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Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2013

Release date: March 12, 2015

Executive Summary

This report responds to a September 2014 request to the U.S. Energy Information Administration (EIA) from U.S. Representative Fred Upton, Chairman of the House Committee on Energy and Commerce, and U.S. Representative Ed Whitfield, Chairman of its Subcommittee on Energy and Power, for an update reflecting Fiscal Year (FY) 2013 data of two earlier EIA reports on direct federal financial interventions and subsidies in energy markets covering FY 2007 and FY 2010.

As in the prior EIA reports on this subject, the scope of the present report is limited to direct federal financial interventions and subsidies that are provided by the federal government, provide a financial benefit with an identifiable federal budget impact, and are specifically targeted at energy markets. As requested, the report focuses on subsidies to electricity production and also includes subsidies to federal electric utilities in the form of financial support.

Given its scope, the report does not encompass all subsidies beneficial to energy sector activities (see text entitled "Not All Subsidies Impacting the Energy Sector Are Included in this Report"), which should be kept in mind when comparing this report to other studies that may use narrower or more expansive inclusion criteria. Consistent with EIA's role and mission, this study focuses on developing data rather than drawing conclusions or discussing policy issues related to subsidies, and in that regard differs from some other reports that address energy subsidies (see text entitled "A Wide Variety of Definitions, Methods and Estimates Occur in Other Energy Subsidy Studies").

Subsidy categories

Energy subsidies and interventions discussed in this report are divided into five separate program categories:

Direct expenditures to producers or consumers. These are federal programs that provide direct cash outlays which provide a financial benefit to producers or consumers of energy.[1]

Tax expenditures. These are largely provisions found in the Internal Revenue Code (IRC, or Tax Code)—Title 26 of the United States Code—that reduce the tax liability of firms or individuals who take specified actions that affect energy production, distribution, transmission, consumption, or conservation.

Research and development. The federal government has an extensive program of funding energy research and development (R&D) activities aimed at a variety of goals, such as increasing U.S. energy supplies or improving the efficiency of various energy consumption, production, transformation, and end-use technologies. R&D programs generally do not directly affect current energy consumption, production, and prices, but if successful, they could affect future consumption, production, and prices.

Catalog of Federal Domestic Assistance

This report uses the General Services Administration's (GSA) *Catalog of Federal Domestic Assistance* to identify energy-related programs. Energy-related programs exist in many federal agencies but are heavily concentrated at the U.S. Department of Energy (DOE).

EIA identified over 70 federal domestic assistance programs, many of which have multiple subprograms, as part of direct or research and development expenditures displayed in this report. However, some agencies administer one large, single program – e.g., the U.S. Department of Health and Human Services (HHS) administers the Low-Income Home Energy Assistance Program (LIHEAP) and the U.S. Department of the Treasury (Treasury) administers the Section 1603 grant program.

DOE operates the most programs and the greatest number of fossil, efficiency and renewable energy incentive programs. The U.S. Department of Agriculture (USDA) also operates several programs. A few programs can also be found among the Departments of the Interior (DOI), Labor (DOL), and Housing and Urban Development (HUD).

Federal electricity programs supporting federal and rural utilities. Through federal utilities, including the Tennessee Valley Authority (TVA), Bonneville Power Administration (BPA), and three smaller 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."[2] The federal government also supports portions of the electricity industry through loans and loan guarantees made by the U.S. Department of Agriculture's Rural Utilities Service (RUS) at interest rates generally below those available to investor-owned utilities (IOUs). This report measures support provided by RUS and federal electricity programs by comparing an average annual interest expense for their long-term debt to a range of cost of capital for IOUs that they might otherwise have incurred in the absence of federal support. Costs are based upon the savings realized from borrowing at preferential rates compared to market rates. Rather than choosing a single benchmark interest rate to estimate the cost of these programs, a range of borrowing costs starting with the 30-year Treasury rate through the Baa IOU interest rate were used.[3] To facilitate exposition, the Executive Summary presents only midpoint value estimates for these programs.

Loans and loan guarantees. The federal government provides financial support for certain energy technologies either by guaranteeing the repayment of loans obtained in the private debt market or by lending money directly to energy market participants. DOE is authorized to provide financial support for innovative clean energy technologies that are typically unable to obtain conventional private financing due to their high technology risks. In addition, eligible technologies must avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases.[4] The authority to enter into loan guarantees under Section 1705 (added by the American Recovery and Reinvestment Act of 2009, referred to as ARRA in this report) of Title XVII of the Energy Policy Act of 2005—a temporary program for the rapid deployment of renewable energy and electric power transmission projects administered by DOE—expired, pursuant to statute, on September 30, 2011. Further, as noted in Section 5 of this report, no loans

were made in FY 2013; hence, discussion in this report is limited. Additional information on this topic is available in EIA's prior subsidy report.

For this report, EIA relies upon many of the data sources and budget documents[5] used in EIA's prior subsidy reports to measure the cost of programs to the federal budget. One significant enhancement is the use of a comprehensive public database summarizing all federal budget obligations that is available through USASpending.gov. For federal agencies other than DOE and Treasury, spending for FY 2010 and FY 2013 is reported based on the obligations reported on that website. Under steady-state conditions, where outlays follow obligations in a regular pattern and there are no sharp discontinuities in the former or the latter, obligation and outlay measures closely correspond. However, with enactment of ARRA, which provided energy funding that dwarfed DOE's previous energy program budgets and also required the rapid obligation of funds that would fund outlays over several years, EIA faced a decision whether to tally spending based on obligations or outlays. Given the multi-year outlays from a 20-year high in budget authority created under ARRA, and the fact that the tax expenditures and grants that constitute the other major spending programs considered in this study are reported in the year where the grant or credit is claimed, EIA determined that that the purposes of the report would be best served by reporting DOE programs based on outlays, using information obtained from DOE's Office of the Chief Financial Officer. Like DOE, Treasury's program is reported based on outlays.

