7
Southwestern	93.0	199.4	106.4	3.0	1.4	1.6
Western Area	634.0	1,041.3	407.3	2.6	1.6	1.0

[a]The nearby NERC regions used for the comparison are SERC (for SEPA), SPP (for SWPA), and WSCC (for WAPA).

Notes: Totals may not equal sum of components due to independent rounding. Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Sources: Form EIA-861, "Annual Utility Report," and company annual reports, income statements, and balance sheets.

Table 14. Computation of Implied Interest Rate Support to the Three Smaller Federal Power Marketing Administrations, 1998
(Thousand 1999 Dollars)

Item	30-Year Treasury Rate	Aaa IOU Rate	Aa IOU Rate	A IOU Rate	Baa IOU Rate
Outstanding Debt	5,814,071	5,814,071	5,814,071	5,814,071	5,814,071
Interest Paid/Implied	324,425	344,746	354,760	366,181	388,853
Implied Support	80,257	172,168	186,380	199,638	224,189

Note: Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Sources: Company annual reports and balance sheets and Moody's Investor Service, *Utility Manual 1998*.

PMA Returns on Capital

The method used to measure the difference between the returns on assets for the three smaller PMAs and those for the IOU comparison group is exactly the same as used for BPA and TVA. The first measure of operating rate of return uses net income before interest and taxes divided by net utility assets. For the comparative IOUs this rate equaled 11.63 percent, compared with 2.9 percent for the three smaller PMAs (Table 15). The two other measures incorporate the deferred assets of the IOUs—largely involving unfinished nuclear power plants—into a before-tax and after-tax basis.

Table 15. Returns on Assets for the Western Area Power Administration, Southwestern Power Administration, and Southeastern Power Administration Compared with Hypothetical Equivalent Investor-Owned Utility Returns, 1990 and 1998

IOU Comparison	Net Plant and Equipment (Million 1999 Dollars)	Actual Revenue (Million 1999 Dollars)	Operating Income (Million 1999 Dollars)	Average Return (Percent)	Adjusted Revenue (Million 1999 Dollars)	Implied IOU Rate of Return (Percent)	Federal Government Support (Million 1999 Dollars)
1990							
No Deferred Assets	7,875.6	901.1	181.2	2.3	1,527.9	10.26	626.8
Deferred Assets Before Taxes . .	7,875.6	901.1	181.2	2.3	1,527.9	10.26	626.8
Deferred Assets After Taxes . . .	7,875.6	901.1	181.2	2.3	1,342.8	7.91	441.7
1998							
No Deferred Assets	6,047.0	1,074.6	173.6	2.9	1,604.3	11.63	529.7
Deferred Assets Before Taxes . .	6,047.0	1,074.6	173.6	2.9	1,472.4	9.45	397.9
Deferred Assets After Taxes . . .	6,047.0	1,074.6	173.6	2.9	1,311.6	6.79	237.0

Notes: EIA's *Financial Statistics of Major U.S. Investor-Owned Utilities* did not report any deferred regulatory assets in 1990. Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Sources: Company annual reports, income statements, and balance sheets; Energy Information Administration, *Financial Statistics of Major U.S. Investor-Owned Electric Utilities 1992*, Volume 1, DOE/EIA-0347(92/1) (Washington, DC, December 1993), Tables 6 and 8; *Financial Statistics of Major U.S. Investor-Owned Electric Utilities 1996*, Volume 1, DOE/EIA-0347(96/1) (Washington, DC, December 1997), Tables 6 and 8; and FERC Form 1.

Generating revenues sufficient to earn an 11.63-percent operating return for three smaller PMAs would require that they increase their average prices by 48 percent, implying a revenue gain of $530 million (Table 15). To generate a before-tax rate of return equal to the IOUs' 9.45-percent rate (including their deferred utility assets), the three smaller PMAs would have to raise prices by 37 percent and increase revenues by $398 million. On an after-tax basis, the three smaller PMAs would have to raise their prices by 22 percent and their total revenues by $237 million in order to realize the IOU 6.79-percent rate of return. Table 15 indicates that the real value of Federal support to the three smaller PMAs underlying the historic cost differential has declined since 1990. In 1990, the three measures of return on plant and equipment provided the three smaller PMAs with respective gains of $627 million, $627 million, and $442 million.

Rural Utilities Service

Background

The Rural Utilities Service (RUS) is an agency of the U.S. Department of Agriculture (USDA) that provides support to rural communities for the development and improvement of water, telecommunications, and electricity services. It is part of a broader set of programs within the USDA whose goal is to assist in the development of rural America. As stated on USDA's web site,

> "USDA Rural Development is committed to helping improve the economy and quality of life in all of rural America. Through our programs, we touch rural America in many ways . . . . Our financial programs support such essential public facilities and services as water and sewer systems, housing, health clinics, emergency

service facilities and electric and telephone service. We promote economic development by supporting loans to businesses through banks and community-managed lending pools. We offer technical assistance and information to help agricultural and other cooperatives get started and improve the effectiveness of their member services. And we provide technical assistance to help communities undertake community empowerment programs."[124]

The RUS was established in October 1994 when the USDA was reorganized and the functions of the Rural Electrification Administration (REA), the Rural Development Administration (RDA) and the Rural Telephone Bank (RTB) were assigned to it. The former REA programs, the focus of the rest of this section, began in May 1935, and were codified into law with the passage of the Rural Electrification Act of 1936 (7 U.S.C. 901). In 1998 RUS electricity borrowers accounted for 6.7 percent of total U.S. retail electricity sales and 4.3 percent of net utility generation (Table 16).

Table 16. Key Statistics for the Rural Utilities Service Electricity Program, 1998

Statistic	Quantity	Percent of National Total
Consumers Served	10,858,441	8.8
Generation (Megawatthours)	157,896,742	4.3
End-Use Sales (Megawatthours)		
Residential	125,210,030	11.1
Commercial/Industrial	84,268,848	4.2
Other	8,165,832	7.9
Total	**217,644,698**	**6.7**

Sources: **Rural Utilities Service:** U.S. Department of Agriculture, Rural Utilities Service, *1998 Statistical Report, Rural Electric Borrowers*, IP 201-1 (Washington, DC, August 1999), pp. 10 and 14. **National:** Energy Information Administration, *Electric Power Annual 1998*, Volume 2, DOE/EIA-0348(98/2) (Washington, DC, December 1999).

RUS Electricity Loan Programs

The RUS electricity program provides support by issuing direct loans to electricity providers to build and maintain distribution facilities and by guaranteeing loans made by others for the construction of new power plants and transmission facilities. The loans fall into three general categories—direct 5-percent "hardship" loans, direct loans with interest rates tied to municipal borrowing rates (referred to in the rest of this section as direct municipal rate loans), and guaranteed loans. In 1998, the RUS electricity program had advanced loans of nearly $21 billion (both hardship and direct municipal rate loans) and had guaranteed loans of nearly $26 billion. In 1998, RUS borrowers had outstanding long-term debt approaching $33 billion.

Hardship loans are made at an interest rate of 5 percent[125] to borrowers that serve financially distressed rural areas. Municipal rate loans fall into two categories—capped and uncapped. Capped municipal rate loans, with rates no higher than 7 percent, are made to borrowers who meet a consumer density test—less than 5.5 consumers per line mile—or the combination of a rate disparity test and a consumer income test. To meet the rate disparity test, the borrower's average revenue per kilowatthour must be higher than the average for the State in which it operates. To meet the income test the consumers served by the borrower must have average per capita incomes or household

[124]Rural Utilities Service, web site www.rurdev.usda.gov/rd/index.html.

[125]Before the amendment of the Rural Electrification Act in 1973, hardship loans were made at an interest rate of 2 percent and had maturities up to 35 years.

incomes below the averages for the State in which it operates. If these tests are not met, the rate on direct municipal loans can exceed 7 percent. The interest rates for uncapped municipal rate loans are set at competitive market rates for similar types of loans. Guaranteed loans are generally made to support the development of power generation facilities. If the money is borrowed from the Federal Financing Bank (FFB) the rate is set at one-eighth percent above the Treasury's cost of money, and the RUS guarantees 100 percent of the loan. If the money is borrowed from a commercial lender, both the interest rate and degree of RUS guarantee vary.[126]

Cost of Loan Support Provided to RUS Electricity Borrowers

The RUS programs do provide cost savings to its borrowers. Enumerating the savings that flow to RUS borrowers requires assessing the administrative costs of running the RUS programs, the costs RUS incurs by loaning money to its borrowers at interest rates below its Treasury borrowing costs (interest rate buydown costs), the costs RUS incurs when it covers defaults on loans it has guaranteed, and measuring the benefit RUS borrowers receive from being able to borrow money below competitive market interest rates. If the RUS did not exist, many of these costs would be borne by the borrowers in the form of higher fees and interest rates.

The amount of loan support provided by RUS is dependent on the market interest rates at the time of issuance. When market interest rates are low the RUS support may be relatively low, but when rates are high—as they were through most of the 1980s—the support can be quite large. An aggregate measure of the total support to RUS electricity borrowers could be derived by comparing the interest rate on all outstanding RUS electricity loans in 1998 to the interest rates on treasury and utility bonds with similar characteristics (i.e., date of issuance, maturity, whether the loan is callable or not, etc.). The difference in interest rates would show the benefit RUS electricity borrowers received in 1998. However, the data needed for such a comparison are not readily available.[127]

As a surrogate measure, the average interest rate faced by RUS borrowers is compared with the 1998 average 30-year Treasury bond rate, the 1998 average IOU 30-year bond rate, a weighted average 30-year Treasury bond rate, and weighted average IOU 30-year bond rates for Aaa, Aa, A, and Baa rated companies.[128] The range is provided because it is unclear what rate RUS electricity borrowers would face in private markets without RUS guarantees. The weighted rates are derived by amortizing the amount of RUS electricity loans advanced each year over the past 30 years (it is assumed that most of the loans are for 30 years), determining the remaining balance on them in 1998, and multiplying this balance by the appropriate rate for the year of issuance. For example, if it is estimated that 10 percent of the outstanding balance of loans in 1998 were issued in 1985, then the 1985 rates for each instrument would receive a 10-percent weight in the average rate. This approach makes numerous simplifying assumptions, but absent actual data it provides a rough estimate of the potential support. It does not address the likelihood that many loans may be shorter than 30 years and that some loans probably have been refinanced. Given that it is likely that non-RUS borrowers have refinanced higher cost loans in recent years, this approach likely overstates the support in 1998. However, the outstanding balance derived using this approach with the weighted Treasury rate is just under $14.3 billion,[129] very close to the $14.0 billion in outstanding distribution system loans shown in Table 17 (distribution loans are the majority of RUS electricity loans advanced).

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[126]For more information on the specifics of RUS electricity program loan conditions see Code of Federal Regulations, 7 CFR 1714.

[127]This information was requested from the RUS but was not provided in time to be used in this report.

[128]The RUS provided EIA with the total quantity of debt issued each year for the past 30 years. The weighted average rates were derived by calculating the average rate on the remaining balance of 30-year Treasury bonds and 30-year utility bonds issued at the same time as the RUS electricity loans.

[129]This 1998 balance value was calculated by assuming that the loans advanced by RUS each year over the past 30 years were issued at the 30-year Treasury rate. The data on loans advanced each year come from the statistical yearbook for rural electric borrowers published annually by the U.S. Department of Agriculture.

Table 17. Rural Utilities Service Electricity Loan Statistics, 1998

Number of Active Borrowers		**Long-Term Debt (Thousands 1999 Dollars)**	
Distribution	699	Distribution	14,038,371
Power Supply	59	Power Supply	18,529,076
Total	**758**	**Total**	**32,567,447**
Funds Advanced (Thousands 1999 Dollars)		**Interest on Long-Term Debt (Thousand 1999 Dollars)**	
Distribution	17,047,980	Distribution	719,632
Power Supply	3,675,429	Power Supply	1,202,044
Total	**20,723,409**	**Total**	**1,921,676**
Loan Guarantees (Thousand 1999 Dollars)			
Power Supply	26,128,863		

Notes: Long-term debt includes RUS long-term debt and other long-term debt advanced by others. Long-term debt values include only information from borrowers reporting detailed information to RUS (686 out of 699 distribution borrowers and 48 out of 59 power supply borrowers). Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Source: U.S. Department of Agriculture, Rural Utilities Service, *1998 Statistical Report, Rural Electric Borrowers*, IP 201-1 (Washington, DC, August 1999), Tables 1 through 5.

The average interest rate paid on the outstanding debt of RUS electricity borrowers in 1998 is actually slightly above the average 30-year Treasury rate for a bond issued in 1998 (Table 18). This comparison reflects the historically low interest rates that prevailed in 1998, rather than negative support from the RUS. When compared to a weighted Treasury rate—which captures the effect of the high interest rates of the 1980s, when many of the outstanding RUS electricity loans were issued—the support to RUS electricity borrowers in 1998 is estimated at $965 million. The estimated support value, using weighted borrowing rates, ranges from $965 million to $1,557 million. Again, the larger value captures the value of access to RUS electricity loans in the 1980s when others faced much higher interest rates.

Table 18. Computation of Implied Interest Rate Support to Rural Utilities Service Electricity Borrowers, 1998

	1998 Rates			Weighted Rates				
Item	RUS Electricity	30-Year Treasury	IOU	30-Year Treasury	Aaa IOU	Aa IOU	A IOU	Baa IOU
Outstanding Debt (Million 1999 Dollars)	32,567	32,567	32,567	32,567	32,567	32,567	32,567	32,567
Interest Paid/Implied (Million 1999 Dollars)	1,922	1,817	2,065	2,886	3,101	3,208	3,315	3,478
Average Rate (Percent)	5.90	5.58	6.34	8.86	9.52	9.85	10.18	10.68
Implied Support (Million 1999 Dollars)	—	—	144	965	1,179	1,287	1,394	1,557

Note: Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Sources: U.S. Department of Agriculture, Rural Utilities Service, *1998 Statistical Report, Rural Electric Borrowers*, IP 201-1 (Washington, DC, August 1999), and Moody's Investor Service, *Utility Manual 1998*.

