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

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Preface

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 using Fiscal Year (FY) 2013 data of two earlier EIA reports that provided a snapshot of direct federal financial interventions and subsidies in energy during FY 2007 and FY 2010. The report provides data on federal programs specifically targeted at energy markets that provide a financial benefit and have an identifiable federal budget impact. As requested, the report focuses on subsidies to electricity production and also includes subsidies to federal electric utilities in the form of financial support.

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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 box 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 box 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.

[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.

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.

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).

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

[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.

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.

Not all subsidies impacting the energy sector are included in this report

This report focuses on financial interventions and subsidies that meet the following criteria: they are provided by the federal government, they provide a financial benefit with an identifiable federal budget impact, and they are specifically targeted at energy. These criteria, particularly the energy-specific requirement, exclude some subsidies that benefit the energy sector.

For example, Section 199 of the American Jobs Creation Act of 2004, referred to as the domestic manufacturing deduction, provides reductions in taxable income for American manufacturers, including domestic oil and gas producers and refiners. Taxpayers generally are permitted a 9% deduction for domestic production activities. The deduction is reduced to 6% for qualified production activities income attributable to the production refining, processing, transportation, or distribution of oil, gas, or any primary product thereof. The Section 199 manufacturing credit applies to oil and gas producers along with a variety of other U.S. manufacturers. While domestic oil and natural gas companies utilized this provision to reduce their tax liability, other industries, including traditional manufacturing sectors and other activities such as engineering and architectural services, sound recordings, and qualified film production, also took advantage of it.

[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).

Accelerated depreciation is the set of tax rules that allow businesses (both energy and non-energy) to deduct from their taxable income the declining value of business-related investments, such as equipment and machinery. Accelerated depreciation provides a subsidy only to the extent that the amount of depreciation specified by the Internal Revenue Service (IRS) exceeds the true economic "wear and tear" costs. Most empirical studies of economic depreciation have found evidence of some type of accelerated economic depreciation affecting various industries, although the exact pattern varied from study to study. This report, consistent with earlier editions, includes the impacts of accelerated depreciation schedules identified as specific to the energy sector, but excludes schedules with applicability beyond the energy sector.

Subsidized credit for energy infrastructure projects is frequently provided by export credit agencies and multilateral development banks. However, entities such as the Export-Import Bank of the United States also provide support to non-energy industries including aerospace, medical equipment, non-energy mining, and agribusiness.

Tax-exempt municipal bonds allow publicly owned utilities to obtain lower interest rates than those available from either private borrowers or the Treasury. However, while they are used by energy industries such as electric utilities, the group of eligible borrowers also includes water utilities, telecommunication facilities, waste treatment plants, and other publicly owned entities.

The tax code allows a foreign tax credit for income taxes paid to foreign countries. If a multinational company is subject to a foreign country's levy, and it also receives a specific economic benefit from that foreign country, it is classified as a "dual-capacity taxpayer." Dual-capacity taxpayers cannot claim a credit for any part of the foreign levy unless it is established that the amount paid under a distinct element of the foreign levy is a tax, rather than a compulsory payment for some direct or indirect economic benefit. Major oil companies are significant beneficiaries of this provision. However, this tax provision is also available to non-energy industries.

The tax code also provides special treatment for some publicly traded partnerships (PTP). Section 7704 of Title 26 of the U.S.C. generally treats a publicly traded partnership as a corporation for federal income tax purposes. For this purpose, a PTP is any partnership that is traded on an established securities market or secondary market. However, a notable exception to Section 7704 occurs if 90% of the gross income of a PTP is passive-type income, such as interest, dividends, real property rents, gains from the disposition of real property, and similar income or gains. This would include gains from natural resource sales. In these cases, the PTP is exempt from corporate-level taxation, thus allowing it to claim pass-through status for tax purposes. As with many other tax provisions, the tax treatment of PTPs is not exclusive to the energy sector.