Key findings

The total value of direct federal financial interventions and subsidies in energy markets decreased nearly 25% between FYs 2010 and 2013, declining from $38.0 billion to $29.3 billion (see Table ES1 and Table ES2).

Conservation and end-use subsidies (excluding LIHEAP) experienced a substantial decline in both absolute and percentage terms between FY 2010 and FY 2013, declining from $10.2 billion to $4.8 billion (see Table ES1).The decrease in subsidies and support for these programs was led by declines in direct expenditures and tax expenditures (see Table ES2). Of the $5.4-billion decline in support of conservation and end use between FY 2010 and FY 2013, the tax credit for energy efficiency improvements to existing homes (26 U.S.C. 25C) accounted for $2.8 billion, with direct expenditures supporting conservation subsidies decreasing $2.3 billion and having the second-largest impact on the overall decline. This '25C' tax credit funded investments in energy-efficient windows, furnaces, boilers, boiler fans, and building envelope components.

Table ES1. Value of energy subsidies by major use, FY 2010 and FY 2013
(million 2013 dollars)

Subsidy and Support Category	FY 2010	FY 2013
Electricity-Related	11,694	16,112
Fuels and Technologies Used for Electricity Production	10,862	14,928
Transmission and Distribution	833	1,184
Fuels Used Outside the Electricity Sector	**10,710**	**5,206**
Conservation, End Uses, and Low-Income Home Energy Assistance	15,574	7,940

Table ES1. Value of energy subsidies by major use, FY 2010 and FY 2013
(million 2013 dollars)

Subsidy and Support Category	FY 2010	FY 2013
Program (LIHEAP)		
Conservation	7,069	1,964
End Uses and Other Technologies	3,127	2,860
LIHEAP	5,378	3,116
Total	**37,979**	**29,258**

Notes: Totals may not equal sum due to independent rounding. Units are in million 2013 dollars; hence, FY 2010 values are inflated to 2013 dollars. In addition to the adjustments for inflation, some FY 2010 numbers reflect updated data that became available subsequent to the previous report.

Sources: **Tax expenditure estimates**: Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government*, Fiscal Years 2015 and 2012. Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2012-2017*, JCS-1-13 (Washington, DC, February 2013), Table 1, Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2010-2014*, JCS-3-10 (Washington, DC, December 2010), Table 1, and computed from data from U.S. Energy Information Administration (EIA), Form EIA-886, "Annual Survey of Alternative Fueled Vehicles," Estimated Consumption of Vehicle Fuels in Thousand Gasoline Equivalent Gallons, by Fuel Type, 2007-2011, accessed December 2014 and U.S. Energy Information Administration (EIA), Form EIA-923,"Annual Electric Utility Data." **Federal direct expenditure and R&D expenditure subsidies** DOE: U.S. Department of Energy, Office of the Chief Financial Officer, *Base Financial Data*, FY 2010 and FY 2013; Treasury: Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government*, Fiscal Years 2015 and 2012; All other: Office of Management and Budget andÂ General Services Administration, USASpending.gov - Government spending at your fingertips, http://www.usaspending.gov/, accessed October 22, 2014. **Federal electric program interest subsidy**: Computed from data from U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report; Rural Utility Service, Annual Statistical Report - Rural Electric Borrowers, 2010 and 2011; Tennessee Valley Authority, 2010 and 2013 Annual Report on Form 10-K; Bonneville Power Administration, Annual Report, 2010 and 2013; Western Area Power Administration, 2010 and 2013 Annual Report; Southeastern Power Administration, 2010 and 2013 Annual Reports; Southwestern Power Administration, 2010 and 2013 Annual Report; Moody's Investors Service. **Loan guarantee programs credit subsidy**: Computed from data from U.S. Department of Energy, Loan Program Office, http://energy.gov/lpo/loan-programs-office, accessed January 20, 2015 and EIA, *Direct Federal Financial Interventions and Subsidies in Fiscal Years 2010*, Table 29. **Budget backgrounds:** Budget documents and submissions from the Departments of Energy, Agriculture, Transportation, Treasury, Health and Human Services, Housing and Urban Development, the Environmental Protection Agency and the General Services Administration, Budget Submission to Congress, *Appendix, Budget of the U.S. Government*, FY 2012 and FY 2015; and Budget Submission to Congress, *Federal Credit Supplement, Budget of the U.S. Government*, FY 2011 and FY 2014.

Subsidies for fuels used outside the electricity sector also experienced a substantial decline in both absolute and percentage terms between FY 2010 and FY 2013, driven mainly by the elimination of the Alcohol Fuel Exemption, also referred to as the Volumetric Ethanol Excise Tax Credit (VEETC). In FY 2010, blends of ethanol and gasoline were eligible for a credit of 45 cents per gallon of ethanol used to produce the blend, resulting in a tax expenditure of nearly $6 billion. This program, however, expired at the end of 2011.