The values shown in Table 18 do not fully capture the support provided by the RUS in the form of loan guarantees to power plant developers. Several analyses have concluded that the RUS faces a significant risk of large loan defaults. For example, in 1997 the U.S. General Accounting Office found that $618 million of the outstanding

electricity loan portfolio was owed by borrowers who were delinquent in their payments and that $7.4 billion of the outstanding debt was owed by borrowers who were in financial distress.[130] At that time the outstanding RUS electricity debt totaled $32.3 billion, of which approximately 25 percent was at risk of not being fully repaid. Much of the problem debt resulted from investments made in expensive nuclear plants many years ago. For example, the *Wall Street Journal* reported that more than $1.5 billion in debt was written down for two borrowers in 1996.[131]

Summary

In total, it is estimated that Federal utilities received market price support equal to $1.4 billion (1999 dollars) in 1998 and return on asset support equal to $655 million to $1.6 billion (Table 19). Federal utilities and RUS borrowers received interest rate support ranging from $325 million to $2.1 billion. These estimates differ from the estimated support for 1990, when the Federal utilities received $1.9 billion in market price support and $2.2 billion to $3.3 billion in return on asset support (Table 19). The spread between the average revenues per kilowatthour charged

Table 19. Summary Estimates of Electricity Market Price, Interest Rate, and Return on Asset Supports, 1990 and 1998
(Million 1999 Dollars)

Utility/Program	Market Price Support	Interest Rate Support		Return on Asset Support	
		Low Estimate	High Estimate	Low Estimate	High Estimate
1990					
Tennessee Valley Authority	440.0	—	—	1,256.7	1,992.8
Bonneville Power Administration	357.4	—	—	480.6	670.7
SEPA, SWPA, and WAPA	1,114.8	—	—	441.7	626.8
Rural Utilities Service	—	—	—	—	—
Total	**1,912.2**	**—**	**—**	**2,179.0**	**3,290.3**
1998					
Tennessee Valley Authority	—	77.1	247.6	227.9	557.0
Bonneville Power Administration	731.5	24.1	116.3	190.0	466.3
SEPA, SWPA, and WAPA	665.9	80.3	224.2	237.0	529.7
Rural Utilities Service	—	143.8	1,557.0	—	—
Total	**1,397.4**	**325.3**	**2,145.1**	**654.9**	**1,553.0**

Notes: SEPA, SWPA, and WAPA designate the Southeastern Power Administration, the Southwestern Power Administration, and the Western Area Power Administration, respectively. Most of the dollar values appearing in this report have been converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Source: Tables 6, 7, 10, 11, 12, 13, 14, 15, and 18 in this chapter.

[130]U.S. General Accounting Office, *Rural Development: Financial Condition of the Rural Utilities Service's Loan Portfolio*, GAO/RCED-97-82 (Washington, DC, April 1997).

[131]*Wall Street Journal* (October 3, 1996), p. A3.

by the Federal utilities and those charged by competing utilities has narrowed since 1990, bringing the price-based measure of support down. Although the interest differential for 1990 was not measured, it probably was higher than the 1998 differential. Since 1990, the four PMAs have lost some (but not all) of their borrowing advantages, although that change is offset to some degree by TVA's refinancing of its high-interest 1998 Federal Financing Bank debt at lower market rates. In contrast, asset support has fallen since 1990.

A Note on Data Sources

Comparable financial data on public power agencies are not easily obtained. The primary data sources for this chapter are data collected on Form EIA-861, "Annual Electric Utility Report"; Form EIA-412, "Annual Report of Public Electric Utilities"; FERC Form 1, "Annual Report of Major Electric Utilities, Licensees, and Others"; Standard and Poor's; and Federal Reserve, Form H-15, The data in those reports create certain ambiguities that should be noted:

- EIA publishes data only for "major" IOUs. EIA identified 239 IOUs as of 1998; however, only 179 were sufficiently large to be required to file FERC Form 1. Those 179 "major" utilities account for 99 percent of the electricity sold by IOUs to ultimate consumers; thus, the data lost by ignoring the missing 60 small IOUs are not of great importance. IOU data are on a calendar-year basis.

- Similarly, EIA publishes data only for "major" publicly owned utilities. In this case, EIA has identified 2,009 publicly owned utilities in 1998.

For rural electric cooperatives, data were obtained from U.S. Department of Agriculture, Rural Utilities Service, *1998 Statistical Report, Rural Electric Borrowers*, IP 201-1 (Washington, DC, August 1999). Cooperative data were collected on a uniform basis for calendar year 1998.

Federal utilities file Form EIA-412, and their financial results are published in EIA's *Financial Statistics of Major U.S. Publicly Owned Utilities*; however, the Federal utilities do not fill out their forms in the same way. Some treat "Federal appropriations" (which are the principal source of their capital) as equity, while others treat it as debt. Some of this lower price debt remains on the PMAs' books, which accounts for their much lower interest costs. For the PMAs, the 1998 annual report of each agency was used. All Federal utility data are for fiscal year 1998.

5. Summary of Results

Introduction

This chapter presents a summary of values of Federal Government interventions in energy transformation and end use markets discussed in Chapters 2, 3, and 4. The estimates are then combined with the estimates for primary energy markets previously published by the Energy Information Administration (EIA),[132] to yield estimates of total subsidies to U.S. energy markets in fiscal year 1999. Summary comparisons are made with the estimates presented in EIA's 1992 subsidy report.[133] Data summarized from Chapters 2 and 3 compare Federal budget outlays for fiscal year 1999 with those for fiscal year 1992.[134] Summary estimates of support to the electricity programs described in Chapter 4 also appear here. Where it is feasible, those results compare data for years 1998 and 1990.

Estimate of Transformation and End Use Subsidies, Fiscal Year 1999

The intent of this report is to identify Federal Government programs that directly seek to influence the allocation and pricing of electricity and end-use energy resources. Where it can be determined, a quantitative assessment of the cost of those programs is presented. Given the definitions specified by the Department of Energy's Office of Policy, it is estimated that Federal subsidies for energy transformation and end use totaled $2.2 billion in fiscal year 1999 (Table 20). Direct expenditures, consisting of appropriations to LIHEAP and to DOE's two conservation programs, the Weatherization Assistance Program and the State Energy Program, amounted to $1.4 billion. Thus, two programs specifically addressed to low-income households—LIHEAP and the Weatherization Assistance Program—accounted for 62 percent of all energy transformation and end use subsidies. The three income tax expenditures totaled $0.370 billion. No excise tax subsidies related to energy transformation or end use were determined to be within the report's scope.[135] Research and development (R&D) outlays amounted to $454 million in fiscal year 1999.

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[132]Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999).

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

[134]In preparing this update, values for a few previously reported fiscal year 1992 items were amended: LIHEAP received an additional appropriation of $357 million, and R&D final outlays for fiscal year 1992 were used.

[135]There are several exemptions from motor fuel excise taxes dedicated to the Highway Trust Fund, including fuel used by State and local governments or nonprofit educational institutions. Fuel used by certain buses, including school buses, may be either exempt or taxed at reduced rates. There are minor exemptions from aviation fuel taxes. Currently, no estimate exists of the value of these primary energy exemptions. Source: Correspondence, Office of Tax Analysis, U.S. Department of the Treasury, January 27, 2000.

Table 20. Summary of Energy Transformation and End Use 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[a]				Total
	Direct Expenditures	Tax Expenditures		Research and Development	
		Income	Excise		
Oil	255	0	0	0	**255**
Gas	501	0	0	0	**501**
Renewables	40	0	0	0	**40**
Electricity[a]	459	155	0	0	**614**
Conservation[b]	166	110	0	0	**276**
End Use[b]	0	105	0	454	**559**
Total	**1,421**	**370**	**0**	**454**	**2,245**

[a]Does not include supports to TVA, the Power Marketing Administrations, and the Rural Utilities Service, which are described in Chapter 4.

[b]Conservation programs are directed primarily at consumers of energy and often are supported by grants. End-use programs are oriented to the development and introduction of new technologies for use in specific sectors.

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

Source: Estimates presented in this report.

In 1999, subsidies for energy transformation were distributed across all fuel types (Table 20). Electricity[136] received subsidies valued at $614 million, 75 percent of which were attributable to the LIHEAP program.[137] Natural gas received $501 million and oil received $255 million, for a total fossil fuel (oil and gas) subsidy of $756 million. End-use activities[138] accounted for $559 million, and conservation subsidies[139] were $276 billion in fiscal year 1999. At $40 million, renewable fuels[140] received less than 2 percent of the total.

Summary of Supports to Electricity, 1998

Support to Federal electric utilities was substantial in 1998 (Table 21), regardless of the method of valuation.[141] In Chapter 4, several alternative approaches are used to estimate the manner and role of Federal support to electricity. The market price comparison is based on the difference between average revenues from sales for resale made by the Federal Power Marketing Administrations (PMAs) and the average wholesale revenues for privately owned utilities in surrounding regions. The interest rate approach measures the difference in borrowing costs for recipients of Federal support and what their borrowing costs would be under various benchmark rates. The return on assets, or historic cost, approach compares cost recovery at Federal utilities with that required in the private

[136]Refers to the electricity-related component of LIHEAP funding and the tax expenditure for "certain energy facilities." Three types of projects are eligible for this tax exemption: facilities for the local furnishing of gas and electricity; district heating and cooling facilities; and certain environmental facilities located at hydroelectric dam sites. Thus, the characterization of this tax expenditure as "electricity" is somewhat arbitrary.

[137]An additional $73 million subsidy to electricity—$33 million for Advanced Turbine systems and $40 million for New Technology Credit—was treated as primary energy in EIA's September 1999 report. See also Table 25.

[138]"End use" includes all itemized R&D programs in this report and one tax expenditure for clean fuel vehicles.

[139]"Conservation" refers to three program elements, two sponsored by DOE's Office of Energy Efficiency, the Weatherization Assistance Program and the State Energy Program, and a tax expenditure for utility-sponsored conservation.

[140]"Renewables" refers only to that portion of LIHEAP electricity consumption attributable to renewable generation sources, in this case, wood.

[141]See Chapter 4 for details concerning these estimates.

sector, where utilities generally recover their operating costs plus depreciation of capital assets, plus some allowance for cost of capital. Because of uncertainties in making financial comparisons between privately owned utilities and nonprofit Federal utilities, low and high estimates are provided for the interest rate and return on asset methods.

Table 21. Summary of Federal Support to Electricity Estimated by Three Valuation Methods, 1998
(Million 1999 Dollars)

Program	Method				
		Interest Rate		Return on Asset	
	Market Price	Low Estimate	High Estimate	Low Estimate	High Estimate
Tennessee Valley Authority	—	77	248	228	557
Bonneville Power Administration	732	24	116	190	466
Western Area Power Administration	407	4	90	167	335
Southeastern Power Administration	152	54	94	45	128
Southwestern Power Administration	106	23	41	25	66
Rural Utilities Service	—	144	1,557	—	—
Total	**1,397**	**325**	**2,145**	**655**	**1,553**

Note: Totals may not equal sum of components due to independent rounding.
Source: Estimates presented in Chapter 4.

Supports made available in 1998 through preferential allocation of power (market price) totaled nearly $1.4 billion (1999 dollars). Nearly half of that amount is attributed to the Bonneville Power Administration (BPA). Low rates of return on assets resulted in supports ranging from $655 million to $1.6 billion (1999 dollars). The Tennessee Valley Authority (TVA) and BPA accounted for most of that amount. Supports arising from access to lower priced capital ranged from $325 million to $2.1 billion (1999 dollars). Despite the nominal magnitude of these estimates, they are small when compared to total electricity revenues. The highest estimate, $2.145 billion, amounts to only 1 percent of total electricity revenues in 1998; and the low estimate, $325 million, amounts to only 0.1 percent of total electricity revenues in 1998.

Summary Results for Total Federal Energy Subsidies, Fiscal Year 1999

The combined findings for fiscal year 1999 primary energy subsidies appearing in EIA's September 1999 report and subsidies for energy transformation and end use appearing in this report are shown in Table 22. The estimated total value for all energy subsidies is $6.2 billion, excluding the supports directed through Federal utility electricity supply.[142] This $6.2 billion constitutes only a small portion of total expenditures on energy nationally. In 1995, total expenditures on energy were estimated at $547 billion (1999 dollars),[143] meaning that Federal subsidies to all energy are 1.1 percent of total energy expenditures.

[142]There are some inherent difficulties in making these comparisons between Federal programs and private suppliers of electricity. Consequently, the values developed by these methods are presented only as a rough indication of magnitude and are withheld from summary tables.

[143]Energy Information Administration, *State Energy Price and Expenditure Report 1995*, DOE/EIA-0376(95) (Washington, DC, August 1998), Table 5.

Table 22. Summary of Primary Energy and Energy Transformation and End Use 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		
Primary Energy					
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**
Subtotal	**4**	**1,656**	**725**	**1,567**	**3,953**
Energy Transformation and End Use					
Oil	255	0	0	0	**255**
Gas	501	0	0	0	**501**
Renewables	40	0	0	0	**40**
Electricity[d]	459	155	0	0	**614**
Conservation	166	110	0	0	**276**
End Use	0	105	0	454	**559**
Subtotal	**1,421**	**370**	**0**	**454**	**2,245**
Total, All Energy	**1,425**	**2,026**	**725**	**2,021**	**6,198**

[a]The category Oil, Gas, and Coal Combined includes expenditures that were not allocated to any one of the three individual fuels.
[b]Alcohol fuels excise tax.
[c]Electricity research and development includes only Advanced Turbine Systems. Other generation technology research and development is distributed by fuel.
[d]Further estimates of Federal electricity subsidies, not included in this table, are presented in Chapter 4.
Note: Totals may not equal sum of components due to independent rounding.
Sources: Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999), and estimates presented in this report.

Fossil fuels received nearly half of the total subsidies in fiscal year 1999 (Table 22). Nuclear and electricity subsidies each amounted to approximately 10 percent. Renewables received nearly $1.1 billion, or 18 percent, but the ethanol excise tax expenditure of $725 million constituted most of the total. End-use subsidies were about 9 percent of the total, most of which was directed to R&D programs. Conservation programs received a little more than 4 percent of the total.

Comparisons With EIA's 1992 Report

Comparing these findings with those reported in 1992 reveals that subsidies to energy transformation and end use have declined about 10 percent (Table 23).[144] A 29-percent decline in direct expenditure subsidies is offset by the introduction of two new tax expenditures and an increase in R&D subsidies (Figure 6). Despite a reduction in the value of the interest exclusion on energy facility bonds, tax expenditures increased overall by 75 percent with the introduction of an exclusion from income of conservation subsidies provided by public utilities and tax credits and deductions for clean fuel vehicles. Overall, Federal funding for energy end use R&D increased by 59 percent.

Table 23. Comparison of Estimates of Federal Financial Interventions and Subsidies in Energy Transformation and End Use on a Budget Outlay Basis: 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			
LIHEAP	1,500	1,712	1,255
Weatherization Assistance and State Energy Programs	262	299	166
Subtotal (Direct Expenditures)	*1,762*	*2,010*	*1,421*
Tax Expenditures			
Interest Income Exclusion (Certain Energy Facilities)	185	211	155
Utility-Sponsored Conservation Exclusion[a]	NI	NI	110
Credit/Deduction for Clean Fuel Vehicles[a]	NI	NI	105
Subtotal (Tax Expenditures)	*185*	*211*	*370*
Research and Development			
Building Technology, State and Community Programs	45	51	81
Industry[b]	97	110	133
Transportation	109	125	202
Unallocated	3	3	38
Federal Energy Management Program Adjustment[c]	-4	-5	NA
Subtotal (Research and Development)	*249*	*285*	*454*
Total	**2,196**	**2,506**	**2,245**

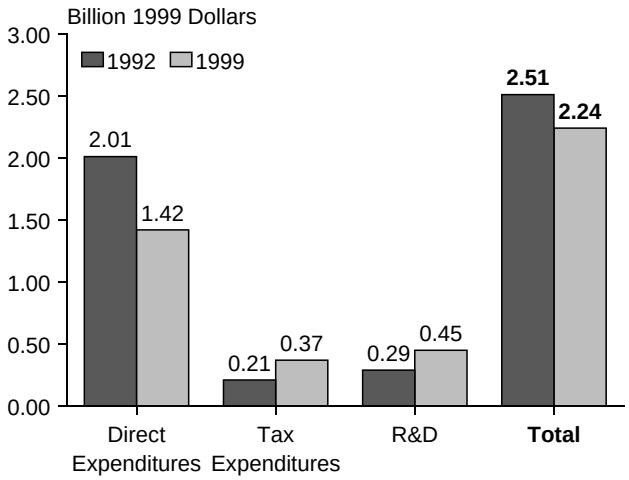
NI = not included. NA = not applicable.
[a]Program not in existence in 1992.
[b]Expenditures for Advanced Turbine Systems ($33 million) were reported as primary energy.
[c]FEMP was not itemized separately in 1992 budget documents. It has been removed in this report.
Sources: Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992); *Federal Financial Interventions and Energy Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999); and estimates presented in this report.