Another type of program not addressed in this report is associated with energy-related trust funds financed by taxes and fees. Examples include the Black Lung Disability Trust Fund, the Leaking Underground Storage Tank Trust Fund, the Oil Spill Liability Trust Fund, the Pipeline Safety Fund, the Aquatic Resources Trust Fund, the Abandoned Mine Reclamation Fund, the Nuclear Waste Fund, and the Uranium Enrichment Decontamination and Decommissioning Fund. By tying trust fund collections to products and activities responsible for the damages they address, the cost of programs for remediation and prevention of those damages can be reflected in the market price of energy use and production. If the fees or taxes collected by trust funds have been set appropriately, the funds will have sufficient resources to meet their obligations with the result that no subsidy is involved. However,

if the fees or taxes are set too low, energy companies are receiving an implicit subsidy. These programs are not addressed in this report because of the difficulty in determining the sufficiency of the funds to meet potential liabilities and the fact that there is no direct federal budgetary impact in FY 2013.

This report also does not include or attempt to quantify the value of limits to liability in case of a nuclear accident provided by Section 170 of the Atomic Energy Act of 1954, the Price-Anderson Act. The Price-Anderson Act requires each operator of a nuclear power plant to obtain the maximum amount of primary coverage of liability insurance. Currently, the amount is about $375 million. Damages exceeding that amount would be funded with a retroactive assessment on all other firms owning commercial reactors based upon the number of reactors they own. However, Price-Anderson places a limit on the total liability to all owners of commercial reactors at about $13 billion.

Key findings

The total value of direct federal financial interventions and subsidies in energy markets decreased 23% 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.

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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.

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**
Fuel and Technologies Used for Electricity Production	10,862	14,928
Transmission and Distribution	833	1,184
Fuels Used Outside the Electric Power Sector	**10,710**	**5,206**
Conservation, End Uses, and Low-Income Home Energy Assistance Program (LIHEAP)	**15,574**	**7,940**
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 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 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.

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). 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 and Development	DOE Loan Guarantee Program	Federal and RUS Electricity	Total	ARRA Related
2013							
Coal	74	769	202	-	30	1,075	129
Refined Coal	-	10	-	-	-	10	-
Natural Gas and Petroleum Liquids	62	2,250	34	-	-	2,346	4
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**
Conservation	**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	-

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

million 2013 dollars

Beneficiary	Direct Expenditures	Tax Expenditures	Research and Development	DOE Loan Guarantee Program	Federal and RUS Electricity	Total	ARRA Related
Natural Gas and Petroleum Liquids	80	2,752	9	-	77	2,918	0
Nuclear	66	957	446	279	144	1,893	33
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**
Conservation	**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 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 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 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. Total energy subsidies and support and selected energy indicators, FY 2010 and FY 2013

Indicators	FY 2010	FY 2013
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 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 Credit (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]

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.

[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/.

Table ES4. Fiscal Year 2013 electricity production subsidies and support

million 2013 dollars, unless otherwise specified

Beneficiary	Direct Expenditures	Tax Expenditures	Research and 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**
Biofuels	-	-	-	-	-	-	-
Electricity - Smart Grid and Transmission	**8**	**211**	**831**	**-**	**134**	**1,184**	**7**
Total	**7,532**	**5,996**	**2,136**	**-**	**449**	**16,112**	**100**