Electricity-related subsidies, primarily directed towards fuels and technologies used for electricity production, increased in both absolute and percentage terms between FY 2010 and FY 2013, reflecting increases in both direct expenditures and tax subsidies. Outlays from Treasury's Energy Investment Grant program (i.e., ARRA's Section 1603 grant program for renewable energy) increased from $4.5 billion in FY 2010 to $8.2 billion in FY 2013, while electricity-related tax expenditures for renewables doubled from $1.9 billion to $3.8 billion.

Between FY 2010 and FY 2013, the share of tax expenditure in total financial interventions and subsidies declined while the share of direct expenditures grew, driven mainly by the elimination of the alcohol fuel exemption on the one hand and significant increases in outlays for ARRA Section 1603 grants for electricity-related renewables on the other. Tax expenditures accounted for 42% ($12.4 billion) of the total value of direct federal financial interventions and subsidies in energy markets in FY 2013, down from 46% ($17.3 billion) in FY 2010, as the share of direct expenditures increased from 39% ($14.8 billion) in FY 2010 to 44% ($12.9 billion) in FY 2013.

The changing mix of direct expenditures between FY 2010 and FY 2013 was primarily driven by ARRA's Section 1603 grant program. Between FY 2010 and FY 2013, the renewable share of direct expenditures increased from 37% to 65%, while the end-use technologies share dropped from 41% to 27%. Total direct expenditures decreased 13% from $14.8 billion to $12.9 billion.

No new DOE loan guarantees were issued in FY 2013. The subsidy cost of the loans issued in FY 2010 totaled $1.7 billion, but this cost is assessed at the time the loan is issued, so there was no subsidy cost for FY 2013. However, there were still outstanding debts in FY 2013 for loans issued in prior years (see Table 25). Â While lending authority for the Section 1705 loan program had expired by 2013, budget authority remains for future lending on the Section 1703 loan program.

Table ES2. Quantified energy-specific subsidies and support by type, FY 2010 and FY 2013 (million 2013 dollars)

Beneficiary	Direct Expenditures	Tax Expenditures	Research & Development	DOE Loan Guarantee Program	Federal & RUS Electricity	Total	ARRA Related
2013							
Coal	74	769	202	-	30	1,075	129
Refined coal	-	10	-	-	-	10	-
Natural Gas	62	2,250	34	-	-	2,346	4

Table ES2. Quantified energy-specific subsidies and support by type, FY 2010 and FY 2013 (million 2013 dollars)

Beneficiary	Direct Expenditures	Tax Expenditures	Research & Development	DOE Loan Guarantee Program	Federal & RUS Electricity	Total	ARRA Related
and Petroleum Liquids							
Nuclear	37	1,109	406	-	109	1,660	29
Renewables	8,363	5,453	1,051	-	176	15,043	8,603
Biomass	332	46	251	-	-	629	369
Geothermal	312	31	2	-	-	345	312
Hydropower	197	17	10	-	171	395	216
Solar	2,969	2,076	284	-	-	5,328	3,137
Wind	4,274	1,614	49	-	-	5,936	4,334
Other	209	-	380	-	5	594	229
Subtotal Renewables Electric	8,291	3,783	977	-	176	13,227	8,597
Biofuels	72	1,670	74	-	-	1,816	6
Electricity - Smart Grid and Transmission	8	211	831	-	134	1,184	780
Conversion	833	630	501	-	-	1,964	1,574
End Use	3,513	1,997	466	-	-	5,976	2,046
LIHEAP	3,116	-	-	-	-	3,116	-
Other	397	1,997	466	-	-	2,860	2,046
Total	**12,891**	**12,428**	**3,491**	**-**	**449**	**29,258**	**13,166**
2010							
Coal	46	485	307	-	100	937	74
Refined coal	-	179	-	-	-	179	-
Natural Gas and Petroleum Liquids	80	2,752	9	-	77	2,918	0
Nuclear	66	957	446	279	144	1,893	33

Table ES2. Quantified energy-specific subsidies and support by type, FY 2010 and FY 2013 (million 2013 dollars)

Beneficiary	Direct Expenditures	Tax Expenditures	Research & Development	DOE Loan Guarantee Program	Federal & RUS Electricity	Total	ARRA Related
Renewables	5,491	8,539	1,140	284	189	15,642	5,530
Biomass	178	551	301	-	-	1,030	246
Geothermal	65	1	2	13	-	81	64
Hydropower	60	18	11	-	181	270	79
Solar	461	126	320	182	-	1,090	628
Wind	4,063	1,241	58	90	1	5,453	4,105
Other	317	-	368	-	7	691	342
Subtotal Renewables Electric	5,143	1,938	1,061	284	189	8,614	5,465
Biofuels	348	6,601	79	-	-	7,028	65
Electricity - Smart Grid and Transmission	4	61	534	21	213	833	486
Conversion	3,091	3,364	610	4	-	7,069	6,375
End Use	6,001	1,011	427	1,066	-	8,505	1,126
LIHEAP	5,378	-	-	-	-	5,378	-
Other	623	1,011	427	1,066	-	3,127	1,126
Total	**14,779**	**17,348**	**3,473**	**1,656**	**723**	**37,979**	**13,624**

Notes: Totals may not equal sum of components due to independent rounding. Energy-specific tax expenditures associated with renewables were allocated based on preliminary generation data. No hydropower generation was assumed to be eligible for production tax credits (PTC). It was assumed all investment tax credits were claimed by solar power plants. Municipal Solid Waste (MSW) and open-loop biomass generation estimates used to calculate PTCs were halved to represent the value of their PTC credit, relative to geothermal and wind. Generation estimates used to calculate credits associated with the PTC captured wind and geothermal plants that came online in 2004 and later, and MSW and open-loop biomass plants that came online in 2006 and later.