[144]The summary estimates shown here are for subsidies in a single year, fiscal year 1999. Comparisons with EIA's 1992 report rely on data for two years, fiscal year 1992 and fiscal year 1999. Consequently, comparisons across energy sources and uses may not adequately describe cumulative or historical effects, for which the allocations could differ.

In the 1992 report, total transformation and end use were dominated by two direct expenditures, the LIHEAP program and the DOE Conservation programs; but by 1999, subsidies showed greater distribution across program types (Tables 20 and 24). The share of total subsidies attributable to these two direct expenditure programs declined from 80 percent to 63 percent. The share attributable to tax expenditures increased from 8 percent to 16 percent, while the R&D share increased from 11 percent to 20 percent. Distribution of subsidies across fuels remained broad, with increases for electricity and end use, and decreases for conservation, oil, and gas.

Overall, Federal energy subsidies are estimated to have declined by 16 percent over the past 7 years, from $7.3 billion in 1992 to $6.2 billion in 1999 (Table 25 and Figure 7).[145] Contributing to the decline was a reduction in LIHEAP expenditures, from $1.712 billion (1999 dollars) to $1.255 billion, a decline of nearly 27 percent, and a significant reduction in DOE's Weatherization Assistance and State Energy programs. Over the range of energy subsidies addressed in fiscal year 1999, five items were eliminated entirely, resulting in a reduction of $177 million, and four programs were introduced over the period, totaling $464 million.

Figure 6. Summary of Energy Transformation and End Use Subsidy Elements, 1992 and 1999



Note: Totals for 1992 and 1999 exclude estimates of subsidies to Federal electricity suppliers. Totals may not equal sum of components due to independent rounding.

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

The largest tax expenditure in 1992, excess of percentage over cost depletion, exhibited the greatest decline both in absolute and percentage terms, dropping from $1.2 billion to $0.3 billion (Table 25). This decline, however, was accompanied by a significant reduction in oil prices over the period, suggesting that much of the reduction in real terms stems directly from the petroleum market. Certain subsidies, however, display noteworthy changes not attributable to macroeconomic changes or changes specific to energy markets (Figure 8). R&D funding for natural gas and end-use activities was significantly higher in 1999 than in 1992, whereas funding levels for programs in nuclear R&D, coal R&D, and direct expenditures for DOE's two conservation programs were significantly lower.

[145]In 1992, EIA reported the following summary statistics (nominal 1992 billions): $4.88 billion for total subsidy, which included $1.409 billion for electricity budget outlays, against which an offset of $3.132 billion was taken for excise taxes (primarily, motor gasoline taxes directed to the Highway Trust Fund). No offset is taken in this report. Federal excises on petroleum products in 1998 may be as much as $30 billion (nominal dollars), of which motor gasoline accounts for more than two-thirds. With a short-run elasticity of around -0.05, the effect of the excise tax is negligible in reducing overall subsidy. In this report, electricity supports are analyzed separately, and no offset is made for excise taxes. Also, three 1992 values were adjusted—an additional $357 million was appropriated to LIHEAP in fiscal year 1992 and regulatory elements of two R&D items (Buildings Research and Standards and FEMP) were excluded from program costs, about $7 million in total. After applying these adjustments, the comparable total subsidy would be $6.431 billion in nominal 1992 dollars or $7.335 billion in 1999 dollars, as opposed to the $6.198 billion reported in 1999. See Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992), Table 1, and Table 25 in this report.

Table 24. Summary of Energy Transformation and End Use 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	392	0	0	0	**392**
Gas	843	0	0	0	**843**
Coal	4	0	0	0	**4**
Renewables	94	0	0	0	**94**
Electricity	205	211	0	0	**[a]416**
Conservation	471	0	0	0	**471**
End Use	0	0	0	[b]285	**285**
Total	**2,010**	**211**	**0**	**285**	**2,506**

[a]Excludes $1,608 million attributed to TVA, the Power Marketing Administrations, and the Rural Utilities Service.
[b]In this report, research and development programs are attributed to energy end use. Total is adjusted for FEMP.
Note: Totals may not equal sum of components due to independent rounding.
Sources: Office of Management and Budget, *Budget of the United States Government, Fiscal Year 1993* (Washington, DC, 1992); U.S. Department of Energy, *Appropriation History Tables, FY 2000 Budget*; and Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992).

Trends in Supports to Electricity, 1990 and 1998

The supports identified by the return on assets (historical cost) method show a significant decline over the period 1990 to 1998.[146] In 1990 (Table 26), it is estimated that the shortfall in recovering historical costs ranged from $2.2 billion (1999 dollars) in the low estimate to $3.3 billion (1999 dollars) in the high estimate.[147] In 1998 (Table 21), that shortfall had been reduced, ranging from $655 million (1999 dollars) in the low estimate to $1.6 billion in the high estimate. TVA's recent introduction of higher electricity rates has been important in reducing the overall level of this support.[148]

The market price methodology shows a decline as well. Estimates of that measure of support were $1.9 billion (1999 dollars) in 1990, falling to about $1.4 billion in 1998 (Tables 21 and 26). Again, TVA's higher wholesale rates reduced the overall level of support, but average revenues realized by all the PMAs approached revenues realized by investor-owned utilities, reflecting a reduction in wholesale prices generally, a gradual narrowing of the price differential, and the emergence of more competitive wholesale markets.

[146]Estimates for 1990 were recalculated in this report in order to facilitate valid comparison. See Chapter 4.
[147]The inclusion or exclusion of deferred assets and tax liability affected the Federal utilities differently as they were compared to privately owned utilities. See Chapter 4 for details.
[148]Most dollar values in the electricity analysis were converted to 1999 dollars using the Gross Domestic Product (GDP) deflator. The GDP deflator was applied to companies' prior year loan and interest data. Although the values on the companies' balance sheets and income statements do not change from year to year, the purpose of the calculation was to estimate Federal Government support in a consistent framework. The framework chosen was the value of Federal Government support in terms of its 1999 purchasing power. The 1999 GDP deflator was 22 percent higher than the 1990 value and 1 percent higher than the 1998 value.

Table 25. Comparison of Estimates of Federal Financial Interventions and Subsidies in 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
Low Income Home Energy Assistance Program	1,500	1,712	1,255
DOE Conservation (Weatherization and State Energy)	262	299	166
Subtotal (Direct Expenditures)	*1,834*	*2,093*	*1,425*
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	[a]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
Exclusion of Interest Income on Bonds for Certain Energy Facilities	185	211	155
Exclusion for Utility-Sponsored Conservation Measures	NI	NI	110
Credit, Deduction for Clean Fuel Vehicles	NI	NI	105
Subtotal (Income Taxes)	*2,100*	*2,396*	*2,026*
Excise Taxes	460	525	725
Subtotal (Tax Expenditures)	*2,560*	*2,921*	*2,751*
Research and Development			
Nuclear Power			
New Nuclear Plants	122	139	30
Waste/Fuel/Safety	620	707	467
Unallocated	148	169	143
Subtotal (Nuclear Power)	*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	[c]NI	[c]NI	[f]88
Advanced Clean Fuels	[d]NI	[d]NI	[g]16
Advanced Research and Technology Development	[e]NI	[e]NI	[h]20
Unallocated	79	90	97
Subtotal (Coal)	*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
Subtotal (Other Fossil Energy)	*96*	*109*	*164*
Electricity			
Advanced Turbine Systems/IRP[i]	5	5	33
Subtotal (Electricity, Primary Energy)	*5*	*5*	*33*
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
Subtotal (Renewable Energy)	*244*	*277*	*327*
End Use			
Building Technology, State and Community Programs	45	51	81
Industry	97	110	133
Transportation	109	125	202
Unallocated	3	3	38
Federal Energy Management Program Adjustment[j]	-4	-5	NA
Subtotal (End Use)	*250*	*285*	*454*
Clean Coal Technology Adjustment[k]	-253	-289	—
Subtotal (Research and Development including Clean Coal Technology)	*2,036*	*2,321*	*2,022*
Total	**6,430**	**7,335**	**6,198**

See notes on following page.

Notes for Table 25:

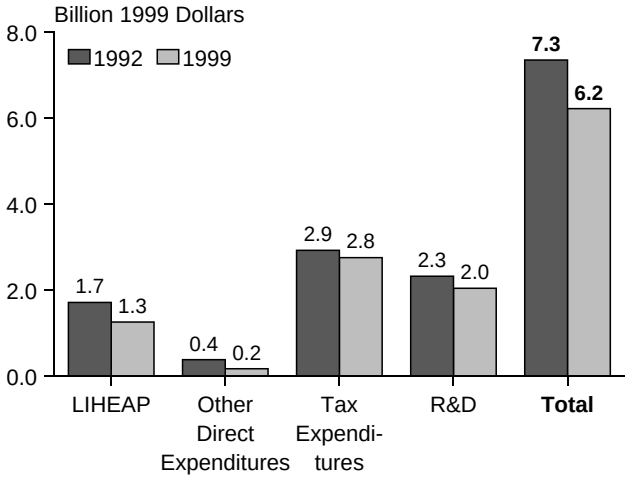
[a]Program terminated.
[b]Introduced in 1992 but not reported in the Federal budget until 1994.
[c]Reclassified as Advanced Research and Technology Development.
[d]Reclassified as Advanced Clean Fuels.
[e]Reclassified as Advanced Clean and Efficient Power Systems.
[f]Replaces Power Generation category from 1992 EIA report.
[g]Replaces Coal Conversion category from 1992 EIA report.
[h]Replaces Preparation/Mining category from 1992 EIA report.
[i]Utility R&D for Integrated Resource Planning in 1992 budget documents.
[j]FEMP was not itemized separately in 1992 budget documents. It has been removed in this report.
[k]Value of appropriations from 1992 EIA report (1992) and value of outlays from September 1999 EIA report.

NI = not included. NA = not available.

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

Sources: Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992); *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999); and estimates presented in this report.

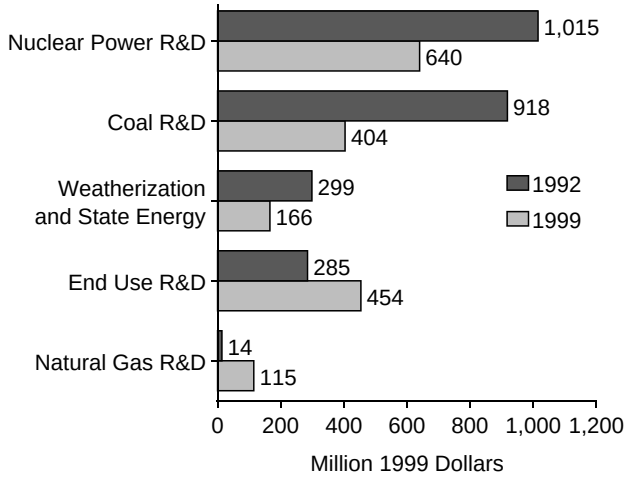
Figure 7. Summary of Federal Energy Subsidy Elements, 1992 and 1999



Note: Tax expenditures, direct expenditures, and research and development expenditures for 1992 include some amounts attributable to electricity as a fuel.

Sources: Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992); *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999); and estimates presented in this report.

Figure 8. Estimates of Selected Federal Financial Interventions and Subsidies, 1992 and 1999



Sources: Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992); *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999); and estimates presented in this report.

Table 26. Summary of Federal Support to Electricity Estimated by Three Valuation Methods, 1990
(Million 1999 Dollars)

Program	Method				
		Interest Rate[a]		Return on Assets	
	Market Price	Low Estimate	High Estimate	Low Estimate	High Estimate
Tennessee Valley Authority	440	—	—	1,257	1,993
Bonneville Power Administration	357	—	—	481	671
Western Area Power Administration	704	—	—	315	435
Southeastern Power Administration	260	—	—	76	118
Southwestern Power Administration	150	—	—	51	74
Rural Utilities Service[b]	—	—	—	—	—
Total	**1,912**	**—**	**—**	**2,179**	**3,290**

[a]Interest rate estimates for 1990 could not be reestimated using the methodology in this report due to lack of some historical data.

[b]Estimates of supports conferred through the Rural Utilities Service could not be reestimated due to lack of some historical data.

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

Sources: Estimates presented in Chapter 4.

Interest rate supports in 1990 could not be reestimated, because certain historical data were not available to EIA. Under a previous methodology, those supports were estimated to range from $1 billion to $1.4 billion (1999 dollars) for the Federal utilities.[149] In 1998, total interest rate supports to TVA, BPA, and the three smaller PMAs ranged from $182 million to $588 million,[150] an apparent reduction over the period that is likely attributable to refinancing programs undertaken by TVA and BPA.[151]

Reduced interest rates on loans extended or guaranteed by the Rural Utilities Service resulted in supports of $985 million to $1.4 billion (1999 dollars) in 1990.[152] The low estimate of support dropped to $144 million in 1998, reflecting the low interest rates prevalent in capital markets, while the high estimate stayed about the same, at $1.557 billion. However, risk to the portfolio of loans made or guaranteed by RUS may have increased greatly in the interim, and several large loans have been written off entirely.

Energy Trust Fund Outlays

Energy trust funds were described in detail in EIA's September 1999 report on primary energy. The results are briefly summarized in this volume to consolidate all the findings. Total outlays for certain energy trust funds have increased since 1992.[153] Table 27 compares the outlays from seven energy trust funds as reported in the 1992 and 1999 EIA reports. Four show percentage increases, led by the Aquatic Resources Trust Fund (359 percent) and the Pipeline Safety Fund (157 percent). Three show percentage decreases, the largest of which is the Nuclear Waste Fund (down 39 percent). Altogether, outlays from the seven trust funds increased by 19 percent, from $1.95 billion (1999 dollars) in fiscal year 1992 to $2.3 billion in fiscal year 1999. The ultimate costs associated with these programs, storing high-level nuclear waste or repairing damage caused by leaking underground storage tanks, cannot be known with precision, and many of the costs may be realized far in the future. Therefore, costs associated with these programs are not included in summary totals.

[149]Alaska Power Administration, included in the 1992 report, has since been sold and is therefore not included in these estimates. See Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992), Table 17, p. 60.

[150]The value of Federal interest rate support depends on the benchmark bond series chosen for comparison. See Chapter 4.

[151]See Chapter 4 for additional details.

[152]Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992), Table 14, p. 57. Because a new methodology is introduced in this report, RUS is not included in Table 26. Comparisons between 1990 and 1998 should be treated cautiously.

[153]Neither EIA's September 1999 report nor EIA's report of November 1992 evaluated the full costs of trust fund programs because of the difficulty in determining the actuarial sufficiency of the excise taxes.

