

Executive Summary

Background

In May 2007, Senator Lamar Alexander asked the Energy Information Administration (EIA) to develop an analysis of Federal energy subsidies focusing on subsidies to electricity production. Senator Alexander also specified that the analysis should be limited to subsidies provided by the Federal government, those that are energy-specific, and those that provide a financial benefit with an identifiable budget impact. Federal energy subsidies and interventions discussed in the body of this report take four principal forms:

- **Direct Expenditures.** These are Federal programs that directly affect the energy industry and for which the Federal government provides funds that ultimately result in a direct payment to producers or consumers of energy.
- **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.
- **Research and Development (R&D).** Federal R&D spending focuses on a variety of goals, such as increasing U.S. energy supplies, or improving the efficiency of various energy production, transformation, and end-use technologies. R&D expenditures do not directly affect current energy production and prices, but, if successful, they could affect future production and prices.
- **Electricity programs serving targeted categories of electricity consumers in several regions of the country.** Through the Tennessee Valley Authority (TVA) and the Power Marketing Administrations (PMAs), which include the Bonneville Power Administration (BPA) and three smaller 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.” The Federal government also indirectly supports portions of the electricity industry through loans and loan guarantees made by the U.S. Department of Agriculture’s Rural Utilities Service (RUS).

With the exception of the Federal electricity programs, this report measures subsidies and support on the basis of the cost of the programs to the Federal budget provided in budget documents. Support associated with Federal electricity programs is measured by comparing the actual cost of funds made available to these entities to EIA estimates of the cost of funds that they might otherwise have incurred in the absence of Federal support.

Summary of Findings

Total Federal energy-specific subsidies and support to all forms of energy are estimated at \$16.6 billion for fiscal year (FY) 2007 (Table ES1). Total energy subsidies have more than doubled in real terms (2007 dollars), increasing from an estimated \$8.2 billion in FY 1999. Tax expenditures have more than tripled since 1999, rising from \$3.2 billion that year to more than \$10.4 billion in 2007.

The increase in energy subsidies and support since 1999 is distributed widely across all energy groups (Table ES1). Changes in the distribution of subsidies by fuel type between

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1999 and 2007 reflect a redirection of priorities. For example, subsidies for renewables increased from 17 percent of total subsidies and support in 1999 to 29 percent in 2007. Natural gas and petroleum related subsidies declined as a share of total subsidies primarily as a result of the expiration of the Alternative Fuels Production Tax Credit for the production of unconventional natural gas in 1999, whereas refined coal was the principal beneficiary of this tax expenditure in 2007. Coal-related subsidies, excluding refined coal, experienced a modest decline from 7 percent in 1999 to 6 percent in 2007.

Table ES1. Energy Subsidies and Support by Type and Fuel, FY2007 and FY1999 (million 2007dollars)

Beneficiary	Direct Expenditures	Tax Expenditures	Research & Development	Federal Electricity Support	Total
2007 Subsidies					
Coal	-	290	574	69	932
Refined Coal ¹	-	2,370	-	-	2,370
Natural Gas and Petroleum Liquids	-	2,090	39	20	2,149
Nuclear	-	199	922	146	1,267
Renewables	5	3,970	727	173	4,875
Electricity (Not fuel specific)	-	735	140	360	1,235
End Use	2,290	120	418	-	2,828
Conservation	256	670	-	-	926
Total	2,550	10,444	2,819	767	16,581
1999 Subsidies					
Coal	-	79	489	-	567
Natural Gas and Petroleum Liquids ²	-	1,878	198	-	2,077
Nuclear	-	-	740	-	740
Renewables	5	1,000	412	-	1,417
Electricity (Not fuel specific)	-	139	175	-	314
End Use	1,545	103	487	-	2,135
Conservation	191	-	-	-	191
Federal Electricity Programs	-	-	-	753	753
Total	1,741	3,199	2,500	753	8,194
Total may not equal sum of components due to independent rounding.					
¹ Tax expenditures attributable to the Alternative Fuels Production Tax Credit.					
² In 1999, the Alternative Fuels Production Credit was realized mostly from the production of coalbed methane; valued at \$1.2 billion, that subsidy is reported in Natural Gas and Petroleum Liquids.					

Recent Federal legislation, including the Energy Policy Act of 2005 (EPACT2005) (Public Law 109-58) and the Energy Independence and Security Act of 2007 (EISA 2007) (Public Law 110-140) suggest that certain energy-related tax expenditures are likely to increase.

Some of the most significant subsidy provisions in EPACT2005 concern nuclear power. Given that no new nuclear power plants are expected to produce electricity before the middle of the next decade, this report provides no estimates for the value of these provisions. EPACT2005 also included mandates for the use of renewable motor fuels that were significantly expanded in EISA 2007. EISA 2007 mandates are not considered in this report given its focus on historical and current tax expenditures. The EISA renewable fuel mandates could become binding in the near future.