Sources: **Tax expenditure estimates**: Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government*, Fiscal Years 2015 and 2012. Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2012-2017*, JCS-1-13 (Washington, DC, February 2013), Table 1, Joint Committee on Taxation, *Estimates of*

Table ES2. Quantified energy-specific subsidies and support by type, FY 2010 and FY 2013 (million 2013 dollars)

Beneficiary	Direct Expenditures	Tax Expenditures	Research & Development	DOE Loan Guarantee Program	Federal & RUS Electricity	Total	ARRA Related

Federal Tax Expenditures for Fiscal Years 2010-2014, JCS-3-10 (Washington, DC, December 2010), Table 1, and, computed from data from U.S. Energy Information Administration (EIA), Form EIA-886, "Annual Survey of Alternative Fueled Vehicles," Estimated Consumption of Vehicle Fuels in Thousand Gasoline Equivalent Gallons, by Fuel Type, 2007-2011, accessed December 2014 and U.S. Energy Information Administration (EIA), Form EIA-923,"Annual Electric Utility Data". **Federal direct expenditure and R&D expenditure subsidies**: DOE: U.S. Department of Energy, Office of the Chief Financial Officer, *Base Financial Data*, FY 2010 and FY 2013; Treasury: Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government*, Fiscal Years 2015 and 2012; All other: Office of Management and Budget andÂ General Services Administration, USASpending.gov - Government spending at your fingertips, http://www.usaspending.gov/, accessed October 22, 2014. **Federal electric program interest subsidy**: Computed from data from U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report; Rural Utility Service, Annual Statistical Report - Rural Electric Borrowers, 2010 and 2011; Tennessee Valley Authority, 2010 and 2013 Annual Report on Form 10-K; Bonneville Power Administration, Annual Report, 2010 and 2013; Western Area Power Administration, 2010 and 2013 Annual Report; Southeastern Power Administration, 2010 and 2013 Annual Reports; Southwestern Power Administration, 2010 and 2013 Annual Report; Moody's Investors Service. **Loan guarantee programs credit subsidy**: Computed from data from U.S. Department of Energy, Loan Program Office, http://energy.gov/lpo/loan-programs-office, accessed January 20, 2015 and EIA, *Direct Federal Financial Interventions and Subsidies in Fiscal Years 2010*, Table 29. **Budget backgrounds:** Budget documents and submissions from the Departments of Energy, Agriculture, Transportation, Treasury, Health and Human Services, Housing and Urban Development, the Environmental Protection Agency and the General Services Administration, Budget Submission to Congress, *Appendix, Budget of the U.S. Government*, FY 2012 and FY 2015; and Budget Submission to Congress, *Federal Credit Supplement, Budget of the U.S. Government*, FY 2011 and FY 2014.

The decline in energy-specific subsidies and support between FY 2010 and FY 2013 does not closely correspond to changes in energy consumption and production over the same time period. Overall energy consumption was roughly 97 quadrillion British thermal units (Btu) in both FY 2010 and FY 2013. Domestic energy production, however, rose 10% from 73.7 quadrillion Btu in FY 2010 to 81.1 quadrillion Btu in FY 2013 (see Table ES3). Oil and natural gas production increased 8 quadrillion Btu, with renewables used for both electricity generation and transport increasing 1 quadrillion Btu. The overall amount of federal subsidies and support provided by federal programs within the scope of this report has declined even as total energy production has increased. However, whether at the aggregate level or for individual fuels or technologies, the amount of subsidy per unit of energy produced or consumed does not necessarily provide insight into the current amount of energy production, consumption, or conservation that is or has been supported or influenced. For many programs, there is a

disconnect between when the money is spent and when the impacts are felt. For example, many subsidies support capital investments, which may produce little energy in their first year of service (possibly the year a subsidy is claimed), but then produce energy for many years. Also, R&D expenditures are not reflected in the nation's energy mix unless and until they lead to innovations that penetrate the market, which is a process that could take many years.

Table ES3. Energy subsidies and support, selected indicators, 2010 and 2013

Indicators	FY2010	FY2013
Total Energy subsidies and Support (million 2013 dollars)	37,979	29,258
U.S. Energy Consumption (trillion British thermal units)	97,296	96,584
U. S. Energy Production (trillion British thermal units)	73,659	81,149
U.S. Coal Production (trillion British thermal units)	21,657	20,209
U.S. Natural Gas (dry and liquids) Production (trillion British thermal units)	24,105	28,353
U.S. Crude Oil Production (trillion British thermal units)	11,530	15,342
U.S. Nuclear Production (trillion British thermal units)	8,318	8,117
U.S. Hydroelectric Production (trillion British thermal units)	2,588	2,579
U.S. Biomass Production (trillion British thermal units)	4,272	4,495
U.S. Wind Production (trillion British thermal units)	863	1,549
U.S. Solar Production (trillion British thermal units)	119	286
U.S. Geothermal Production (trillion British thermal units)	207	220