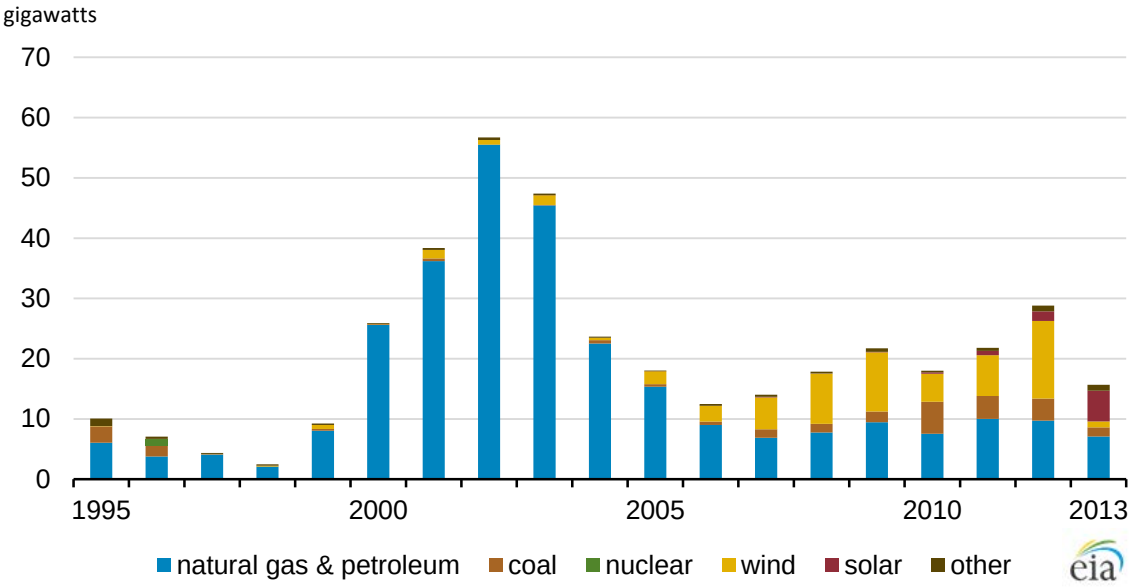
Notes: Totals may not equal sum of the components due to independent rounding. Estimates of Federal electricity program subsidies and support are based on the most recent annual report data for federally owned utilities which conform to the FY convention.
Sources: **Fuel Allocation Factors**: Computed 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**: 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 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.
[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.

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.

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*."

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 2000 Generation (percent)	Annual Growth from 2000 to 2013 (percent)
Coal	1,966	1,586	51	39.0	-1.6
Natural Gas and Petroleum Liquids	712	1141	18.7	28.0	3.7
Nuclear	754	789	19.8	19.4	0.4
Other	13	20	0.3	0.5	3.3
Renewables	**356**	**532**	**9.4**	**13.1**	**3.1**
Biomass	61	60	1.6	1.5	-0.1
Geothermal	14	17	0.4	0.4	1.2
Hydropower	276	269	7.2	6.6	-0.2
Solar (utility)	-	9	-	0.2	-
Solar (distributed)	-	10	-	0.2	-
Wind	6	168	0.1	4.1	29.9
Biofuels	-	-	-	-	-
Total	**3,802**	**4,068**	**100**	**100**	**0.5**

Notes: Totals may not equal sum of components due to independent rounding. Other includes net generation from pumped hydroelectric storage, other gases, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.

Sources: U.S. Energy Information Administration, U.S. Energy Information Administration, Monthly Energy Review, (Feb 2015), Table 7.2a. For Solar (distributed), estimated from U.S. Energy Information Administration, Annual Energy Outlook 2014, Table A16.

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	3.5	185	8	3.5
Natural Gas and Petroleum Liquids	28.2	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	9.8
Geothermal	0.02	0.06	100	0.1	1.9
Hydropower	0.04	0.03	3	0.1	0.1
Solar	0.06	0.22	935	0.5	18
Wind	-	-	-	-	-
Other	0.04	0.03	-	0.1	-
Total	**33.43**	**43.74**	**5,206**	**100**	**100**

Notes: 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.

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.

[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).

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.