Notwithstanding the doubling of Federal energy-related subsidies and support between 1999 and 2007, and a significant increase in most energy prices over that period, U.S. energy production is virtually unchanged since 1999 (Table ES2). Basic economic principles suggest that higher real energy prices together with the significant incentives provided to various production segments of the energy sector would tend to raise domestic energy production. A variety of factors unrelated to prices or subsidy programs such as State and Federal statutory limitations imposed on onshore and offshore oil and natural gas exploration in environmentally sensitive areas, uncertainty regarding future environmental policies possibly restricting future emissions of greenhouse gases, and declines in future production from previously developed domestic oil and natural gas resources may have impeded growth in energy production despite modest growth in consumption.

In response to Senator Alexander’s specific request, this report focuses on subsidies that provide benefits to the electric power industry in one of three ways, specifically that:

Table ES2. Total Energy Subsidies and Support, Selected Indicators, 1999 and 2007

Item	1999	2007	Percent Change 1999 to 2007	Average Annual Growth (Percent)
Energy Subsidies and Support (million 2007 dollars)	8,194	16,581	102.4	9.2
Energy Expenditures (billion 2007 dollars)	674	1,269	88.1	8.2
Energy Consumption (quadrillion Btu)	97	101	4.6	0.6
Energy Production (quadrillion Btu)	72	72	0.1	*

NOTE: * Value is less than one-tenth of one percent.

Sources: Energy Information Administration, *Annual Energy Review 2006*, DOE/EIA-0384(2006) (Washington, DC, June 2007), Tables 1.1, 1.2, 1.3, 1.5, and D1; *Short-Term Energy Outlook* (Washington DC, January 8, 2008 release), <http://www.eia.doe.gov/emeu/steo/pub/contents.html>; *Annual Energy Outlook 2008 (Early Release)*, <http://www.eia.doe.gov/oiaf/aeo/index.html>, and this report.

- affect a fuel used as input for the generation of electricity;
- are directed to technological components of the industry, such as generation, transmission, or distribution;
- are directed to, or are applied by, a business enterprise whose primary purpose is the generation, transmission, and/or distribution of electricity.

Table ES3 summarizes the split between electricity production subsidies, support to Federal utility programs, and other energy subsidies deemed to be unrelated to electricity production.

Table ES3. Allocation of Electricity Production and Other Energy Subsidies (million 2007 dollars)

Subsidy and Support Category	FY 2007 Electricity Production Subsidies and Support	FY 2007 Other Energy Subsidies and Support	FY 2007 Total Energy Subsidies and Support
Fuel Specific ¹	5,105	2,330	7,435
Transmission and Distribution ²	1,235	-	1,235
Federal Utilities and RUS Borrowers Capacity ³	407	-	407
Energy Subsidies Unrelated to Electricity Production ⁴	-	7,504	7,504
Total	6,747	9,834	16,581

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

¹Includes fuel-related tax expenditures, R&D, and direct expenditures applicable entirely to a specific type of electric generation, or primary fuel production-related subsidies allocated to either electricity or other sectors based on each sector's proportionate consumption of the applicable fuel. Excludes fuels that have no role in electricity production such as ethanol and other biofuels.

²Includes transmission and distribution-related tax expenditures, R&D, and \$360 million of estimated financial support attributable to Federal utilities' and RUS borrowers' debt associated with transmission and distribution assets.

³Reflects the estimated portion of Federal utilities' and RUS borrowers' interest support attributable to long-term debt associated with capacity and certain TVA and BPA regulatory assets. This support is then assigned by fuel-type.

⁴Includes tax and direct expenditures for end-use activities and transportation-related alternative fuels. Among these subsidies are conservation programs, residential and commercial energy efficiency programs, and ethanol and biofuels tax credits.

Sources: See Table 26, Table 27 and Table 30.

Findings Regarding Electricity Production-Related Subsidies

Subsidies and support related to electricity production are estimated at \$6.7 billion (Table ES3), or about 41 percent of total energy subsidies. A significant portion of electricity subsidies and support (\$1.2 billion, or 18 percent of total electricity subsidies and support) is directed to electric plant or infrastructure, such as transmission. Another \$407 million consists of capital cost support associated with electric generation assets of Federal utilities and RUS loans. The beneficiaries of this support are electricity consumers who purchase power produced by the Federal utilities and RUS borrowers. The estimated interest subsidy associated with these assets is allocated by fuel type. The remaining \$5.1 billion of electricity subsidies are either directed at specific types of electricity production, based on fuel type or investment, or expenses associated with upstream production and transportation of fuels used in electricity production—all of which either affect the cost of the input fuel or reduce the cost of generating equipment used to produce electricity.