Note: Totals may not equal the sum of components due to independent rounding.
Sources: **Consumption:** EIA, Monthly Energy Review, Table 1.3, accessed December 2014. **Production:** EIA, Monthly Energy Review, Table 1.2, accessed December 2014. **Tax expenditure estimates**: Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government*, Fiscal Years 2015 and 2012. Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2012-2017*, JCS-1-13 (Washington, DC, February 2013), Table 1, Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2010-2014*, JCS-3-10 (Washington, DC, December 2010), Table 1, and computed from data from U.S. Energy Information Administration (EIA), Form EIA-886, "Annual Survey of Alternative Fueled Vehicles," Estimated Consumption of Vehicle Fuels in Thousand Gasoline Equivalent Gallons, by Fuel Type, 2007-2011, accessed December 2014. **Federal direct expenditure and R&D expenditure subsidies**: DOE: U.S. Department of Energy, Office of the Chief Financial Officer, *Base Financial Data*, FY 2010 and FY 2013; Treasury: Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government*, Fiscal Years 2015 and 2012; All other: Office of Management and Budget and General Services Administration, USASpending.gov - Government spending at your fingertips, http://www.usaspending.gov/, accessed October 22, 2014. **Federal electric program interest subsidy**: Computed from data from U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report; Rural Utility Service, Annual Statistical Report - Rural Electric Borrowers, 2010 and 2011; Tennessee Valley Authority, 2010 and 2013 Annual Report on Form 10-K; Bonneville Power Administration, Annual Report, 2010 and 2013; Western Area Power Administration, 2010 and 2013 Annual Report; Southeastern Power

Table ES3. Energy subsidies and support, selected indicators, 2010 and 2013

Indicators	FY2010	FY2013

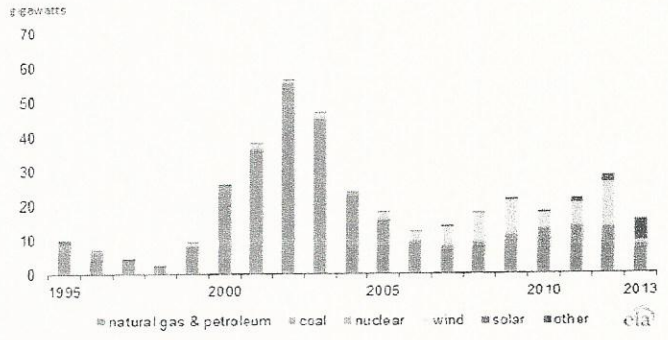
Administration, 2010 and 2013 Annual Reports; Southwestern Power Administration, 2010 and 2013 Annual Report; Moody's Investors Service. **Loan guarantee programs credit subsidy**: Computed from data from U.S. Department of Energy, Loan Program Office, http://energy.gov/lpo/loan-programs-office, accessed January 20, 2015 and EIA, *Direct Federal Financial Interventions and Subsidies in Fiscal Years 2010*, Table 29. **Budget backgrounds:** Budget documents and submissions from the Departments of Energy, Agriculture, Transportation, Treasury, Health and Human Services, Housing and Urban Development, the Environmental Protection Agency and the General Services Administration, Budget Submission to Congress, *Appendix, Budget of the U.S. Government*, FY 2012 and FY 2015; and Budget Submission to Congress, *Federal Credit Supplement, Budget of the U.S. Government*, FY 2011 and FY 2014.

Findings regarding electricity-related subsidies and support

Electricity-related subsidies increased 38% between FY 2010 and FY 2013, from $11.7 billion to $16.1 billion (see Table ES1). This increase was largely the result of a $4.2 billion increase, from $1.1 billion in FY 2010 to $5.3 billion in FY 2013, in support of solar energy, reflecting a large increase in the installation rate of solar facilities utilizing the ARRA Section 1603 grant payments or the 30% Investment Tax CreditÂ (see Table ES2 and Figure ES1). Total subsidies to wind energy also increased between FY 2010 and FY 2013, rising from $5.5 billion to $5.9 billion.

Wind energy received the largest share of direct federal subsidies and support in FY 2013, accounting for 37% of total electricity-related subsidies (see Table ES4). Nearly three-fourths of FY 2013 wind energy subsidies were direct expenditures and largely resulted from the ARRA Section 1603 grant program.[6,7]

Figure ES1. Electricity generating gross capacity additions by year



Sources: 2013: Additions to electricity generating capacity in the Annual Energy Outlook 2014 (AEO2014), Reference case; 1995-2012: History: U.S. Energy Information Administration, Form EIA-860, "*Annual Electric Generator Report*."

Support for Smart Grid and electricity transmission represented the largest portion of electricity-related R&D subsidies. Nearly 39% of FY 2013 R&D expenditures were devoted to researching the electricity grid's capability to accommodate larger shares of electricity from

intermittent sources (e.g., solar, wind, and other renewable energy sources) and offer other potential benefits to producers and consumers of electricity. In FY 2013, electricity-related R&D support was $2.1 billion, or 13% of the electricity-related total value of direct federal financial interventions and subsidies.

Electricity-related renewables received a large share of direct federal subsidies and support in FY 2013 compared with their share of total electricity generation. Renewables (excluding biofuels) received 72% of all electricity-related subsidies and support in FY 2013 (see Table ES3 and Table ES4), yet accounted for 13% of total generation in calendar year 2013.[8] More than three-quarters of the subsidies going to renewables were direct expenditures or tax expenditures targeting upfront capital investments for projects expected to produce energy for at least 20 years.