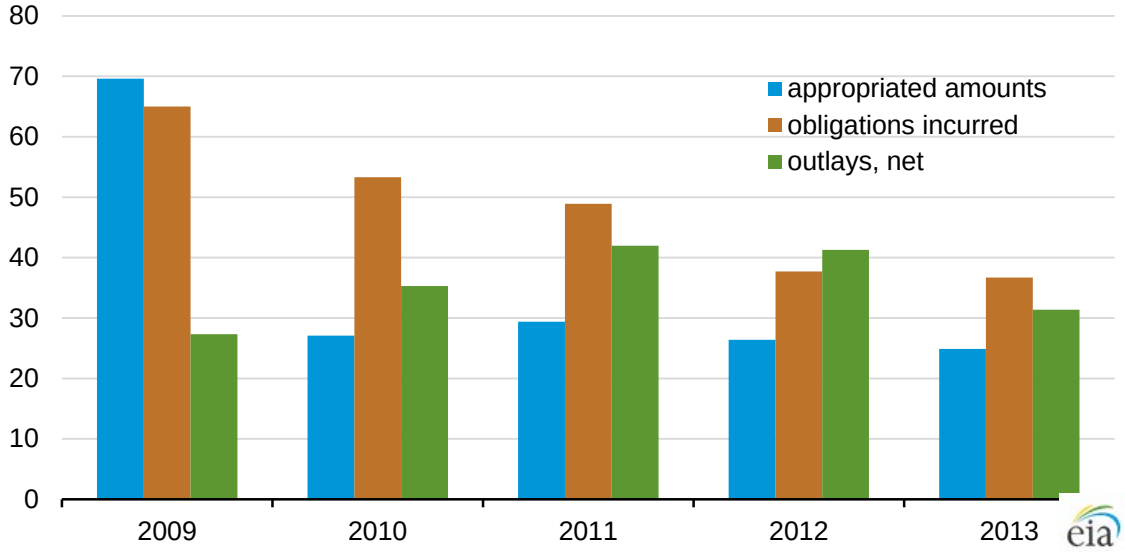
EIA's budget research revealed that much of ARRA funding was completely obligated by FY 2010; however, significant outlays that fit the criteria of a subsidy in this report were made from ARRA-related funding in fiscal years subsequent to FY 2010. Hence, the use of obligations in the case of DOE would 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]

[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.

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

billion nominal dollars



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.

A wide variety of definitions, methods, and estimates occur in other energy subsidy studies

This report and its previous editions respond to a specific congressional request. There is a continuing debate over the scope, role, and effectiveness of energy policy measures, and several studies addressing energy subsidies appear each year from various sources. Some examples within the past five years include: (1) Environmental Law Institute (2009), 'Estimating U.S. Government Subsidies to Energy Sources: 2002-2008' (2) Earth Track, Inc. (2010), 'EIA Energy Subsidy Estimates: A Review of Assumptions and Omissions' (3) DBL Investors (2011), 'What Would Jefferson Do? The Historical Role of Energy Subsidies in Shaping America's Energy Future' and (4) Management Information Services, Inc. (2011), '60 Years of Energy Incentives: Analysis of Federal Expenditures for Energy Development.' Several of these reports and others in the literature seek to draw conclusions about policy issues related to energy subsidies.

This EIA report focuses on developing data to provide information that can be used by others to conduct their own analyses. Along with EIA, the Congressional Research Service (CRS), the Congressional Budget Office (CBO), and the Government Accountability Office (GAO) also issue occasional reports on the scope and nature of federal energy subsidies that mainly or exclusively focus on data. Recent CRS, CBO, and GAO reports include: (1) CRS (2012), 'Energy Tax Incentives: Measuring Value Across Different Types of Energy Resources'[12] (2) CBO (2012), 'Federal Financial Support for the Development and Production of Fuels and Energy Technologies' (3) GAO (2013), 'Energy: Federal Support for Renewable and Advanced Energy Technologies' and (4) GAO (2014), 'Energy Policy: Information on Federal and Other Factors Influencing U.S. Energy Production and Consumption from 2000 through 2013.'

Taken together, the extensive literature on subsidies provides examples of how differing definitions and methods can yield a wide range of estimates and interpretations.

[12] CRS Report R41953, *Energy Tax Incentives: Measuring Value Across Different Types of Energy Resources*, September 18, 2013, by Molly F. Sherlock.

1. Introduction

Background

This report responds to a September 2014 request (see Appendix A) 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 of two earlier EIA reports on direct federal financial interventions and subsidies in energy covering FY 2007 and FY 2010.

As requested, this report updates the previous report using FY 2013 data and is limited to 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. Subsidies to federal electric utilities, defined as several unique types of financial support, are also included as requested. These criteria do exclude some subsidies beneficial to energy sector activities (see text box entitled "Not All Subsidies Impacting the Energy Sector Are Included in this Report" in the Executive Summary of this report) and this should be kept in mind when comparing this report to other studies that may use narrower or more expansive inclusion criteria.

The report does not include research on any long-term historical trends. It draws no conclusions concerning how direct financial interventions and subsidies in earlier or intervening fiscal years relate to current incentives and subsidies, as well as the consistency or effectiveness of current or past subsidy and support programs in achieving energy, economic, or environmental objectives that may have motivated their adoption. For many subsidy and support programs covered in this report, especially longer-term research and development activities, program expenditure does not correlate with the year in which impacts on energy consumption, production, or conservation may be realized.