Table 27. Comparison of Outlays to Energy Trust Funds, Fiscal Years 1992 and 1999
(Million 1999 Dollars)

Energy Trust Fund	Fiscal Year 1992	Fiscal Year 1999	Percent Change
Black Lung Disability	1,107	1,021	-7.8
Abandoned Mine Reclamation	176	247	40.3
Nuclear Waste Fund	301	185	-38.5
Oil Spill Liability	176	178	1.1
Pipeline Safety Fund	14	36	157.1
Leaking Underground Storage Tank Fund	99	67	-32.3
Uranium Enrichment Decontamination and Decommissioning[a]	NA	223	NA
Aquatic Resources[b]	81	372	359.3
Total	**1,953**	**2,329**	**19.3**

[a]The Uranium Enrichment Decontamination and Decommissioning Trust Fund was established by the Energy Policy Act of 1992.

[b]Includes amounts for boat safety, coastal wetlands, and sports fish restoration.

NA = not applicable.

Sources: Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992); and *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999).

Appendix A
Previous Studies of Federal Subsidies to Electricity and Public Power

Introduction

A variety of methods have been used to estimate the magnitude of subsidies involved in Federal provision of electricity and other financial advantages that accrue to public sources of electric power. With the decline of some types of subsidies and the onset of an increasingly competitive wholesale electricity market, an increasing number of analysts have opted for a measure of subsidy based on the actual value of the commodity.

Table A1 at the end of this appendix provides some detail about the methods used in nine other reports on subsidies present in the Federal supply of electricity. The first two, both analyses of the 1980s, arrived at relatively large estimates, using program outlays in the Federal budget, tax expenditures, and loans. The Tax Reform Act of 1986 gradually phased out accelerated cost recovery, by which capital-intensive industries received very large subsidies. While continuing the budget analysis of the 1980s, the 1992 report by the Energy Information Administration (EIA)[154] introduced the idea of measuring subsidies through market comparison, in this case a comparison of Power Marketing Administration (PMA) wholesale rates with the wholesale rates of adjacent investor-owned utilities.[155]

Over a period of several years, the U.S. General Accounting Office (GAO) published a series of reports on the operations of the PMAs. The reports specified several areas (benefits, delayed and abandoned construction projects, and legislative interventions preventing rate recovery) in which PMAs generally did not recover direct power costs through rates, and which therefore constituted a subsidy. The U.S. Department of Energy, responding for the PMAs, concurred with GAO's findings but suggested that some of the costs might ultimately be recoverable. The GAO also found and quantified several instances in which PMAs received subsidies through access to lower interest rates, and examined the impacts of price differentials using a slightly different market measure. GAO calculated the preference customers' average rate for PMA power and compared that to their average rate for power from all sources. It was concluded that, without Federal hydropower, rate impacts to preference customers would be varied and widespread; however, the report did not refer to this price differential as a subsidy.

The Congressional Budget Office (CBO) continued the use of average cost prices in its 1997 report, *Should the Federal Government Sell Electricity*? Attempting to determine the value of Federal assets, the authors determined the difference in average wholesale price between PMAs and investor-owned utilities. With this, the CBO was able to estimate the net cash flow from Federal assets. CBO found that a potential sale of these assets, in present value terms, would be heavily influenced by assumptions about future market rates, concluding that under pessimistic conditions, sale of all Federal assets would result in a budgetary loss of $200 million.

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

[155]The source for the comparison was Form EIA-861, "Annual Electric Utility Report."

As a competitive electricity market has been introduced in the past several years, a number of analysts have examined the question of price differential between public and private suppliers of electricity. While only tangentially related to the issue of subsidies, this literature lays out the many differences in cost character and purpose between investor-owned utilities and the several types of publicly owned utilities.

Annotated Bibliography

This bibliography briefly describes the estimates made in other reports for the range, magnitude, and effect of Federal intervention in electricity markets. The entries are arranged in chronological order and are characterized as "interest rate measure," "market measure," "budget analysis," or some combination thereof.

H.R. Heede, R.E. Morgan, and S. Ridley, *The Hidden Costs of Energy* (Washington, DC: Center for Renewable Resources, 1985). [*Interest rate and budget analysis*] Estimating Federal electricity subsidies at $28 billion (1984 dollars), the authors included tax provisions such as accelerated cost recovery, tax exemptions for municipal bonds, agency outlays for the Bureau of Reclamation, the Rural Electrification Administration (now the Rural Utilities Service), the Power Marketing Administrations, and the Tennessee Valley Authority (TVA).

M. Kosmo, *Money to Burn? The High Costs of Energy Subsidies* (New York, NY: World Resources Institute, 1987). [*Market measure*] Pointing out that the marginal cost of providing electricity was well above the price frequently realized, Kosmo suggested that U.S. consumers of electricity, especially consumers during peak periods, were receiving a subsidy of about $91 billion (1999 dollars) annually. The industry has changed greatly since 1987: peak load pricing is common in retail markets, wholesale markets generally reflect time-of-day value, and most importantly, marginal costs have fallen below the average costs realized in most retail transactions, thereby eliminating this type of subsidy.

C. Komanoff and C. Roelofs, *Fiscal Fission: The Economic Failure of Nuclear Power. A Greenpeace Report on the Historical Costs of Nuclear Power in the United States of America* (New York, NY: Komanoff Energy Associates, 1992). [*Other measure*] Using a cumulative approach to measuring subsidies to the nuclear industry in the United States, Komanoff quantified the total Federal subsidy to the industry at $97 billion (1990 dollars) over the period 1950-1990. Komanoff included Federal research and development, regulation, uranium enrichment, waste fund shortfall, and underpayment of taxes but did not include the Price-Anderson Act, which places substantial limitations on liabilities of nuclear operators.

D.N. Koplow, *Federal Energy Subsidies: Energy, Environmental, and Fiscal Impacts* (Lexington, MA: The Alliance to Save Energy, 1993). [*Interest rate and budget analysis*] Koplow estimated that program outlays for the PMAs and TVA amounted to $746 million (1989 dollars). Additionally, Koplow identified $1.2 billion in program outlays for the Rural Electrification Administration. Koplow estimated program outlays for the Army Corps of Engineers at $643 million, but he did not quantify a program outlay for the Bureau of Reclamation. Tax expenditures played an important role in Koplow's analysis. He estimated an interest rate subsidy of nearly $1.4 billion for exclusion of interest on municipal bonds, and another $283 million for the tax exclusion on bonds for certain energy facilities. By summing accelerated cost recovery tax deductions[156] and agency programs for primary energy sources and then allocating their effects to electricity by share of fuel, Koplow arrived at a total estimate for electricity subsidy of $22 billion (1989 dollars). Koplow did not include an estimate based on market price differential.

[156]Phased out by the Tax Reform Act of 1986.

U.S. House of Representatives, Subcommittee on Oversight and Investigations of the Committee on Natural Resources, *Taking from the Taxpayer: Public Subsidies for Natural Resource Development* (Washington, DC, 1994). [*Combination*] The majority staff report cited EIA's 1992 estimate for both historic cost subsidies and the market price subsidy without specifying a preferential method. The report addressed Federal hydropower projects in the 17 States served by the Bureau of Reclamation, which produce power marketed by two PMAs, the Western Area Power Administration (WAPA) and the Bonneville Power Administration (BPA). The report also mentioned that loans and loan guarantees administered by the Rural Electrification Administration (REA) constituted a subsidy.

Putnam, Hayes & Bartlett, Inc., *Analysis of TVA Subsidies and Artificial Competitive Advantages* (Washington, DC, August 1995). [*Combination*] Putnam estimated that TVA received $1.217 billion in subsidies in 1993. About half the subsidy was attributed to exemption from Federal and State income taxes, calculated as the revenue requirement necessary to bring TVA to a tax liability comparable to investor-owned utilities, 2.97 percent of net electric utility plant. Other areas of subsidies quantified were exemptions from other State and local taxes (net of payment in lieu of taxes), about 38 percent of total subsidies. Federal revenue losses from sales of preference power and State and local tax expenditures to TVA bondholders comprised relatively small portions of total subsidy.

U.S. General Accounting Office, *Federal Power: Outages Reduce the Reliability of Hydroelectric Power Plants in the Southeast*, GAO/T-RCED-96-180 (Washington, DC, July 1996). [*Other measure*] Focusing on the Corps of Engineers hydroelectric resources marketed by the Southeastern Power Administration, GAO found that 11 plants comprising 1.96 gigawatts of hydroelectric capacity experienced an availability decline of about 8 percent over the period 1987 to 1995. The report suggested that the Corps of Engineers planning and budgeting systems did not facilitate effective maintenance schedules. Ironically, the reduced output necessitated rate increases for Southeastern, which under a market price methodology would reduce the extent of the Federal subsidy.

U.S. General Accounting Office, *Power Marketing Administrations: Cost Recovery, Financing, and Comparison to Nonfederal Utilities*, GAO/AIMD-96-145 (Washington, DC, September 1996). [*Combination*] In this report, GAO estimated costs and revenues using three methodological questions: have three PMAs (Southeastern, Southwestern, and Western) been able to recover their power-related costs? Do they realize a subsidy through their financing? And is there a market-price differential between them and non-Federal utilities with respect to wholesale rates? GAO reported that these three PMAs have not recovered their power-related costs, falling short in 1995 by $83 million.[157] Cumulatively, GAO estimated a shortfall from these power-related projects of $1.8 billion (1995 dollars).[158] Additionally, GAO estimated a financing subsidy totaling $228 million in 1995, arising from the difference between average interest rate costs and the Treasury average interest rate.[159] GAO also found that PMA average wholesale rates were about 40 percent below those of adjacent investor-owned utilities in 1994, and that a roughly equivalent disparity in prices existed for the years 1990-1993 as well.

J.E. Kwoka, Jr., *Power Structure—Ownership, Integration, and Competition in the U.S. Electricity Industry* (Boston, MA: Kluwer Academic Publishers, 1996). [*Combination*] In an academic analysis of the principal dimensions of the performance of the U.S. electric power industry, Kwoka finds that publicly owned utilities have overall costs that are 5.5 percent lower than those of investor-owned utilities. The lower costs for publicly owned utilities arise in the

[157]Two projects have not operated as designed, the Russell project and the Truman project. Two other projects, Washoe and Mead-Phoenix, are in financial danger, and a transmission line was abandoned. According to GAO, the Pick-Sloan irrigation project will probably not be completed, preventing the recovery of those costs in the absence of Congressional action. Certain environmental mitigation costs incurred at Shasta dam and Glen Canyon dam have also been excluded from rate recovery.

[158]"Cumulatively," apparently, means "over the past 30 years."

[159]GAO suggested that the cumulative financing subsidy could be "in the billions."

distribution sector, while investor-owned utilities achieve greater efficiency in generation. Publicly owned utilities price their power lower than investor-owned utilities, ranging between 2.5 percent and 3.7 percent. The residential sector realizes most of the price benefits. Kwoka finds significant vertical economies of scale, providing a cost rationale for the traditional industry structure. Thus, the role of ownership type in overall performance is given a cost basis, indicating that coexistence of public and private ownership is both rational and beneficial.

R. Munson, *Federal Power Dinosaurs: Reforming TVA and PMAs in a Competitive Electricity Environment* (Washington, DC: Northeast-Midwest Institute, 1997). [*Combination*] Munson cites several other studies, claiming annual subsidies as high as $3.2 billion annually.[160] Munson placed estimates of revenue forgone by TVA's exemption from Federal income tax at $1.2 billion, and he argued that TVA enjoyed a large financial advantage in the bond market, attributing its AAA rating more to TVA's association with the Federal Government than to its management practices and balance sheet.

U.S. General Accounting Office, *Federal Power: Issues Related to the Divestiture of Federal Hydropower Resources*, GAO/RCED-97-48 (Washington, DC, March 1997). [*Combination*] Without arriving at a recommendation, GAO identified some of the factors affecting the divestiture debate. The report acknowledged the considerable financial advantages in obtaining capital and mentioned the ability of the PMAs to charge lower rates than privately owned wholesalers. The report also described the preference customers, the chief beneficiaries of the subsidy, in some detail. Sale of these assets would allow the highest bidder to decide the extent and distribution of their potential benefits in water management, flood control, irrigation, recreation, and environmental management; however, the question of compatibility between public and private interests in the management of these assets remains.

Congressional Budget Office, *Reducing the Deficit: Spending and Revenue Options* (Washington, DC, March 1997), pp. 219-220. [*Market measure*] In a general discussion of reducing the deficit, CBO calculated that the Federal Government could net $65 million if PMAs, excluding Bonneville, were to charge the average wholesale rate realized by privately owned utilities (3.8 cents per kilowatthour in 1995). Another $145 million could be realized by ending BPA's residential exchange program, yielding a total annual savings of $210 million.

A. Richardson, "Public Power: An Inexpensive Insurance Policy Against Consolidation," *Public Utilities Fortnightly*, Vol. 135, No. 16 (September 1, 1997), pp. 40-45. [*Combination*] Richardson points out the important role that public power can play in sponsoring a competitive electricity marketplace. Objecting to the idea that the PMA practice of pricing power at cost constitutes a subsidy, he suggests that the real issue is whether or not the Federal Government should pursue maximum return on its investment in infrastructure. Richardson also argues that the nominal value to IOUs of cumulative net deferred income taxes exceeded $57 billion by 1994.

U.S. General Accounting Office, *Federal Electricity Activities: The Federal Government's Net Cost and Potential for Future Losses*, GAO/AIMD-97-110 (Washington, DC, September 1997). [*Treasury interest rate subsidy*] GAO itemized the Federal Government's net recurring cost, the differential between total expenses incurred and total revenue received from electricity activities, in an attempt to quantify the Government's exposure to risk in increasingly competitive electricity markets. GAO used an "accrual method," similar to the interest rate subsidy discussed here, using the Treasury rate for comparison, finding that in 1996, the net financing cost to the Federal Government was $1.459 billion, more than half of which was attributed to the Rural Utilities Service (RUS). With the inclusion of a writeoff

[160]Munson attributed that estimate to EIA (1992), summing the $1.2 billion from the interest rate subsidy and another $2 billion from the market price subsidy, which was illustrated but not included in the total. In the 1992 report, EIA quantified the subsidy at $1.4 billion, based on Federal budget information and net outlays.

of loans incurred by the RUS and direct power costs incurred by PMAs not recovered through rates, GAO estimated the subsidy for 1996 at $2.5 billion. Over the period 1992-1996, GAO estimated the net financing cost as $6.9 billion (constant 1996 dollars) and the total net cost as $8.6 billion.

Congressional Budget Office, *Should the Federal Government Sell Electricity?* (Washington, DC, November 1997). [*Combination*] Not necessarily geared to the issue of subsidy, the report is a comprehensive examination of the value of Federal hydropower assets, including TVA. Three methods of valuation were employed: maximum value to the private sector; present value of additional tax receipts to the Federal Government; and the present value of the net income stream which the Federal Government would forgo absent ownership of the assets. The assumption is that private owners would raise rates to prevailing market levels, and that the Federal Government would retain the debt obligations of the PMAs. The total value of these assets ranged from $45 to $62 billion. Divesting the assets might result in budgetary savings of as much as $16 billion or a budgetary loss of $0.2 billion, depending on future power rates.