Interest rate support for federal electricity programs did not increase from FY 2010 to FY 2013. While these programs expanded long-term debt by financing more new generation and transmission projects, the increased debt was offset by lower effective interest rates and more favorable spreads between 30-year Treasury bonds and the cost of debt for IOUs in FY 2013 compared to FY 2010.

Table ES4. Fiscal year 2013 electricity production subsidies and support
(million 2013 dollars, unless otherwise specified)

Beneficiary	Direct Expenditures	Tax Expenditures	Research & Development	DOE Loan Guarantee Program	Federal and RUS Electricity[a]	Total	Share of Total Subsidies and Support
Coal	61	642	167	-	30	901	6%
Natural Gas and Petroleum Liquids	18	662	10	-	-	690	4%
Nuclear	37	1,109	406	-	109	1,660	10%
Renewables	7,408	3,373	722	-	176	11,678	72%
Biomass	62	9	47	-	-	118	1%
Geothermal	221	22	2	-	-	245	2%
Hydropower	194	17	10	-	171	392	2%
Solar	2,448	1,712	234	-	-	4,393	27%
Wind	4,274	1,614	49	-	-	5,936	37%
Other	209	-	380	-	5	594	4%
Subtotal Renewables Electric	7,408	3,373	722	-	176	11,678	72%

Table ES4. Fiscal year 2013 electricity production subsidies and support
(million 2013 dollars, unless otherwise specified)

Beneficiary	Direct Expenditures	Tax Expenditures	Research & Development	DOE Loan Guarantee Program	Federal and RUS Electricity[a]	Total	Share of Total Subsidies and Support
Biofuels	-	-	-	-	-	-	-
Electricity - Smart Grid and Transmission	8	211	831	-	134	1,184	7%
Total	**7,532**	**5,996**	**2,136**	**-**	**449**	**16,112**	**100**

[a]The estimates provided in this table represent the average of the low and high values of more detailed estimates provided in the body of this report.
Notes: Totals may not equal sum of the components due to independent rounding. Estimates of Federal electricity program subsidies and support are based on the most recent annual report data for federally owned utilities which conform to the FY convention.
Sources: **Fuel Allocation Factors**: Computed from data from U.S. Energy Information Administration, Monthly Energy Review, DOE/EIA-0035(2014/12), (Washington, DC, 20585), Table 7a. **Tax expenditure estimates**: Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government*, Fiscal Years 2015 and 2012. Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2012-2017*, JCS-1-13 (Washington, DC, February 2013), Table 1, Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2010-2014*, JCS-3-10 (Washington, DC, December 2010), Table 1, and, computed from data from U.S. Energy Information Administration (EIA), Form EIA-886, "Annual Survey of Alternative Fueled Vehicles," Estimated Consumption of Vehicle Fuels in Thousand Gasoline Equivalent Gallons, by Fuel Type, 2007-2011, accessed December 2014. **Federal direct expenditure and R&D expenditure subsidies**: U.S. Department of Energy, Office of the Chief Financial Officer, *Base Financial Data*, FY 2010 and FY 2013; Office of Management and General Services Administration, USASpending.gov - Government spending at your fingertips, http://www.usaspending.gov/, accessed October 22, 2014. **Federal electric program interest subsidy**: Computed from data from U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report, Rural Utility Service, Rural Electric Borrowers Statistics Report, 2010 and 2011, Tennessee Valley Authority Annual Report, 2010 and 2013, Bonneville Power Authority Annual Report, 2010 and 2013, Western Area Power Administration 2007 and 2013 Annual Report, Southeastern Power Administration 2010 and 2013 Annual Reports, Southwestern Power Administration 2010 and 2013 Annual Reports, Moody's Investors Service, and Federal Reserve Bank Form H-15. **Loan guarantee programs credit subsidy**: Computed from data from U.S. Department of Energy, Loan Program Office, http://energy.gov/lpo/loan-programs-office, accessed January 20, 2015 and EIA, *Direct Federal Financial Interventions and Subsidies in Fiscal Years 2010*, Table 29. **Budget backgrounds:** Budget documents and submissions from the Departments of Energy,

Table ES4. Fiscal year 2013 electricity production subsidies and support
(million 2013 dollars, unless otherwise specified)

Beneficiary	Direct Expenditures	Tax Expenditures	Research & Development	DOE Loan Guarantee Program	Federal and RUS Electricity[a]	Total	Share of Total Subsidies and Support

Agriculture, Transportation, Treasury, Health and Human Services, Housing and Urban Development, the Environmental Protection Agency and the General Services Administration, Budget Submission to Congress, *Appendix, Budget of the U.S. Government*, FY 2012 and FY 2015; and Budget Submission to Congress, *Federal Credit Supplement, Budget of the U.S. Government*, FY 2011 and FY 2014.

Findings Regarding Subsidies and Support for Fuels Used Outside of the Electricity Sector

Renewable fuels received 65% of the value of direct federal financial interventions and subsidies in energy markets for fuels not used to produce electricity (see Table ES6**). Subsidies and support for fuels used outside the electricity sector were $5.2 billion in FY 2013, which accounted for 18% of total subsidies and support. Of that amount, the support for biofuels was** $1.8 billion in FY 2013, driven mainly by tax expenditures, including the estimated tax expenditure of $1.6 billion for the biodiesel producer tax credit. As noted earlier, subsidies and support for biofuels have declined substantially since FY 2010, when the tax credits for ethanol-blended fuels that have since expired were available.