Subsidy categories

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

Direct expenditures to producers or consumers (Section 2 of this report). The most obvious subsidy is a direct payment of federal funds. These are federal programs that provide direct cash outlays which provide a financial benefit to producers or consumers of energy, most of which are included in GSA's *Catalog of Federal Domestic Assistance*, a government-wide compendium of federal programs, projects, services, and activities that provide assistance or benefits to the American public.[13]

Tax expenditures (Section 2 of this report). These are provisions based mainly in the Internal Revenue Code (IRC or Tax Code)—Title 26 of the United States Code (26 U.S.C.)—that reduce the tax liability of firms or individuals who take specified actions that affect energy production, distribution, transmission, consumption, or conservation. According to Treasury, tax expenditures describe revenue losses attributable to provisions of federal tax laws which allow a special exclusion, exemption, or deduction from gross income or which provide a special credit, a preferential rate of tax, or a deferral of tax

[13] Office of Management and Budget and 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.

liability. These exceptions are often viewed as alternatives to other policy instruments because of a lack of a budget item, such as federal spending or regulatory programs. EIA relied on the definitions of tax expenditures incorporated in the federal budget and the associated tax expenditures estimated by Treasury that are itemized in various sections of Budget of the United States Government, *Analytical Perspectives*. To a lesser extent, Table 1 includes data estimates by the Congressional Joint Committee on Taxation (JCT). Some tax expenditures that benefit the energy industry may also support non-energy related activities, such as the use of accelerated depreciation schedules. EIA has included only those provisions that are narrowly targeted to the energy sector.

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

Research and development (Section 3 of this report). The federal government has an extensive program of funding energy research and development (R&D) activities. These are federal subsidies 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 subsidies generally do not directly affect current energy consumption, production, and prices, but, if successful, they could affect future consumption, production, and prices. Like the direct expenditures programs, R&D programs also were identified using the *Catalog of Federal Domestic Assistance*.

Federal electricity programs supporting federal and rural utilities (Section 4 of this report). 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."[14] These marketing administrations recover investment and production costs through the sale of generation; however, their capital investments are implicitly (or explicitly) backed by the full faith and credit of the U.S. government. Thus, they may be eligible for more favorable financing terms than utilities by private investors or state or local governments. 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

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

those available to investor-owned utilities (IOU). 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.

Loan and loan guarantees (Section 5 of this report). These involve federal 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 the energy market participants. The 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.[15] ARRA amended DOE's loan guarantee program's authorizing legislation, creating Section 1705—a temporary program for the rapid deployment of renewable energy and electric power transmission projects administered by DOE—that expired, pursuant to statute, on September 30, 2011. Further, as noted in Section 5 of this report, no loans were executed in FY 2013; hence, discussion in this report is limited, but a complete reference is available in prior editions of EIA's subsidy report.