U.S. General Accounting Office, *Rural Utilities Service: Risk Assessment for the Electric Loan Portfolio*, GAO/T-AIMD-98-123 (Washington, DC, March 1998). [*Combination*] Testimony focusing on the viability of RUS loans. As of September 1996, RUS had outstanding loans of $32 billion, about $10 billion of which GAO classified as "financially stressed." To a certain extent, loan recipients might be shielded from competitive pressure because of wholesale power contracts, but these are now being challenged in court, increasing the risk to the Federal Government.

Putnam, Hayes & Bartlett, Inc., *Subsidies and Unfair Competitive Advantages Available to Publicly-Owned Utilities* (Washington, DC, March 1998). [*Combination*] In a report prepared for the Edison Electric Institute, the trade association representing investor-owned utilities, the authors describe and estimate four components of subsidy to public power: income tax advantage, other tax advantages, reduced cost of capital, and the effects of preferential treatment by Federal power producers. Summing these four, the authors estimate the total subsidy at $6.23 billion for 1995, of which $1.32 billion can be traced to differences in average interest rates, with another $1.86 billion attributed to the difference between the revenue needs of investor-owned utilities (IOUs) and those of municipals, were they to lose Federally supplied hydropower. In a more direct analogy to the market-price methodology employed here, the authors also estimate the revenue forgone by the Federal Government at $4.475 billion (1995), again by applying the difference in cost basis between IOUs (4.87 cents per kilowatthour for bulk power) and PMAs (3.05 cents per kilowatthour). Under PHB's revenue forgone methodology, the Federal income tax component of total subsidy increases from $2.26 billion to $3.32 billion, reflecting exempted interest income realized by holders of securities issued by Federal and municipal utilities.

U.S. General Accounting Office, *Federal Power: Options for Selected Power Marketing Administrations' Role in a Changing Electricity Industry*, GAO/RCED-98-43 (Washington, DC, March 1998). [*Combination*] This report lays out three options for rethinking the Federal Government's role in generation and wholesale electricity markets: continue under the present regime of Federal ownership and operation; institute certain management and operations improvements, including restructuring PMAs as Federally owned corporations or raising rates such that direct power costs would be fully recovered; and full divestiture of the PMAs' assets. Noting that all electricity suppliers would soon face increased competition, the report indicated that the hydropower assets and the recovery of their costs posed some risk for the Federal Government. In discussing the divestiture option, GAO found that some preference customers would face higher rates if PMAs were transferred to private ownership. GAO also echoed CBO's (November 1997) finding that, under certain market conditions, the sale of these assets could result in a net loss to the Federal treasury.

L.L. Peters, *The Costs and Benefits of Federal Power Programs*, A Critique of the Report, "Should the Federal Government Sell Electricity?" Prepared for the American Public Power Association (Washington, DC: Northwest Economic Research, Inc., May 1998). [*Market measure*] Peters objects to CBO's methodology, specifically, the exclusive focus on Federal budget impacts, and he argues that CBO minimizes potentially problematic issues such as market power and regulation of transmission assets and ancillary services. Significantly, Peters objects to average wholesale cost as a viable factor in determining the present value of Federal assets because the data year, 1995, reflects noncompetitive prices and wholesale contracts from the 1980s. With specific regard to the Pacific Northwest, Peters suggests using a forecasted price for some future year as a better proxy for market value, thereby reducing the valuation to the Federal budget from $19.9 billion to $11.4 billion.

American Public Power Association, *Public Power's Lower Electric Rates to Customers Are Not Explained by the Use of Tax-Exempt Financing and Preferential Access to Federal Hydro Power* (Washington, DC, July 1998). [*Interest rate, market measure*] The American Public Power Association reports that the difference in rates charged by investor-owned utilities and publicly owned systems is only partially attributable to the use of tax-exempt financing and access to Federal hydroelectricity. With average embedded interest rates 1.1 percent less than those paid by IOUs, publicly owned systems would need to recover an additional $564 million (1999 dollars), which would require an average rate increase of 2.8 percent. This additional revenue requirement would narrow the differential between publicly owned utilities' rates and IOUs' rates by just 16 percent. If Federal hydropower were reallocated according to peak demand imposed by three types of utilities (rather than statutory preference), then publicly owned systems would need to recover an additional 3.6 percent.

C. Fischer and M.A. Toman, *Environmentally and Economically Damaging Subsidies: Concepts and Illustrations* (Washington, DC: Resources for the Future, October 1998). [*Combination*] The authors describe the financing mechanisms of public power and the PMAs as inefficient and environmentally damaging and note that certain tax exemptions increase electricity demand. The authors also expect that emerging wholesale markets will gradually erode the effects of these financial subsidies.

U.S. General Accounting Office, *Federal Power: Regional Effects of Changes in PMAs' Rates*, GAO/RCED-99-15 (Washington, DC, November 1998). [*Market measure*] This report provides a State-by-State analysis of changes to the rates of PMA preference customers in the event that market rates were to prevail. The report is broader in scope than the companion January 1999 report (GAO/RCED-99-55). A market price comparison was employed, finding that Southeastern's preference customers would experience the smallest rate increases, and that Western and Southwestern's preference customers might experience moderate rate increases. To estimate the market rate, GAO first determined the average wholesale rate paid by preference customers for power from all sources, and then determined the average wholesale rate paid to all sources other than PMAs, with the difference being the market rate. The report also estimates possible effects at the residential retail level of the markets. Bonneville Power was excluded from the study.

MSB Energy Associates, *Federal Tax Breaks That Lower Investor-Owned Utility Costs and U.S. Treasury Revenues*, Paper Prepared for the American Public Power Association (Madison, WI, December 1998). [*Tax analysis*] MSB estimated that IOUs benefited in the amount of $8.4 billion in 1996. Most of the benefit came from deferred income taxes arising from accelerated depreciation. Smaller benefits were attributed to investment tax credits and IOU issues of tax-free bonds. Treasury losses in 1996 were estimated as $8.8 billion, arising from the loss of direct taxes through deferred income taxes and income tax credits as well as forgone income taxes on equity and interest income.

U.S. General Accounting Office, *Federal Power: PMA Rate Impacts, by Service Area*, GAO/RCED-99-55 (Washington, DC, January 1999). [*Market measure*] Reporting on estimated impacts for preference customers of the PMAs, the report examines rate impacts by PMA and describes potential impacts of PMA rate changes in specific, disaggregated State markets. GAO used the market price analysis developed in its November 1998 report and reached the same substantive conclusions found previously, namely, that Southeastern's preference customers would likely experience small rate increases, and that areas served by Southwestern and Western would likely face moderate rate increases. Certain markets served by Western Area Power in South Dakota, Iowa, and Minnesota could face sizable rate increases.

U.S. General Accounting Office, *Federal Power: Implications of Reduced Maintenance and Repairs of Federal Hydropower Plants*, GAO/RCED-99-63 (Washington, DC, March 1999). [*Combination*] Reduced reliability of Federal hydropower assets places a strain on their ability to compete with more reliable units. GAO found that over the period 1993-1997, units operated by the Bureau of Reclamation were available about 83 percent of the time, and units operated by the Corps of Engineers were available about 89 percent of the time. The industry average for non-Federal hydroelectric assets was 91 percent. The report described some alternative finance strategies that Bonneville Power had used to fund much-needed maintenance. The report pointed out the difference in rates charged by PMAs and other private wholesalers but suggested that, ultimately, the lower rates helped the PMAs recover their accumulated debt to the Treasury.

U.S. General Accounting Office, *Tennessee Valley Authority: Assessment of the 10-Year Business Plan*, GAO/AIMD-99-142 (Washington, DC, April 1999). [*Combination*] GAO reviewed TVA's 10-Year Plan for the period 1997-2007 and determined that TVA was on the "right track" in moving to reduce its high fixed financing costs in order to respond to competitive pressures by 2007. At the same time, GAO also characterized two of TVA's goals as "unachievable." Significantly, GAO approved of TVA's decision to refinance $2.7 billion of Federal Financing Bank (FFB) debt held at 9.67 percent to long-term bonds at 5.37 percent.[161] GAO projected that the refinancing measure alone would provide annual savings of $116 million over the 1997-2007 period. TVA's ultimate goal is to reduce its debt by half to about $14 billion, but GAO found that an additional 2 years would be needed to achieve that goal. TVA also has about $8.5 billion in deferred assets, primarily non-generating nuclear plants, which it hopes to reduce to $500 million by 2007; GAO doubted that the full reduction could be accomplished. Further, GAO found that TVA had underestimated certain costs over the period, namely, for capital expenditures on environmental equipment in excess of the $600 million per year allowed by the Plan, and for investment in new generating capacity. GAO found that TVA's assumptions about future market prices for electricity were reasonable, implying that the overall success of the Plan will be highly sensitive to market prices.

MSB Energy Associates, *Twisted Facts, Tortured Logic: EEI's Failed Attempt To Explain Away Public Power's Low Rates*, Paper Prepared for the American Public Power Association (Madison, WI, October 1999). [*Combination*] In a rebuttal to the Putnam, Hayes & Bartlett study of 1998, MSB argues that alternative calculations of the effects of income tax advantages, non-income tax advantages, cost of capital, and preference power yield a substantially different result. Of the 1.17 cents per kilowatthour difference in average retail rates, MSB reports that income tax exemptions account for only 22 percent of the price advantage enjoyed by publicly owned utilities, rather than the 50 percent figure implied by Putnam. For non-income tax exemptions, MSB calculates a percentage difference of 1 percent (Putnam implied 18 percent); for cost of capital, MSB accounts for 10 percent of the difference (Putnam implied 30 percent); and for preference power, MSB accounted for 3 percent of the difference (Putnam implied 42 percent).

[161]Congressional authority for the refinancing was included in the 1999 Treasury and General Government Appropriations Act.

Table A1. Comparison of Estimates for Federal Electricity Subsidies

Report, Author	Analysis Year	Estimate (Million Nominal Dollars)	Estimate (Million 1999 Dollars)	Scope	Approach	Main Findings (Nominal Dollars)
The Hidden Costs of Energy. Center for Renewable Resources	1984	28,000	42,080	Electric utilities	Budget outlay, tax benefits, loans	$4 billion attributed to REA, $1.2 billion in interest rate subsidy to PMAs and TVA.
Federal Energy Subsidies: Energy, Environmental, and Fiscal Impacts. Koplow	1989	13,666	17,380	Industry-wide, plus Federal	Tax benefits, budget outlays	$5.7 billion in agency outlays, of which $1.2 billion to REA, $7.9 billion in tax benefits, most of which to ACRS.
Federal Energy Subsidies. EIA	Fiscal year 1992	1,409	1,608	PMAs, TVA, REA	Budget outlay, net of receipts	Alternatively: $4.3 billion at IOU interest rate, $2.8 billion at government rate; $2 billion using market price.
Reducing the Deficit: Spending and Revenue Options. CBO	1995	210	223	BPA, PMAs	Cross subsidy, and price difference	$145 million for BPA's residential exchange program; another $65 million is revenue forgone from a PMA average wholesale rate lower than the national average, and the preferred customer requirement.
PMAs: Cost Recovery, Financing, and Comparison to Nonfederal Utilities. GAO	Fiscal year 1995	311	330	SEPA, SWPA, WAPA	Interest rate subsidy plus unrecovered costs	Includes $228 million in Treasury rate subsidy for three PMAs and $83 million for direct power costs not recovered through rates.
The Federal Government's Net Cost and Potential for Future Losses. GAO	Fiscal year 1996	2,462	2,565	SEPA, SWPA, WAPA, BPA, RUS	Interest rate subsidy plus unrecovered costs	Includes $1.878 billion for RUS, $185 million for three PMAs' financing costs and other power-related costs, and $398 million for BPA.
Should the Federal Government Sell Electricity? CBO	1995	Not estimated	Not estimated	Federal utilities	Net cash flow in present terms using average market rates	Federal assets are worth between $45 billion and $62 billion, depending on power rates; selling these assets would either net $16 billion or cost $0.2 billion.
Regional Effects of Changes in PMAs' Rates. GAO	1995	Not estimated	Not estimated	SEPA, SWPA, WAPA	Differential in preference customer average rates between PMA power and all power sources	Very little price differential in SEPA, moderate price differential in SWPA and WAPA.
Subsidies and Unfair Competitive Advantages Available to Publicly-Owned Utilities. Putnam, Hayes & Bartlett	1995	4,475	4,749	All customers, including IOUs	Market price difference	Market price estimated as the difference between IOUs' bulk rate (4.87 ¢/kWh) and PMAs (3.05). Report also estimates competitive advantage through tax avoidance and lower cost of capital.

Appendix B

Fact Sheets on Federal Subsidies and Other Interventions for Energy Transformation and End Use

1. Low Income Home Energy Assistance Program

Description

The Low Income Home Energy Assistance Program (LIHEAP), originally established in 1981, is a block grant program under which the Federal Government gives States, the District of Columbia, U.S. territories, and Indian tribal organizations annual grants to provide home energy assistance for needy households. LIHEAP is administered through the U.S. Department of Health and Human Services, but most of the important decisions about the program's implementation are left to the grantees. LIHEAP assistance does not reduce eligibility or benefits under other aid programs.

Federal rules also require outreach activities; coordination with the U.S. Department of Energy's Weatherization Assistance Program; and annual audits. Grantees decide the mix and dollar range of benefits, choose how benefits are provided, and decide what agencies will administer the program components. In addition to funds used for heating and/or cooling assistance, however, a reasonable amount of the funds must be set aside by grantees for energy crisis intervention. Up to 15 percent of grantees' allotments (up to 25 percent with a waiver) may be used for low-cost residential weatherization or other energy-related home repair.

Payments may be made directly to eligible households or to home energy suppliers. Assistance may be provided in the form of cash, vouchers, or payments to third parties, such as utility companies or fuel dealers. In practice, the majority of the funds are paid directly to energy providers.[162]

Revenue Loss/Outlay

The fiscal year 1999 Omnibus Appropriations Bill, signed on October 21, 1998, provided $1.1 billion (1999 dollars) in LIHEAP funding for fiscal year 1999, plus $300 million appropriated in emergency funding of which $155 million was expensed, and $1.1 billion in advanced funding for fiscal year 2000. On October 9, 1998, the U.S. Senate and House of Representatives agreed to a Conference Report reauthorizing LIHEAP for 5 years at "such sums as may be necessary" for fiscal year 2000 and fiscal year 2001, and at $2 billion (nominal dollars) annually for fiscal years 2002 through 2004.

Rationale

When LIHEAP was first implemented, energy prices were rising rapidly. The program sought to help lower income families maintain their standard of living. Now, nearly one-half of all recipient households contain elderly or handicapped persons. The program subsidizes both heating and cooling energy use for lower income households.

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

No. 2 fuel oil, natural gas, coal, and electricity end use.

Impact

LIHEAP helps to ameliorate the impacts of high energy costs on lower income households. Excluding weatherization grants, the program functions as a subsidy to energy consumption.

[162]U.S. Department of Health and Human Services, web site www.acf.dhhs.gov/programs/opa/facts/heapfs.htm.

2. Building Technology Assistance Program

Description

The U.S. Department of Energy (DOE) provides conservation assistance in a number of areas, primarily through the Building Technology Assistance Program, which complements DOE's research and development efforts and accelerates the deployment of new technologies and the adoption of advanced building practices through technical and financial assistance, outreach, and selective demonstration projects. The Building Technology Assistance Program supports two grant programs: the Weatherization Assistance Program, which provides support for the weatherization of low-income homes, and the State Energy Program, which provides grants to promote innovative State energy efficiency and renewable energy activities.