Tax expenditures comprise about two-thirds of the total subsidies and support related to electricity production (Table ES4). The alternative fuel production tax credit,¹ which is largely directed to producers of coal-based synthetic fuels, also referred to as refined coal, accounted for about one-half of total tax expenditures related to electricity production in FY 2007.

Nuclear programs, renewable programs, and non-fuel-specific electricity production subsidies and support each ranged from \$1 billion to \$1.3 billion.

Natural gas and petroleum liquids receive a lower level of support from electricity production-related subsidies and support than other fuel groups. Overall, electricity production-related subsidies are spread broadly across the various fuel groups, probably more so than in the past.²

Table ES4. Fiscal Year 2007 Electricity Production Subsidies and Support (million 2007 dollars)

Fuel End Use	Direct Expenditures	Tax Expenditures	Research & Development	Federal Electricity Support	Total
Coal	-	264	522	68	854
Refined Coal	-	2,156	-	-	2,156
Natural Gas and Petroleum	-	203	4	20	227
Nuclear	-	199	922	146	1,267
Renewables	3	724	108	173	1,008
Transmission and Distribution	-	735	140	360	1,235
Total	3	4,281	1,696	767	6,747

NOTES: Estimates of Federal electricity program support are based on the most recent audited annual reports for Federally-owned utilities which conform to Federal fiscal year convention. The Rural Utilities Service estimate is based on calendar year 2005 data.

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

Sources: See Table 34.

Electricity production subsidies and support per unit of production (dollars per megawatthour) vary widely by fuel. Coal-based synfuels (refined coal) that are eligible for the alternative fuels tax credit, solar power, and wind power receive, by far, the highest subsidies per unit of generation, ranging from more than \$23 to nearly \$30 per megawatthour of generation (Table ES5). Subsidies and support for these generation sources are substantial in relationship to the price or cost of electricity at the wholesale or end-user level. The average U.S. electricity price was about \$53 per megawatthour at the wholesale level in 2006 and about \$92 per megawatthour to end users in all sectors in FY 2007.³

¹ The alternative fuel production tax credit was initially established in the Windfall Profit Tax Act of 1980 (Public Law 96-223). The provision was codified in Section 29 of the Internal Revenue Code. It was subsequently modified by Section 710 of the American Jobs Creation Act of 2004 (Public Law 108-357) to include synthetic coal, which was redefined as refined coal and recodified in Section 45 of the Internal Revenue Code. The expiration date to qualify for the credit was extended in EPACT2005.

² EIA did not analyze electricity production subsidies in particular in its 2000 report. However, a line item comparison of various energy subsidies indicates that newer subsidy programs have been directed toward fuel groups and activities, such as renewables, conservation, and transmission that previously received less attention.

³ Energy Information Administration Form EIA-861 "Annual Electric Power Industry Report," 2006; and Energy Information Administration, *Electric Power Monthly December 2007*, DOE/EIA 0026(0712) (Washington, DC, December 2007), Table 5.6.B.

Table ES5. Subsidies and Support to Electricity Production: Alternative Measures

Fuel/End Use	FY 2007 Net Generation (billion kilowatthours)	Alternative Measures of Subsidy and Support	
		FY 2007 Subsidy and Support (million 2007 dollars)	Subsidy and Support per Unit of Production (dollars/megawatthour)
Coal	1,946	854	0.44
Refined Coal	72	2,156	29.81
Natural Gas and Petroleum Liquids	919	227	0.25
Nuclear	794	1,267	1.59
Biomass (and biofuels)	40	36	0.89
Geothermal	15	14	0.92
Hydroelectric	258	174	0.67
Solar	1	14	24.34
Wind	31	724	23.37
Landfill Gas	6	8	1.37
Municipal Solid Waste	9	1	0.13
Unallocated Renewables	NM	37	NM
Renewables (subtotal)	360	1,008	2.80
Transmission and Distribution	NM	1,235	NM
Total	4,091	6,747	1.65

NOTES: Unallocated renewables include projects funded under Clean Renewable Energy Bonds and the Renewable Energy Production Incentive.

NM=Not meaningful. Totals may not equal sum of components due to independent rounding.

Sources: See Table 35

The differences between rankings of subsidies and support based on absolute amounts and amounts per megawatthour are driven by substantial differences in the amount of electricity generation across fuels. Capital-intensive, baseload generating technologies, such as coal-fired steam generators and nuclear generators, together produce about 70 percent of total net generation,⁴ which tends to reduce their subsidies and support per unit of production compared to the other fuel groups (Table ES5). For the same reason, electricity subsidies for solar and wind show a relatively large subsidy per unit of production, as these groups account for less than 1 percent of total net generation in the country. It is important to recognize that the subsidies-per-megawatthour calculations are a snapshot taken at a particular point in time. Some electricity sources, such as nuclear, coal, oil, and natural gas, have received varying levels of subsidies and support in the past which may have aided them in reaching their current role in electricity production.⁵ The impacts of prior subsidies, some of which may no longer be in effect, are not measured in the current analysis.