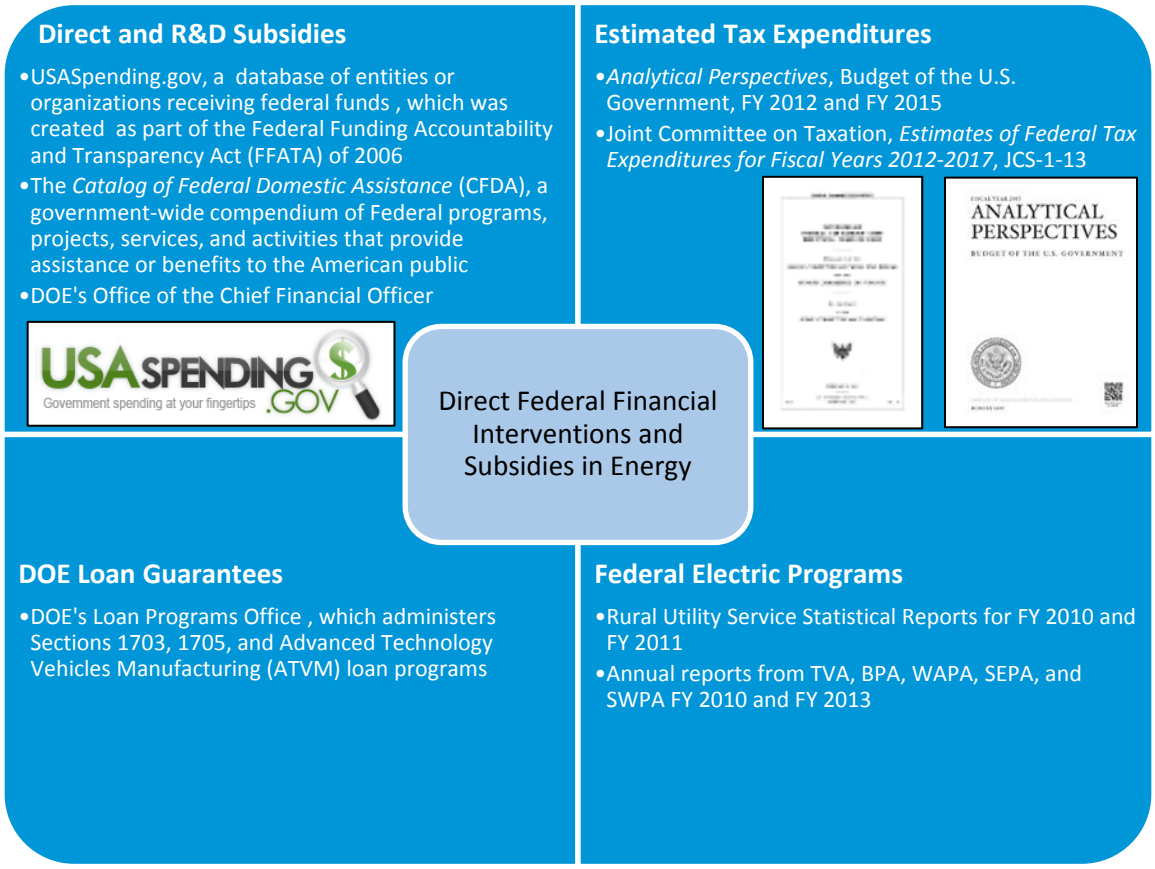
Data sources

For this report, EIA relies upon many of the data sources and budget documents[16] 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 the Department of Energy (DOE), spending is reported based on the obligations reported on that website for FY 2010 and FY 2013. 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 (see text box "Sources of Direct Expenditure and R&D Expenditure Subsidy Data").

[15] 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.

[16] Office of Management and Budget, *Analytical Perspectives, Budget of the U.S. Government*, Editions 2012 and 2015. Data for 2010-2016 appear in Edition 2012 (Table 17-1) and data for 2013-2019 appear in Edition 2015 (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).

Figure 1. Data sources for energy-related subsidies



Sources of direct expenditure and R&D expenditure subsidy data

For this report, EIA relies upon many of the data sources and budget documents[17] 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 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 expenditures and R&D expenditures are based on outlays, as provided by the Office of the Chief Financial Officer at DOE. Treasury's direct expenditures are similarly based on outlays, as obtained from *Analytical Perspectives*.

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, enactment of the American Recovery and Reinvestment Act of 2009 (ARRA), which included energy funding that dwarfed the DOE's previous energy program budgets and 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 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 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.

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 essentially "front-loads" the estimates of direct and R&D expenditures. ARRA included appropriations of more than $45.2 billion to the Department of Energy.[18]

[17] Office of Management and Budget, *Analytical Perspectives, Budget of the U.S. Government*, Editions 2012 and 2015. Data for 2010-2016 appear in Editon 2012 (Table 17-1) and data for 2013-2019 appear in Edition 2015 (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).

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

Organization of report

Following this introduction, Section 2 reports on energy-related tax expenditures and direct expenditures, which together account for the bulk of the subsidies and support within the scope of this report. Section 3 discusses subsidies which are listed in the federal budget as R&D expenditures. Section 4 evaluates support associated with federal electricity programs. Section 5 briefly discusses loan guarantees, notwithstanding the fact that no loans were closed in FY 2013.