Revenue Loss/Outlay

Federal appropriations outlays for the Building Technology Assistance Program amounted to $155 million (nominal dollars) in fiscal year 1998, $166 million in fiscal year 1999, and $191 million in fiscal year 2000.

Rationale

The Weatherization Assistance Program engages State and local partners to increase the efficiency of homes occupied by low-income citizens who can least afford rising energy bills. The State Energy Program provides grants to State and local governments to create a network for energy efficiency.

Major Form(s) of Energy/ Fuel Cycle Stage(s) Affected

Renewable fuels, oil, gas, and electricity end use.

Impact

The Building Technology Assistance Program subsidizes energy conservation and is designed to reduce energy consumption. Although the technologies supported often are cost-effective on their own, cost sharing with nonprofit and government agencies makes the first-cost barrier less inhibitive.

3. Exclusion of Interest Income on Energy-Related State and Local Bonds

Description

The interest on private activity bonds issued by State or local governments to finance certain energy facilities may be exempt from gross income for Federal tax purposes. There are three types of privately used facilities for which such bonds may be issued: facilities for the local furnishings of gas and electricity; district heating and cooling facilities; and certain environmental facilities at hydroelectric dam sites. Also included are bonds issued by local governments to acquire certain facilities previously owned by investor-owned utilities. The provision of local gas and electricity is limited to those investor-owned facilities that serve no more than two adjacent counties (or one city and an adjacent county). All of these tax-exempt private activity bonds can be issued only if they receive an allocation of authority to issue from a State's private activity bond volume cap. The cap for 1999 was the greater of $50 per capita or $150 million. Several other types of private activity bonds are also subject to these caps. The tax-free status of bonds for certain small-scale hydroelectric generating facilities, geothermal facilities, and alcohol production facilities was terminated in the 1980s.

Revenue Loss/Outlays

Estimated Revenue Loss and Outlay Equivalent, 1987-2004
(Million Nominal Dollars)

Fiscal Year	Revenue Loss			Outlay Equivalent[a] (Total)
	Individuals	Corporations	Total	
1987	0	305	305	360
1988	0	290	290	385
1989	0	315	315	380
1990	0	255	255	315
1991	0	125	125	185
1992	0	125	125	185
1993	100	65	165	235
1994	105	70	175	245
1995	105	70	175	250
1996	105	70	175	255
1997	105	70	175	255
1998	80	30	110	155
1999	80	30	110	155
2000	80	30	110	155
2001	85	30	115	165
2002	85	30	115	165
2003	85	30	115	165
2004	85	30	115	165

[a]An outlay equivalent is the amount of outlay that would be required to provide the taxpayer the same after-tax income as would be received through the tax preference.

Sources: **1987-1993**: Office of Management and Budget, *Budget of the United States Government, Fiscal Year 1993* (Washington, DC, 1992). **1994-2004**: Office of Management and Budget, *Analytical Perspectives, 2000* (Washington, DC, 1999). Also earlier editions.

Rationale

The tax exemption is intended to encourage the development of specific types of energy facilities.

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

Natural gas transformation, electricity generation.

Impact

The tax exemption encourages investment in debt-financed energy projects. The subsidy lowers utility financing costs and results in product prices that are lower and product consumption that is greater than they would be without the subsidy.

4. Exclusion of Utility Conservation Subsidies

Description

The Energy Policy Act of 1992 added a new provision to the tax code which allowed subsidies from utilities directed at individuals to be excluded from the gross income of the consumer. The subsidy applies to energy conservation measures funded by the utility for the benefit of consumers. Utilities engaged in demand side management activities often pay consumers to purchase more efficient heating or cooling equipment in order to reduce the consumption of natural gas and electricity.

There are two common utility-rebate programs offered to consumers. One is load-control, which involves the installation of devices that reduce energy usage during peak-demand periods.[163] The other, load management, involves the acquisition of more efficient energy appliances, which can be obtained through the utility, or through another party. These subsidies are excluded from gross income in calculating the consumer's tax liability.

Revenue Loss/Outlay

Estimated Revenue Loss and Outlay Equivalent, 1987-2004
(Million Nominal Dollars)

Fiscal Year	Revenue Loss			Outlay Equivalent[a] (Total)
	Individuals	Corporations	Total	
1987	NA	NA	NA	NA
1988	NA	NA	NA	NA
1989	NA	NA	NA	NA
1990	NA	NA	NA	NA
1991	NA	NA	NA	NA
1992	NA	NA	NA	NA
1993	50	0	50	70
1994	100	0	100	140
1995	130	0	130	175
1996	100	0	100	210
1997	70	0	70	95
1998	80	0	80	110
1999	80	0	80	110
2000	80	0	80	105
2001	75	0	75	105
2002	75	0	75	100
2003	75	0	75	105
2004	80	0	80	105

[a]An outlay equivalent is the amount of outlay that would be required to provide the taxpayer the same after-tax income as would be received through the tax preference.

NA = not available.

Sources: Office of Management and Budget, *Budget of the United States Government, Appendix 2000* (Washington, DC, 1999). Also earlier editions.

[163]B.M. Bird, S.M. Platau, and A. Warren, "Excluding Utility Rebates from Gross Income," *The CPA Journal* (March 1993), p. 56.

Rationale

The rationale for the tax subsidy is to encourage consumers to take advantage of utility funds available for the upgrade of heating and cooling equipment without penalty.

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

Natural gas transformation, electricity end use.

Impact

The relatively small size of the subsidy as compared with the billions of dollars spent on household appliances each year results in only a minor impact on U.S. demand for electricity and natural gas.

5. Tax Credit and Deduction for Clean-Fuel, Alternative-Fuel, and Electric Vehicles

Description

The Clean Air Act Amendments of 1990 (CAAA90) and the Energy Policy Act of 1992 (EPACT) mandate that vehicle fleets owned by fuel providers and State governments, as well as certain vehicle fleets operating in air quality nonattainment areas, gradually acquire and use low-emission vehicles in increasing percentages through the year 2010. CAAA90 includes measures directed at reducing the amount of pollutants emitted from vehicles. Petroleum-based gasoline and diesel fuels are acceptable under CAAA90, as long as the vehicles satisfy the prescribed emissions standards. EPACT requires the use of vehicles that operate primarily on fuels other than gasoline or diesel (called alternative-fuel vehicles or AFVs).

To encourage the use of clean-fuel vehicles and AFVs, Federal and State incentives are available, such as tax credits, deductions, and exemptions for purchases of AFVs, purchases of alternative fuels used in AFVs, and the costs of building and maintaining fueling and electric charging facilities. EPACT provides Federal incentives for the purchase or conversion of individual AFVs through Federal income tax deductions for clean-fuel vehicles[164] and income tax credits for electric vehicles (EVs).

The amount of the tax deduction for qualified clean-fuel vehicles (in nominal dollars) is based on the gross vehicle weight (gvw) and vehicle type as follows:

- $2,000 for automobiles, small vans and pickup trucks, and other small vehicles (excluding off-road vehicles)
- $5,000 for trucks or vans with gvw 10,000 to 26,000 pounds
- $50,000 for trucks or vans with gvw more than 26,000 pounds
- $50,000 for buses with seating capacity of more than 20 adults.

The tax deduction for clean-fuel vehicles is available for business or personal vehicles, except for EVs, which are eligible for the separate Federal tax credit described below. The deduction is not amortized and must be taken in the year the vehicle is acquired. A tax deduction of up to $100,000 per location is available for qualified clean-fuel refueling properties and EV recharging properties, provided that the equipment is used in a trade or business.

EPACT also provides an Electric Vehicle Tax Credit for purchases of qualified EVs and hybrid electric vehicles (HEVs). The amount of the credit is 10 percent of the cost of the vehicle, up to a maximum of $4,000. To qualify for the credit, the vehicle must be powered primarily by an electric motor drawing current from batteries or other portable sources of electric current. All dedicated, plug-in only EVs qualify for the tax credit. All series and some parallel HEVs meet these qualifications.[165] The tax credit for EVs is available for business or personal vehicles. The dollar amounts for the Clean Fuel Vehicle tax deduction and tax credits are phased out from 2002 through 2004.

Except for deductions for the purchase or conversion of AFVs and the Federal tax credits for EVs, most of the Federal incentives for advanced vehicle technologies are programmatic grants oriented toward large investments. The lead Federal agencies for AFV programs are the Department of Energy, the Department of Transportation, and the Environmental Protection Agency.

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[164]A vehicle for any model year in a class or category of vehicles that has been certified to meet the clean-fuel standards of CAAA90 applicable for that model year is considered a clean-fuel vehicle.

[165]A hybrid vehicle has an on-board electrical generating system (excluding fuel cell technology). A series hybrid system involves an internal combustion engine generating electricity to directly charge the batteries that propel the vehicle; a parallel hybrid system involves both the batteries and the internal combustion engine propelling the vehicle and recharging the batteries.

The Transportation Equity Act for the 21st Century (TEA-21) was signed into law by the President on June 9, 1998. TEA-21 authorizes a wide range of programs, including Federal surface transportation programs for highways, highway safety, and mass transit, for the 6-year period 1998-2003. It includes initiatives to promote infrastructure development in support of AFVs. The Highway Trust Fund (HTF) is the source of funding for most of the programs in the Act. Federal motor fuel taxes are the major source of income for the HTF. The full authorizations for the highway and transit programs in TEA-21 total almost $218 billion.

Revenue Loss/Outlay

Estimated Revenue Loss and Outlay Equivalent, 1998-2004
(Million Nominal Dollars)

Fiscal Year	Revenue Loss			Outlay Equivalent[a] (Total)
	Individuals	Corporations	Total	
1998	15	60	75	95
1999	15	65	80	105
2000	15	75	90	115
2001	15	80	95	130
2002	15	75	90	120
2003	15	60	75	95
2004	10	50	60	65

[a]An outlay equivalent is the amount of outlay that would be required to provide the taxpayer the same after-tax income as would be received through the tax preference.

Note: Includes tax deduction for clean-fuel vehicles and property and tax credit for AFVs. Does not include funds associated with TEA-21.

Source: Office of Management and Budget, *Analytical Perspectives, 2000* (Washington, DC, 1999).

Rationale

EPACT encourages the use of alternative fuels (fuels other than gasoline or diesel) in the transportation sector of the U.S. economy in order to decrease the Nation's dependence on foreign oil, increase energy security through the use of domestically produced alternative fuels, reduce the balance of payments deficit, and stimulate domestic employment. CAAA90 created several initiatives to reinforce one of the original goals of the Clean Air Act, to reduce pollutant emissions from mobile sources.

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

Energy Forms: alternative fuels (methanol, denatured ethanol, and other alcohols; and fuels other than alcohol derived from biological materials, including neat biodiesel); natural gas; propane; hydrogen; electricity (including electricity from solar energy); and any other fuel the Secretary of Energy determines, by rule, is substantially not petroleum and would yield substantial energy security benefits and substantial environmental benefits.

Fuel Cycle Stages: Energy transformation (refining and blending) and end use (light-duty and heavy-duty vehicles).

Impact

EIA's *Annual Energy Outlook 2000* projects that alternative fuels used in highway travel will achieve a 2.2-percent share of all motor fuel use for highway travel by 2010.[166]

[166]Energy Information Administration, *Annual Energy Outlook 2000*, DOE/EIA-0383(2000) (Washington, DC, December 1999).

6. Building Technology, State and Community Programs (BTS) Research and Development

Description

The mission of the U.S. Department of Energy (DOE) building technology research and development (R&D) program, within the Office of Energy Efficiency and Renewables Energy, is to make buildings more efficient and affordable and communities more livable. The goal of the Building Research and Standards program is to accelerate the introduction of highly efficient building technologies and practices through R&D and increase the minimum energy efficiency of buildings and equipment through appliance standards, building codes, and guidelines. The building technology R&D (non-grant) programs complement other DOE grant programs that help to demonstrate and increase consumer awareness of the benefits and costs of energy-efficient technologies. DOE has supported the development and market introduction of such technologies as electronic ballasts for fluorescent lights, the condensing gas furnace, and improved refrigerant compressors.

Revenue Loss/Outlay

Appropriations for the BTS program appropriations were $77.6 million in fiscal year 1998 and $96.2 million in fiscal year 1999. The appropriations included $14.4 million in fiscal year 1998 and $15.3 million in fiscal year 1999 for regulatory expenditures that are not considered subsidies in this report. Therefore, the adjusted funding level is $63.2 million in 1998 and $81.0 million in 1999. (All figures are in nominal dollars.)[167]

Rationale

Residential and commercial buildings accounted for more than one-third of U.S. energy use and 35 percent of U.S. carbon emissions in 1997.[168] The ratio of private investment in buildings R&D relative to expenditures is substantially lower than that for other industries, potentially slowing the rate of technological improvement in that sector.[169]

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

Oil, natural gas, and electricity end use.

Impact

The BTS 1998 Strategic Plan[170] established a goal of displacing 2 quadrillion British thermal units (Btu) of primary energy use by 2010 and to reduce carbon emissions in 2010 by 36 million metric tons relative to 1996 emissions.

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[167]U.S. Department of Energy, *U.S. Department of Energy Fiscal Year 2000 Congressional Budget Request*, DOE/CR-0059 (Washington, DC, May 21, 1999), Energy Efficiency and Renewable Energy, Building Technology, State and Community Sector.

[168]Energy Information Administration, *Annual Energy Outlook 2000*, DOE/EIA-0383(2000) (Washington, DC, December 1999), Tables A2 and A19.

[169]U.S. Department of Energy, *U.S. Department of Energy Fiscal Year 2000 Congressional Budget Request*, DOE/CR-0059 (Washington, DC, May 21, 1999), Energy Efficiency and Renewable Energy, Building Technology, State and Community Sector.

[170]U.S. Department of Energy, *U.S. Department of Energy Fiscal Year 2000 Congressional Budget Request*, DOE/CR-0059 (Washington, DC, May 21, 1999), Energy Efficiency and Renewable Energy, Building Technology, State and Community Sector.

7. Federal Energy Management Program

Description

The Federal Energy Management Program (FEMP) was established in 1974 to provide direction, guidance, and assistance to Federal agencies in planning and implementing energy management programs. The mission of FEMP is to reduce the cost of Government by advancing energy and water efficiency, promoting renewables, and managing utility costs. Section 543 of the National Energy Conservation Policy Act, as amended by the Energy Policy Act of 1992 (EPACT) requires each agency to achieve: a 10-percent reduction in energy consumption in its Federal buildings by fiscal year 1995, when measured against a fiscal year 1985 baseline on a Btu-per-gross-square-foot basis; and a 20-percent reduction in Btu per gross square foot by fiscal year 2000. Furthermore, agencies were required to achieve a 30-percent reduction by fiscal year 2005 per Executive Order 12902, issued in 1994.

Executive Order 13123, "Greening the Government Through Efficient Energy Management" supersedes Executive Order 12902. Executive Order 13123 encourages effective energy management in the Federal Government and builds on work begun under EPACT and previous Executive Orders. The goals of the order include:

- Through life-cycle cost-effective energy measures, each agency shall reduce its greenhouse gas emissions attributed to facility energy use by 30 percent by 2010, compared to such emissions levels in 1990.