Total subsidies for natural gas and petroleum liquids declined 20% from $2.7 billion in FY 2010 to $2.2 billion in FY 2013 (see Table ES2). Support for natural gas and petroleum liquids is primarily based on tax provisions of the IRC. Tax expenditures related to the excess of percentage over cost depletion for wells declined from $1 billion to $530 million between FY 2010 and FY 2013. However, expensing of exploration and development costs rose from $422 million to $550 million over the same period, likely reflecting increased domestic drilling activities.

Table ES5. Measures of electricity production and growth

Beneficiary	2000 Net Generation (billion kilowatt-hours)	2013 Net Generation (billion kilowatt-hours)	Share of 2000 Generation (percent)	Share of 2013 Generation (percent)	Annual Growth from 2000 to 2013 (percent)
Coal	1,966	1,572	51.7	40.1	-1.7
Natural Gas and Petroleum Liquids	726	1,033	19.1	26.4	2.7
Nuclear	754	789	19.8	20.1	0.3
Renewables	356	512	9.4	13.1	2.8

Table ES5. Measures of electricity production and growth

Beneficiary	2000 Net Generation (billion kilowatt-hours)	2013 Net Generation (billion kilowatt-hours)	Share of 2000 Generation (percent)	Share of 2013 Generation (percent)	Annual Growth from 2000 to 2013 (percent)
Biomass	61	57	1.6	1.5	-0.5
Geothermal	14	165	0.4	4.2	20.9
Hydropower	276	266	7.3	6.8	-0.3
Solar (utility)	-	9	-	0.2	-
Solar (distributed)	-	10	-	0.3	-
Wind	6	168	0.2	4.3	29.2
Other			-	-	-
Biofuels			-	-	-
Total	**3,802**	**3,916**	**100**	**100**	**0.2**

Note: Totals may not equal sum of components due to independent rounding. Fuels used outside of the electric power sector still can be used to generate electricity.
Sources: EIA, Monthly Energy Review, DOE/EIA-0035(2014/12), (Washington, DC, 20585), Tables 7a, 1.2, and 2.6.

Table ES6. Subsidies and support to fuels used outside of the electric power sector

Beneficiary	2000 Fuel Production Excluding that used for Electricity Generation (quadrillion Btu)	2013 Fuel Production Excluding that used for Electricity Generation (quadrillion Btu)	FY 2013 Subsidy and Support (million 2013 dollars)	Share of 2013 Non-Electricity-Related Fuel Production (percent)	Share of 2013 Non-Electricity-Related Subsidies (percent)
Coal	2.52	3.50	185	8.0	3.5
Natural Gas and Petroleum Liquids	28.20	35.75	1,657	81.7	31.8
Nuclear	-	-	-	-	-
Renewables	2.71	4.49	3,365	10.3	64.6
Biomass and Biofuels	2.55	4.15	2,328	9.5	44.7
Geothermal	0.02	0.06	100	0.1	1.9
Hydropower	0.04	0.03	3	0.1	0.1

Table ES6. Subsidies and support to fuels used outside of the electric power sector

Beneficiary	2000 Fuel Production Excluding that used for Electricity Generation (quadrillion Btu)	2013 Fuel Production Excluding that used for Electricity Generation (quadrillion Btu)	FY 2013 Subsidy and Support (million 2013 dollars)	Share of 2013 Non-Electricity-Related Fuel Production (percent)	Share of 2013 Non-Electricity-Related Subsidies (percent)
Solar	0.06	0.22	935	0.5	18.0
Wind	-	-	-	-	-
Other	0.04	0.03	-	0.1	-
Total	**33.43**	**43.74**	**5,206**	**100.0**	**100.0**

Note: Totals may not equal sum of components due to independent rounding. Fuels used outside the electric power sector still can be used to generate electricity.
Sources: EIA, Monthly Energy Review, DOE/EIA-0035(2014/12), (Washington, DC, 20585), Tables 7a, 1.2, and 2.6

Sources of Direct Expenditure and R&D Expenditure Subsidy Data

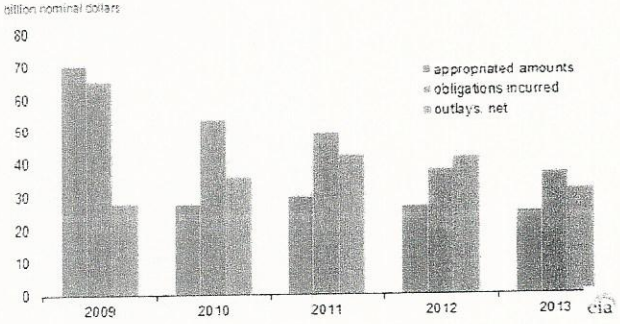
For this report, EIA relies upon many of the data sources and budget documents[9] used in EIA's prior subsidy reports to measure the cost of programs to the federal budget. One significant enhancement is the use of a comprehensive public database summarizing all federal budget obligations that is available through USASpending.gov. For federal agencies other than DOE and Treasury, information on direct expenditures and R&D expenditures for FY 2010 and FY 2013 were extracted from USASpending.gov. This extraction represents roughly 22% (or $3.5 billion) of the $16.4 billion estimated as the combined direct and R&D expenditures in energy in FY 2013, whereas the remaining 78% of the total is estimated using the same updated data sources used in EIA's prior subsidy report. DOE's direct expenditure and R&D expenditures are based on outlays, as provided by the Office of the Chief Financial Officer at DOE.