Because this report is intended as an update, it focuses on providing tabular comparisons of FY 2013 data with FY 2010 data, and generally limits discussion to areas where changes were made or new methodologies were used. Readers can find additional information in earlier reports in the series and other supporting documents.[19]

[19] U.S. Energy Information Administration, Federal Financial Interventions and Subsidies in Energy Markets 2007, Washington, DC, 20585, April 2008, available at http://www.eia.gov/oiaf/servicerpt/subsidy2/index.html and U.S. Energy Information Administration, Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2010, Washington, DC, 20585, August 2011, available at http://www.eia.gov/analysis/requests/subsidy/.

2. Tax Expenditures and Direct Expenditures

Overview

This section focuses on estimates of energy-specific federal tax provisions and direct expenditure subsidies that support the energy sector, including energy producers, providers, and consumers.

In FY 2013, energy-related tax expenditures were estimated to be $12.4 billion, or 42% of the total subsidies and support identified in this report (see Table 1). This is substantially lower than the $17.3 billion, or 46% share in FY 2010. This reflects, in large part, the importance of shifts in subsidies for renewable energy production during this time, including the expiration of a key alcohol fuel tax exemption and the residual impact of the temporary Section 1603 grants program established under ARRA. Section 1603 provisions shifted some subsidies from 10-year payouts of production tax credits to one-time capital expenditure grants, and has helped incentivize additional investment in newer technologies.[20] Despite the expiration of the Section 1603 grants program at the end of 2011, OMB budget documents project outlays under this program into FY 2017.

Of the FY 2013 total tax expenditures ($12.4 billion) that subsidize or otherwise support activities of energy producers or consumers, $5.5 billion (44%), was for tax provisions that support renewable energy sources. Natural gas and petroleum liquids represent the next largest source at $2.3 billion (or 18%), with end-use technologies at $2.6 billion (or 21%).

Direct expenditures were slightly more than tax expenditures at $12.9 billion and represented 44% of total subsidies and support. Renewable energy sources, particular wind and solar projects taking advantage of the Section 1603 grant program, accounted for over 64% of these direct expenditures.

Tax expenditures

Energy tax expenditures are broadly defined as provisions in the Internal Revenue Code (IRC) that provide beneficial tax treatment to taxpayers who produce, consume, or economize on energy in ways that are deemed to be in the public interest.[21] Energy-specific tax expenditures for FY 2010 together with FY 2013 estimates are reported in Table 1.

The federal budget lists tax expenditures, pursuant to the Congressional Budget Act of 1974 (Public Law 93-344), which defines them as "revenue losses attributable to provisions of federal tax laws, which allow a special exclusion, exemption, or deduction from gross income or provide a special credit, preferential rate of tax, or deferral liability." In preparing data on energy-related tax expenditures, the EIA relied on the definitions of tax expenditures incorporated in the federal budget and the associated tax expenditures estimated by the Department of the Treasury.[22] To a lesser extent, this section includes data estimates by the congressional Joint Committee on Taxation (JCT).

[20] National Energy Renewable Laboratory, §1603 Treasury Grant Expiration: Industry Insight on Financing and Market Implications, accessed February 16, 2015.
[21] As explained in the Introduction, this report only covers tax provisions that impact just the energy sector.
[22] Office of Management and Budget, *Budget of the U.S. Government, Analytical Perspectives*, Fiscal Years 2012 and 2015 (Washington, DC). It is unknown the extent that the FY 2015 *Analytical Perspectives* accounts for the enactment of the Tax Increase Prevent Act of 2014, which was enacted in December 2014 and extended many expired energy-related tax provisions.

Tax expenditures arise from provisions in federal tax laws including credits, deductions, deferrals, preferential rates, and exemptions (exclusions), as briefly described below.

Tax credit. A tax credit is an amount deducted directly from income tax otherwise payable. For Instance, the HOPE credit can lower an eligible party's tax bill by a fixed amount per child for the first two years of his/her college education. A tax credit reduces the taxpayer's tax bill dollar-for-dollar; that is, a tax credit of $1,000 will reduce the final tax bill by $1,000 (subject to restrictions of the Alternative Minimum Tax (AMT); see discussion below).