- Through life-cycle cost-effective energy measures, each agency shall reduce energy consumption per gross square foot of its facilities, excluding facilities covered in other sections of this order, by 30 percent by 2005 and 35 percent by 2010 relative to 1985.

- Through life-cycle cost-effective energy measures, each agency shall reduce energy consumption per square foot, per unit of production, or per other unit as applicable by 20 percent by 2005 and 25 percent by 2010 relative to 1990.

- Each agency shall try to expand the use of renewable energy within its facilities and in its activities by implementing renewable energy projects and by purchasing electricity from renewable energy sources. In support of the Million Solar Roofs initiative, the Federal Government shall strive to install 2,000 solar energy systems at Federal facilities by the end of 2000 and 20,000 solar energy systems at Federal facilities by 2010.

- Through life-cycle cost-effective energy measures, each agency shall reduce the use of petroleum within its facilities.

- The Federal Government shall strive to reduce total energy use and associated greenhouse gas and other air emissions, as measured at the source.

- Through life-cycle cost-effective measures, agencies shall reduce water consumption and associated energy use in their facilities to reach the goals set in the Order.

Revenue Loss/Outlay

Funding for FEMP, $23.8 million in 1999, is not included in the tables of this report—although it appears in the End Use R&D category of the DOE budget—because the impact of the program is primarily internal to the Federal Government. Funds are used for education, training, and encouragement of third-party investments.

Rationale

The Federal Government is the Nation's largest energy consumer. With more than 500,000 buildings, the Federal Government can lead the Nation in energy-efficient building design, construction, and operation. As a major energy consumer, the Federal Government can promote energy efficiency, water conservation, and the use of renewable energy products and help foster markets for emerging technologies. In fiscal year 1996, the Government spent nearly $8 billion to provide energy for its buildings, vehicles, and process energy.[171] In the private sector, profit is the incentive for making conservation investments. In the public sector, other incentives are needed to encourage cost-effective investments.

Major Form(s) of Energy/ Fuel Cycle Stage(s) Affected

Energy and water efficiency, renewable energy technologies, end use.

Impact

FEMP benefits the government by:

- Reducing building energy costs and saving taxpayers money. The fiscal year 1997 Federal building energy bill was down by more than $2 billion from 1985 (nominal dollars), about $900 million of which resulted from Federal energy management.[172]
- Expanding the marketplace by deploying new efficiency and renewable energy technologies. This will result in reducing pollution and generating new jobs.
- Promoting environmentally sound building design and operations.
- Setting a good example for State and local governments and the private sector.
- Establishing the United States as a leader among nations in managing its own energy costs.

[171]U.S. Department of Energy, Energy Efficiency and Renewable Energy Network, web site www.eren.doe.gov/femp/aboutfemp/fempoverview.html.

[172]U.S. Department of Energy, Energy Efficiency and Renewable Energy Network, web site www.eren.doe.gov/femp/aboutfemp/fempoverview.html.

8. Industrial Sector Research and Development

Description

The mission of the U.S. Department of Energy (DOE) industrial sector research and development (R&D) program, within the Office of Energy Efficiency and Renewable Energy, is to improve the energy efficiency, environmental performance, and productivity of energy-intensive industries by rapidly developing and delivering advanced science and technology options that will lower raw material and energy use per unit of output; improve labor and capital productivity; and reduce generation of wastes and pollutants. The energy-intensive industries include forest products, steel, glass, aluminum, chemicals, metal casting, agriculture, petroleum, and mining.

Revenue Loss/Outlay

The industrial sector program appropriations were $98.9 million in fiscal year 1998 and $132.9 million in fiscal year 1999. The Advanced Turbine Systems (ATS) program funding, which is excluded from these totals, was $35 million in fiscal year 1998 and $33 million in fiscal year 1999.[173] (All figures are in nominal dollars.)

Rationale

Industry consumed more than 38 percent of all the energy used in the United States in 1997.[174] Energy use is concentrated in a relatively small number of industries. Focusing efforts on these industries should lead to substantial benefits in terms of productivity gains and reductions in pollution and waste generation. Funding includes the development of industry road maps that identify and prioritize the research efforts supported under this program on a cost-sharing basis with private industry and in collaboration with national laboratories.

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

All fuels, end use.

Impact

DOE's Industry Sector Strategic Plan established a goal for 2010 of a 25-percent reduction from 1997 levels of energy consumption per unit of output.[175]

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[173]The ATS program is discussed under the classification of an electric utility-oriented research program on page 33 and page 95 in *Federal Financial Interventions and Subsidies in Energy Market 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999). Commercialization of the ATS is projected for 2001.

[174]U.S. Department of Energy, *U.S. Department of Energy Fiscal Year 2000 Congressional Budget Request*, DOE/CR-0059 (Washington, DC, May 21, 1999), Energy Efficiency and Renewable Energy, Industry Sector.

[175]U.S. Department of Energy, *U.S. Department of Energy Fiscal Year 2000 Congressional Budget Request*, DOE/CR-0059 (Washington, DC, May 21, 1999), Energy Efficiency and Renewable Energy, Industry Sector.

9. Transportation Sector Research and Development

Description

The U.S. Department of Energy (DOE) transportation sector research and development (R&D) program, within the Office of Energy Efficiency and Renewable Energy, funds activities directed at improved vehicle technology, fuels utilization, technology deployment, materials technologies, and related management and planning activities. The mission of the program is to support the development of advanced transportation vehicles and fuels that will reduce energy demand, particularly for petroleum; reduce criteria pollutant emissions; reduce greenhouse gas emissions; and enable U.S. transportation to sustain a strong competitive position in domestic and world markets. The transportation R&D program includes support to the Partnership for a New Generation of Vehicles (PNGV), which involves major U.S. vehicle manufacturers and multiple Federal agencies. The goal is to develop a mid-size family sedan with a fuel economy of up to 80 miles per gallon by 2004 without sacrificing comfort or safety. Research for the PNGV is directed at fuel cells, advanced direct-injection engines, exhaust systems, advanced batteries, and electronic power controllers.

Revenue Loss/Outlay

The transportation sector program appropriations were $190.0 million in fiscal year 1998 and $202.1 million in fiscal year 1999. The fiscal year 2000 request to Congress was $252.1 million. (All figures are in nominal dollars.) Included in these totals were appropriations for the DOE Clean Cities Program in the amount of $2.9 million in fiscal year 1998, $7.9 million in fiscal year 1999, and a request for $10.7 million in fiscal year 2000. (See the following fact sheet for the Clean Cities Program.) PNGV activities accounted for $116.7 million in fiscal year 1998 and $128.1 million in fiscal year 1999. The fiscal year 2000 budget request to Congress includes $143.1 million for the PNGV.

Rationale

Transportation accounts for almost 67 percent of the petroleum consumed in the United States.[176] Highway vehicles contribute significantly to urban air quality problems and to carbon dioxide emissions. Given the projections of substantial growth in the number of vehicles and increased total consumption of fuels, it is essential to develop vehicles with higher fuel economy and to expand the use of clean, nonpetroleum fuels.

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

Petroleum (primarily), natural gas, renewable fuels (ethanol), and electricity end use.

Impact

The transportation sector program goal is to promote the use of advanced petroleum-based fuels, nonpetroleum fuels, and more efficient vehicles sufficiently to reduce projected highway transportation oil consumption in 2010 by 10 percent from the Energy Information Administration's baseline forecast in its *Annual Energy Outlook 1999*.[177]

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[176]U.S. Department of Energy, *U.S. Department of Energy Fiscal Year 2000 Congressional Budget Request*, DOE/CR-0059 (Washington, DC, May 21, 1999), Energy Efficiency and Renewable Energy, Energy Conservation, Transportation Sector.

[177]U.S. Department of Energy, *U.S. Department of Energy Fiscal Year 2000 Congressional Budget Request*, DOE/CR-0059 (Washington, DC, May 21, 1999), Energy Efficiency and Renewable Energy, Energy Conservation, Transportation Sector.

10. Clean Cities Program

Description

Sponsored by the U.S. Department of Energy (DOE), the Clean Cities Program is designed to encourage the use of alternative-fuel vehicles (AFVs) and their supporting infrastructure throughout the Nation. The Clean Cities organization is built on the premise that we can change our communities for the better through cooperation and voluntary partnerships, working to reduce our reliance on imported oil and improving air quality. Unlike traditional command-and-control programs, the Clean Cities Program involves the voluntary participation and partnership of local stakeholders, such as State and local governments and private businesses.

The Clean Cities Program is set up as a support program only. DOE funding supports the organization and management of the program, including information dissemination. Clean Cities coalitions do not directly receive funding from DOE but may receive information on a variety of funding sources. Although Clean Cities coalitions do not receive or distribute funds, they do act as magnets for Federal funding, such as Congestion Mitigation and Air Quality Improvement (CMAQ), and innovative alternative-fuel projects. Special alternative-fuel projects that support the Clean Cities Program may receive financial assistance through DOE's State Energy Program.

Revenue Loss/Outlay

The appropriations for the DOE Clean Cities Program (in nominal dollars) were $2.9 million in fiscal year 1998, $7.9 million in fiscal year 1999, and a request for $10.7 million for fiscal year 2000.

Rationale

Emissions from vehicles are the single largest contributor to air pollution in many cities, affecting air quality and increasing health care costs. Expanding the use of alternative fuels through the Clean Cities Program offers solutions to many of these problems. By encouraging AFV use, the Clean Cities Program will help achieve energy security and environmental quality goals at both the national and local levels.

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

Energy Forms: alternative fuels (methanol, denatured ethanol, and other alcohols; and fuels other than alcohol derived from biological materials, including neat biodiesel); natural gas; propane; hydrogen; electricity (including electricity from solar energy); and any other fuel the Secretary of Energy determines, by rule, is substantially not petroleum and would yield substantial energy security benefits and substantial environmental benefits. **Fuel Cycle Stages:** Energy transformation (refining and blending) and end use (light-duty and heavy-duty vehicles).

Impact

The Clean Cities Program will have the ongoing impacts of advancing clean air objectives; facilitating AFV production and conversion; expanding local refueling infrastructure; supporting regulated fleets; creating new jobs and commercial opportunities; developing "Clean Corridors"; and increasing public awareness.

11. Corps of Engineers/Bureau of Reclamation Hydropower Projects

Description

The Department of the Interior's Bureau of Reclamation and the Army Corps of Engineers are both engaged directly and indirectly in hydroelectric power. Both agencies are charged with the construction, operation, and maintenance of Federal hydroelectric facilities. The Corps of Engineers operates nationwide, whereas the Bureau of Reclamation conducts its activities only in 17 western States.

The direct costs of maintenance and operation in producing hydroelectricity are paid by the Power Marketing Administrations (PMAs), which purchase and resell the power; however, the indirect costs of the projects are not allocated to electricity production. Typically, construction of dams has been primarily for the benefits of irrigation, municipal water supply, and flood control, and only secondarily for the production of power. Construction costs incurred for flood control, recreation, and fish and wildlife purposes are nonreimbursable and are borne by users of irrigation, municipal water supply, and power generation. Thus, the costs of construction for power generation need to be pro-rated accordingly. Moreover, when the Corps of Engineers dredges a waterway to facilitate navigation, and that waterway flows to a hydroelectric facility, silting at the dam is reduced, increasing the life of the dam and reducing maintenance costs. The costs are registered not for hydroelectric power generation but for navigation.

Revenue Loss/Outlay

The direct costs of power are reimbursed by the PMAs. The imputation of indirect costs borne by the Corps of Engineers or the Bureau of Reclamation for electricity production is difficult to estimate, in part because Federal reclamation law allows cross-subsidization among projects. Thus, users of the electricity reimburse not only the construction costs allocated to power generation but also some portion of the construction costs incurred for irrigation.

Rationale

The original rationale for Federal involvement with hydroelectric plants was that the cost of adding hydroelectric capability to dams was small in comparison with the perceived benefits of economic development.

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

Hydropower, electricity generation.

Impact

Essentially, most of the fixed costs of developing the hydroelectric sites have been paid by the Federal Government for other reasons. It may well be that, were it not for the other reasons, electric power would not have been available until later in the affected areas. The value of the economic development, although difficult to estimate, can be seen as resulting from the availability of relatively inexpensive hydropower.

12. Rural Utilities Service

Description

The U.S. Department of Agriculture (USDA) is the Federal Government's principal provider of loans used to assist infrastructure development in the Nation's rural areas. Through the Rural Utilities Service (RUS), the USDA finances the construction, improvement, and repair of electrical, communications, and water and waste disposal systems. RUS provides credit assistance through direct loans and through repayment guarantees on loans made by other lenders. Established by the Federal Crop Insurance Reform and the Department of Agriculture Reorganization Act of 1994, RUS administers the electricity and telecommunications programs that were operated by the former Rural Electrification Administration (REA) and the water and waste disposal programs operated by the former Rural Development Administration (RDA). The following discussion refers only to the electricity segment of the overall RUS utility loan program.

Revenue Loss/Outlay

Although operating somewhat like a commercial lender for rural utilities, RUS is not required or intended to recover all its financing or other costs. The primary function of the RUS is to provide credit assistance to aid in rural development. Interest charges to its borrowers cover only a portion of the Federal Government's cost for RUS electricity programs. RUS makes direct loans at below-market interest rates according to law. For these loans, it receives annual appropriations to cover the interest differential. It also receives an appropriation to cover its administrative expenses. The budget authority for the electric loans program in nominal dollars was $33 million for fiscal year 1998, $35 million for fiscal year 1999, and an estimated $10 million for fiscal year 2000.[178]

Recently RUS has written off loans to rural electric cooperatives under Department of Justice authority. RUS wrote off about $982 million of debt in fiscal year 1996, a total of about $1.05 billion (in constant 1996 dollars) over the 5-year period 1992-1996, and more than $500 million (nominal dollars) in fiscal year 1997. The most significant writeoffs were related to generation and transmission borrowers, which require large investments.[179]

Rationale

RUS electricity loans are made primarily to rural electric cooperatives; more than 99 percent of the borrowers with electricity loans are nonprofit cooperatives. These cooperatives are either generation and transmission (G&T) cooperatives or distribution cooperatives. A G&T cooperative is a nonprofit rural electric system whose chief function is to sell electric power on a wholesale basis to its owners, consisting of distribution cooperatives and other G&T cooperatives. A distribution cooperative sells the electricity it buys from a G&T cooperative to its owners, the retail customers.

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

Electricity.

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[178]U.S. General Accounting Office, *Federal Electricity Activities: The Federal Government's Net Cost and Potential for Future Losses*, GAO/AIMD-97-110 (Washington, DC, September 1997).

[179]U.S. Department of Agriculture, "1999 Budget Summary," web site www.usda.gov/agency/obpa/Budget-Summary/1999/text.html.

Impact

Almost 1,000 electric cooperatives operating in 46 States own and operate some 45 percent of the Nation's electric distribution lines, serving more than 14 million electricity customers (meters). Electric cooperatives serve 11 percent of the Nation's electricity customers, accounting for almost 8 percent of the kilowatthours sold and 5 percent of the electricity generated by the electric utility industry.[180]

[180]Energy Information Administration, *Electric Sales and Revenue 1998*, DOE/EIA-0540(98) (Washington, DC, October 1999).