Appropriations, **obligations**, and **outlays** are the primary phases of the United States government budget control system. Congress enacts appropriations that provide federal agencies and programs budget authority to make financial commitments (i.e., obligations) to spend funds. Obligations are legally binding agreements to purchase items or services, which is the budget phase captured in USASpending.gov. Outlays are payments made by the federal government for services performed, and they offset or liquidate outstanding obligations.

Under steady state conditions, where outlays follow obligations in a regular pattern and there are no sharp discontinuities in the former or the latter, obligation and outlay measures closely correspond. However, the enactment of ARRA included energy funding that dwarfed DOE's previous energy program budgets and required the rapid obligation of funds that would fund outlays over several years. Because ARRA appropriations created a wide gap between budget authority, obligations, and outlays, EIA faced a decision whether to tally spending based on obligations or outlays. Given the multi-year outlays from a 20-year high in budget authority created under ARRA, and the fact that both tax expenditures and the Section 1603 grants that

constitute the other major spending programs considered in this study are reported in the year when the grant or credit is claimed, EIA determined that users of the report would be best served by reporting DOE programs based on outlays, using information obtained from DOE's Office of the Chief Financial Officer.

Figure ES2. Department of Energy budget appropriation amounts, obligations incurred, and net outlays, FYs 2009-2013



Sources: Appropriations and Obligations: DOE, FY 2013 DOE Agency Financial Report, December 17, 2013; Outlays, Net: DOE, Office of the Chief Financial Officer, email communications on March 2, 2015.

EIA's budget research revealed that much of ARRA funding was completely obligated by FY 2010; however, significant outlays that fit the criteria of a subsidy in this report were made from ARRA-related funding in fiscal years subsequent to FY 2010. Hence, the use of obligations in the case of DOE would tend to distort subsidy trends and "front-load" the estimates of direct and R&D expenditures. ARRA included appropriations of more than $45.2 billion to DOE[10] and a review of total appropriations, obligations and outlays appear in Figure ES2 to show the overall impact from ARRA-related funding on DOE.[11]

See complete report

Footnotes

[1]Office of Management and Budget and U.S. General Services Administration, *2014 Catalog of Federal Domestic Assistance*, (Washington, DC, October 2014) https://www.cfda.gov/downloads/CFDA_2014.pdf, accessed December 1, 2014.

[2]Flood Control Act of 1944 (58 Stat. 890; 16 U.S.C. 825s).

[3]Moody's Investor Service and Federal Reserve Bank Form H-15.

[4]Section 1703 of Title XVII of the Energy Policy Act of 2005 authorizes the U.S. Department of Energy to support innovative clean energy technologies that are typically unable to obtain conventional private financing due to high technology risks. In addition, the technologies must

avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases. See: United States Department of Energy, Loan Programs Office at http://www.energy.gov/lpo/projects.

[5]Office of Management and Budget, *Analytical Perspectives of the Budget of the United States*, Editions 2012 and 2015. Data for 2010-2016 appear in Table 17-1 and data for 2013-2019 appear in Table 14-1. Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2010-2014*, JCS-3-10, Table 1 (Washington, DC, December 2010) and Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2012-2017*, JCS-1-13, Table 1 (Washington, DC, February 2013).

[6]In FY 2010, 84% of Section 1603 grant payments went to wind energy; however, in FY 2013 this percentage dropped to 52%.

[7]Note that direct expenditures include grant programs where all of the cost is assigned to the year in which a project enters service. For many wind projects, the Section 1603 grant was used in lieu of the production tax credit (PTC), which is paid out over the first 10 years of a project's operation. Although the Section 1603 grant, which represents 30% of the project's installed cost, and the PTC, providing an inflation-adjusted value of approximately 2.3 cents per kilowatt-hour (kWh) for energy sold, are not necessarily equal, they are relatively comparable in present value terms. The use of the Section 1603 grant results in "front-loaded" direct expenditure for a project that might otherwise have claimed the PTC over a 10-year period.

[8]U.S. Energy Information Administration, Monthly Energy Review, January 2015, DOE/EIA-0035(2015/01) (Washington, DC, January 2015), Table 7.2, http://www.eia.gov/totalenergy/data/monthly/.

[9]Office of Management and Budget, *Analytical Perspectives of the Budget of the United States*, Editions 2012 and 2015. Data for 2010-2016 appear in Table 17-1 and data for 2013-2019 appear in Table 14-1. Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2010-2014*, JCS-3-10, Table 1 (Washington, DC, December 2010) and Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2012-2017*, JCS-1-13, Table 1 (Washington, DC, February 2013).

[10]Recovery Board, *ARRA Funding Status Report as of December 2012*, accessed January 23, 2015.

[11]Of the $45.2 billion designated by Congress for the Department of Energy as part of ARRA, as of December 2012, $35.8 billion has been distributed in the form of contract, grant, and loan awards; $0.7 billion expired and denotes the amounts not distributed by the deadlines in ARRA, Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act), or deadlines set by the Office of Management and Budget; and $5.2 billion has not been awarded and denotes the difference between the appropriations and the funds awarded, of which $5.1 billion represents lines of credit for the Bonneville and Western Area Power Administration programs. These lines of credit funds do not expire.