A per-unit measure of electricity production subsidies and support may provide a better indicator of its market impact than an absolute measure. For example, even though coal receives more subsidies in absolute terms than wind power, the use of wind is likely to be more dependent on the availability of subsidies than the use of coal.

⁴ In fiscal year 2007, nuclear and coal accounted for 68 percent of total net generation.

⁵ See Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, SR/OIAF/99-03 (Washington, DC, September 1999); Energy Information Administration, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, SR/EMEU/92-02 (Washington, DC, November 1992).

Other factors can also play an important role in determining the market impact of a particular production subsidy. For example, generation using refined coal whose production is made possible by its eligibility for the Alternative Fuel Production Tax Credit would probably be replaced entirely by conventional coal generation if the tax credit were unavailable. In contrast, generation resulting from the growth in wind power capacity that is supported by renewable production tax credits would likely be replaced with generation from a broad mix of generation sources if that credit were unavailable.

Findings Regarding Energy Subsidies Not Related to Electricity Production

Based on the subsidy categories used in this report, 59 percent of energy-related subsidies are associated with end-use applications or with fuel consumed outside the electric power sector. These subsidies totaled \$9.8 billion in FY 2007 (Table ES6).

About one-third of energy subsidies unrelated to electricity production are related to the promotion of alternative fuels, particularly ethanol and biodiesel, both of which are eligible to receive a blender's credit under the Volumetric Ethanol Excise Tax Credit (VEETC). Blenders receive a \$0.51 per gallon credit for each gallon of ethanol that is blended with gasoline for use as a motor fuel.⁶ The benefit provided by the credit is equivalent to that provided by the reduced excise tax rate for gasohol in effect prior to the enactment of VEETC in late 2004. Internal Revenue Service regulations require that blenders apply for VEETC refunds to offset gasoline excise tax payments, but they may submit a claim for payment or take a credit against other taxes if their VEETC credits exceed their gasoline excise tax liability. Based on its implementation rules, the Treasury reports VEETC as a reduction in excise tax revenues for FY 2007. For purposes of this report, it is classified as a tax expenditure.

Non-fuel specific subsidies totaling \$3.6 billion focus on energy efficiency, conservation, and energy-related financial assistance to residential, commercial, and industrial end users. Conservation and energy efficiency subsidies can affect electricity consumption in the long run by reducing the need for investment in additional generating capacity, with a resultant decline in fuel use. While these subsidies can affect electricity markets, they do not provide a direct or indirect subsidy to electricity production and are therefore classified separately from the electricity production-related subsidies estimated for purposes of this report.

⁶ The credits for mixtures other than ethanol are \$0.60 per gallon for alcohol fuel mixtures (other than ethanol), \$0.50 per gallon of biodiesel, and \$1.00 per gallon for agri-biodiesel.

Table ES6. Energy Subsidies Not Related to Electricity Production: Alternative Measures

Category	Fuel Consumption (quadrillion Btu)	Alternative Measures of Subsidy and Support	
		FY 2007 Subsidy and Support (million 2007 dollars)	Subsidy per million Btu (2007 dollars)
Coal	1.93	78	0.04
Refined Coal	0.16	214	1.35
Natural Gas and Petroleum Liquids	55.78	1,921	0.03
Ethanol/Biofuels	0.57	3,249	5.72
Geothermal	0.04	1	0.02
Solar	0.07	184	2.82
Other Renewables	2.50	360	0.14
Hydrogen	*	230	NM
Total Fuel Specific ¹	60.95	6,237	0.10
Total Non-Fuel Specific	NM	3,597	NM
Total End-Use and Non-Electric Energy	NM	9,834	NM

NOTES: Non-electric power refined coal consumption is based on the sum of monthly deliveries, in short tons, reported in the EIA publications cited below for FY 2007. Delivered refined coal to non-electric customers is converted to equivalent Btu consumption based on EIA's estimate of the average Btu content for refined coal deliveries to generators reported to EIA. Other renewables includes hydroelectric, wood, biomass losses and co-products, and hydroelectric power as reported in the sources noted below.

¹Subsidy shown differs from that shown in Table ES3 due to inclusion of fuels that have no role in electricity production, such as ethanol and other biofuels.

*Less than 500 trillion Btu.

NM = Not meaningful

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

Sources: See Table 36.