13. Power Marketing Administrations

Description

In the past, the Federal Government has sought to advance development in rural areas through its Power Marketing Administrations (PMAs): Bonneville (BPA), Southeastern (SEPA), Southwestern (SWPA), and Western Area (WAPA). The Alaska Power Administration was sold in 1998, more than 10 years after privatization of all the PMAs was first proposed by the Executive Branch. The sale of the Alaska Power Administration was achievable largely because of its small size (by far the smallest of the PMAs) and because it operated strictly as an electricity generator, with no transmission operations or non-energy activities, such as flood control, irrigation, or recreation. None of the other PMAs has been sold. Much of the activity of the PMAs consists of marketing power produced by Army Corps of Engineers and Bureau of Land Management hydropower projects. Subsidies to the PMAs include: (1) low-interest loans; (2) preferential repayment schedules; (3) debt forgiveness; and (4) no primary taxation, such as property or income tax.

BPA, by far the largest PMA, can be used as an example to describe Federal subsidies. As part of the New Deal, BPA was created by Congress to sell the power generated from Federal dams in the Columbia Basin. Publicly owned utilities were given preferential customer status to the power. The law called for the PMAs to be self-supporting by offsetting their cost from the fees charged for power; however, even if BPA always repaid its debt on time and covered all its other accounting (historical) costs, the rates charged for electric power still would not cover the true cost of providing the power. The shortfall arises because until 1974 BPA had access to special low-interest loans: in 1998, BPA had $4.5 billion (1999 dollars) in appropriated debt outstanding, $2.5 billion in long-term debt, and $7.0 billion in non-Federal projects debt. BPA's appropriated debt and long-term debt in 1998 bore interest rates only slightly above the Treasury rate. Those artificially low borrowing costs are deemed a measure of Federal Government support. BPA's non-Federal debt carried a Standard and Poor's AA credit rating, reflecting in part the view of the financial community that BPA benefits from the tacit support of the U.S. Treasury. This, too, is deemed a measure of Federal Government support.

Revenue Loss/Outlay

The PMAs are expected to provide power at cost and are not intended to earn a profit because of legislative intent. The PMAs earn below-market values on their average wholesale electricity sales. If they charged wholesale rates equal to those of the neighboring utilities, their revenues would rise by $1.4 billion (1999 dollars). This is a measure of Federal support to the consumers of the PMAs' wholesale electricity. In 1998, the U.S. Treasury's net financing costs for the PMAs ranged from $104 million (1999 dollars) to $340 million. The financing cost benefits derive from the PMA's ability to borrow money at the most favorable U.S. Treasury cost of funds and from a flexible repayment plan allowed to the PMAs but not to the Treasury. BPA's non-Federal borrowing at Standard and Poor's AA rating is also seen as a measure of Federal support. Further, BPA does not earn a rate of return on its assets equivalent to the average return realized by investor-owned utilities. If BPA were to realize such a return, its revenues for 1998 would rise by between $190 million and $466 million.

Rationale

The PMA subsidies were provided in part to promote economic development in areas where it was felt that private enterprise would not offer electric power, and in part because of the nature of the regional economy. The flexible repayment approach was adopted in view of the significant variability in revenues associated with hydroelectric power, a major source of power for some PMAs.

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

Electricity transmission, distribution, and end use.

Impact

Although they differ from the Tennessee Valley Authority (TVA) (discussed in the subsequent fact sheets) in that they generally do not produce power, the PMAs sell low-cost public power to regional customers. Efforts are ongoing to make the PMAs pay for themselves, which would alleviate the equity problem involved when the Federal Government subsidizes particular groups of power consumers.

14. Tennessee Valley Authority

Description

The Tennessee Valley Authority (TVA), a Federally owned and chartered corporation, is the largest wholesale electric utility in the United States. It was created by the TVA Act of 1933 for the unified development of the Tennessee River Basin, which comprises parts of seven States. The TVA runs several programs:

- The Stewardship Program includes maintaining a system of dams, reservoirs, and navigational facilities and, among other things, maintaining and managing 230,000 acres of public land and 11,000 miles of shoreline. TVA operates and maintains the navigation channel from Paducah, Kentucky, to Knoxville, Tennessee; operates a system of multipurpose reservoirs to retain excessive seasonal runoff and regulate discharges at flow rates that can be accommodated by downstream channels and reservoirs (resulting in the reduction of flood crests); performs dam safety modifications and maintenance activities; operates dewatering areas associated with TVA's reservoir system; and performs environmental research services at its Muscle Shoals Reservation.

- The Water and Land Program is intended to aid conservation. TVA operates an air-quality monitoring network, monitors water quality, promotes the wise use of forest resources in the region, and prepares maps for its own needs and to help the U.S. Geological Survey.

- The Power Program provides power to an area of 80,000 square miles in the seven Tennessee Valley States. TVA owns and operates a substantial mix of hydroelectric, coal, gas turbine, and nuclear power plants.

Revenue Loss/Outlay

The TVA has a complicated financial structure, historically funded through a combination of power and nonpower revenues, borrowing, and direct Federal appropriations. In comparison with the interest rates paid by investor-owned utilities (IOUs), TVA is estimated to have benefited from Government support of $77 million to $248 million (1999 dollars) in 1998 because of the utility's artificially low borrowing costs. Asset support to the TVA ranges from $228 million to $557 million. In July 1997, TVA issued a 10-year business plan, the purpose of which was to outline its program for operating in a more competitive environment.

Although TVA is unregulated and was committed early on to hydropower, its venture into heavy borrowing at high interest rates for a massive nuclear program caused it to charge prices close to the average of nearby investor-owned utilities.[181] According to the 2000 Federal budget, "Prior to 2000, appropriations provided for public services to maintain and operate public resources—navigable channels, flood control, recreation and non-regulatory, community-based programs that protect the water quality of the Tennessee river system . . . . The Budget proposes that beginning in 2000, these services be funded entirely by TVA's power revenues, users fees, and sources other than appropriations, except for Land Between the Lakes National Recreation Area."

In a 1999 report, the General Accounting Office identified $8.5 billion of TVA's 1998 debt that was being treated as a deferred asset and at that time was not being recovered through the ratebase.[182] TVA's total property, plant, and equipment assets were valued at $29 billion (nominal dollars) in 1998. Deferred nuclear generating units accounted for $6.3 billion of the total. Nuclear power accounted for 28 percent of TVA's gross generation by fuel source in 1998.

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[181]Financial data from Energy Information Administration, *Financial Statistics of Selected Investor-Owned Utilities*, DOE/EIA-0437(90/1) (Washington, DC, 1992).

[182]U.S. General Accounting Office, *Tennessee Valley Authority, Assessment of the 10-Year Business Plan*, GAO/AIMD-99-142 (Washington, DC, April 1999).

Rationale

According to President Franklin Roosevelt's promotion of the TVA, "[The] potential usefulness of the Tennessee River . . . transcends mere power development; it enters the wide fields of flood control, soil erosion, afforestation, elimination from production use of marginal agricultural lands, and distribution and diversification of industry."[183]

Major Form(s) of Energy/Fuel Cycle Stage(s) Affected

Hydropower, coal, and nuclear electricity generation, transmission, distribution, and end use.

Impact

Because TVA is such a complicated enterprise, it is difficult to identify and assess the impacts of its operations. Its overall, long-term effect on the economy of the region is a matter of considerable controversy. Critics argue that most of the economic activity that occurred in the Tennessee Valley resulted from TVA's own construction and operations rather than a secondary economic boost to the region. Supporters argue that the Valley would have remained underdeveloped without the TVA. Compared with TVA's scale of operations, Federal outlays are relatively small. Under present financial conditions, TVA's power prices are near those of IOUs, and its power is not as inexpensive as its founders predicted. It is likely that the costs of compliance with the Clean Air Act Amendments of 1990 will not improve TVA's financial status, and that its power prices may rise further.

[183]W.U. Chandler, *The Myth of TVA* (Cambridge, MA: Ballinger, 1984), p. 26.

Appendix C
Federal End-Use Energy Research and Development Appropriations

Table C1 in this appendix documents the annual Federal end-use energy research and development appropriations illustrated in Figure 3 in Chapter 3. The table also documents the allocation of Department of Energy budget line items into the programmatic groupings discussed in Chapter 3. Most of the data are taken from an internal appropriations tally maintained by the Office of the Chief Financial Officer within the Department of Energy. This tally is considerably more detailed than the budget presentations in the *Budget of the United States Government*. As in any data set, however, it is best to know exactly what is being measured. Thus, users of this data set should be aware of the following considerations:

- Data are for appropriations and not for outlays.

- The appropriations shown are for final spending authority, after any subsequent reprogramming and supplemental appropriations have been made. Thus, the figures shown are not necessarily identical with the figures appropriated by the Congress in each year's budget. There were several instances of large-scale reprogramming of Departmental funds in the early 1980s.

- Fiscal year 1999 appropriations are estimated.

- The term "unallocated" is used to describe budget items that cannot be attributed to particular programs or activities. Much of this spending is administrative "overhead" within the Department of Energy and capital and operating costs of the national laboratories. However, because overhead costs have not been treated uniformly over time and are not treated uniformly by different offices within the Department of Energy, it is not possible to use these figures to ascertain what portion of research and development spending is actually devoted to overhead costs, nor to compare overhead spending across programs. See also the discussion of "unallocated" on page 17 of Chapter 3.

- Appropriations for the "IRP" category shown in Table 25 of this report are not included here.

- Appropriations for regulatory (codes and standards) programs in the building technology sector for fiscal years 1992-1999 are excluded from Table C1. Expenditures for such programs before 1992 are included in the building technology appropriations but cannot be disaggregated because of data limitations. See also the discussion of the programs in Chapter 3.

Table C1. Summary of U.S. Department of Energy Research and Development Expenditures for Energy Transformation and End Use, Fiscal Years 1978-1999

(Million 1999 Dollars)

Item	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Building Technology	142.3	163.9	197.4	157.9	77.5	60.9	55.9	59.6	53.6	41.5	45.6
Federal Energy Management Program	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Industrial Sector	71.6	82.6	113.9	120.3	46.9	43.5	50.4	46.1	57.6	47.5	43.5
(Minus Advanced Turbine Systems)[a]	—	—	—	—	—	—	—	—	—	—	—
Industrial Sector, Net	71.6	82.6	113.9	120.3	46.9	43.5	50.4	46.1	57.6	47.5	43.5
Transportation Sector	150.8	204.9	214.5	181.6	95.8	83.9	97.2	89.1	81.4	76.1	68.1
Multi-Fuel	23.5	21.2	31.8	45.8	26.8	19.9	19.1	34.6	36.7	39	38.2
Other Unallocated	0.0	0.0	0.0	0.0	0.0	1.9	3.1	25.7	16.4	16.3	10.2
Total	**388.3**	**472.6**	**557.6**	**505.5**	**247.0**	**210.1**	**225.6**	**255.0**	**245.7**	**220.4**	**205.4**

Item	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Building Technology	41.5	43.3	57.9	51.4	49.5	71.0	88.1	76.4	67.9	64.0	81.0
Federal Energy Management Program[b]	NA	NA	NA	NA	NA	NA	NA	NA	20.2	20.0	23.8
Industrial Sector	38.5	62.5	70.6	110.3	124.2	134.5	139.6	112.8	118.0	135.6	165.9
(Minus Advanced Turbine Systems)[a]	—	—	—	—	—	—	—	—	—	-35.0	-33.0
Industrial Sector, Net	38.5	62.5	70.6	110.3	124.2	134.5	139.6	112.8	118.0	100.6	132.9
Transportation Sector	69.1	79.0	93.2	124.7	154.1	192.0	202.8	181.5	176.4	192.3	202.1
Multi-Fuel	41.0	43.7	41.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Unallocated	18.8	2.1	2.7	3.1	4.0	5.1	8.9	8.5	27.0	29.3	37.7
Total	**208.9**	**230.7**	**265.6**	**289.5**	**331.7**	**402.6**	**439.4**	**379.2**	**409.5**	**406.2**	**477.4**

[a]Included in "Natural Gas R&D" in budgets for historical years.

[b]An adjustment of -$4.6 million in 1992 and -$23.8 million was made to the total line of Table 4 of this report because FEMP expenditures are not considered a subsidy.

NA = not applicable. Expenditures for FEMP before 1997 are included in other end use R&D programs.

Sources: U.S. Department of Energy, Office of the Chief Financial Officer, "Budget Authority History Table by Appropriation" (Washington, DC, 1998); *U.S. Department of Energy Fiscal Year 1999 Budget Request*, DOE/CR-0050 (Washington, DC, February 1998); and *U.S. Department of Energy Fiscal Year 2000 Budget Request*, DOE/CR-0059 (Washington, DC, May 21, 1999).

Appendix D
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Appendix E

Letters From the DOE Office of Policy

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United States Government **Department of Energy**

memorandum

Memorandum for: Mary Hutzler
Director, Office of Integrated Analysis and Forecasting
EI-80

From: Mark Mazur, Acting Director, Office of Policy

Date: May 20, 1999

Subject: Energy Subsidy Study

This is to request that the Energy Information Administration (EIA) undertake a service report for the Office of Policy that updates EIA's 1992 report on Federal Energy Subsidies and begins an examination of the energy market impacts 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 report will be used in interagency discussions and may be the first of several reports requested.

The analysis should include the following:

- an update of any additions/deletions of Federal subsidies based on Administration and Congressional action since the 1992 report was written; and
- an estimate of the size of each current subsidy.

Subsidies to be included in the report are those wherein a government or public body provides a financial benefit. The subsidy must also be specific; for example, depreciation schedules, that can be used in non-energy sectors as well, are not included in the definition of a subsidy for this study.

This analysis will cover primary energy only, and to be most helpful, this report should be completed by August 15, 1999.

If you have any questions about this request, please let me know.

The Secretary of Energy
Washington, DC 20585

September 29, 1999

TO: Jay Hakes
Mary Hutzler

FROM: Mark Mazur,
Director, Office of Policy

SUBJECT: Request for Additional Examination of Energy Market Interventions

This is to request that the Energy Information Administration (EIA) provide the Office of Policy with updated information regarding Federal interventions in energy markets affecting energy transformation and end-use. This analysis will complement the study of subsidies affecting primary energy sources prepared in response to our earlier request.

Subsidies or other interventions in energy markets to be addressed are those affecting energy transformation or end-use wherein a government or public body provides a financial benefit. Attention should be focused on interventions specifically targeted on energy transformation and end-use. Broad policies or programs that are generally applicable throughout the economy need not be considered.

For all subsidies falling within the scope of this request, your analysis should include:

- an update of any additions/deletions of Federal subsidies based on Administration and Congressional action since the time of EIA's 1992 report
- an estimate of the size of each current subsidy.

Where there has been a significant change in the amount or scope of a particular subsidy relative to information presented in EIA's 1992 report, it would be useful if the updated report were to review the legal and/or programmatic developments that led to such a change. While the focus is on subsidies available as of the date of this request, the report should also identify any subsidies in energy markets affecting energy transformation or end-use that were addressed in the 1992 report but have since been eliminated.

To be most helpful, your report should be completed by January 15, 2000. Please let me know if you have any questions about this request.

cc: Howard Gruenspecht