Tax deduction. A tax deduction is an amount deducted from taxable income to arrive at adjusted taxable income. An example is the mortgage interest deduction available to homeowners. A tax deduction reduces the taxpayer's tax bill proportionately to the taxpayer's marginal tax rate (sometimes referred to as tax bracket). A tax deduction of $1,000 to a taxpayer in the 25% tax bracket will reduce the tax bill by $250; to a taxpayer in the 35% tax bracket, the same deduction will reduce the tax bill by $350 (again, see note on the AMT below).

Tax deferral. A tax deferral allows for payment of a tax in a later year, effectively providing an interest-free loan. The Office of Management and Budget (OMB) reports the annual value of tax expenditures for tax deferrals on a cash basis. The OMB notes that "although such estimates are useful as a measure of cash flow into the government, they do not accurately reflect the true economic cost of the provisions. For example, for a provision where activity levels have changed, so that incoming tax receipts from past deferrals are greater than deferred receipts from new activity, the cash-basis tax expenditure estimate can be negative, despite the fact that in present value terms current deferrals have a real cost to Government." A tax deferral does not reduce the nominal tax bill of a taxpayer, but provides value to the taxpayer (and cost to the government) because of the difference between the nominal tax burden and the real tax burden in the year of actual payment. According to OMB Circular 94, the U.S. Government's discount rate for a 7-year financial transaction is 0.5%. So the government would value a 7-year deferral of $1000 at $966 in the year of receipt, for a cost to the Treasury of $34. However, private taxpayers would likely have a different discount rate based on their own financial circumstances.

Preferential tax rate. A preferential tax rate treats certain forms of taxable income more favorably than other income. One example is the lower tax rate applied to capital gains. Preferential tax rates reduce a taxpayer's tax bill in direct proportion to the difference between the preferred tax rate and the rate that would otherwise be applied (if that can be determined). A taxpayer in the 25% tax bracket would see a 40% reduction in the tax owed on their capital gains if those gains are taxed at a 15% rate. For such a taxpayer, $4,000 of ordinary taxable income would result in a tax bill of $1,000, but $4,000 of capital gains income would result in a tax bill of $600.

Tax exclusion. A tax exclusion exempts a portion of income from taxation. For example, employee-provided health insurance can often be excluded from income. The impact on tax burden to the tax payer for a tax exclusion is fundamentally the same as the impact of a tax deduction, as described above.

The determination of what exactly is a preferential provision is subject to interpretation. Items in the budget identified as tax expenditures by Treasury on occasion differ from those determined to be tax

expenditures by the Congressional Joint Committee on Taxation (JCT) — i.e., the two bodies which produce most of these estimates. Historical tax expenditure data used in this report are taken from a number of government sources. For FY 2013, Treasury is the primary provider of estimates for tax expenditures, supplemented by data provided by the JCT.

Table 1. Estimates of energy-specific tax expenditures, FY 2010 and FY 2013

million 2013 dollars

Tax Provision	FY 2010	FY 2013
Energy Investment Credit	137	1,950
Energy Production Credit	1,624	1,670
Biodiesel Producer Tax Credit[a]	517	1,600
Nuclear Decommissioning	949	1,100
Credit for Residential Energy Efficient Property	232	960
Credit for Energy Efficiency Improvements to Existing Homes	3,364	610
Temporary 50-Percent Expensing for Equipment used in the Refining of Liquid Fuels	801	600
Expensing of Exploration and Development Costs	422	550
Excess of Percentage over Cost Depletion	1,033	530
Amortization of Certain Pollution Control Facilities	105	400
Alternative Fuel and Fuel Mixture Credit	179	350
Exclusion from Income of Conservation Subsidies Provided by Public Utilities	232	340
Tax Credit and Deduction for Clean-Burning Vehicles	264	270
Advanced Energy Manufacturing Facility Investment Tax Credit	190	210
Transmission Property Treated as Fifteen-Year Property	105	200
Credit for Investment in Clean Coal Facilities	253	180
Credit for Construction of New Energy Efficient Homes	21	150
Credit for Energy Efficient Appliances	158	150
Natural Gas Distribution Pipelines being Treated as 15-Year Property	127	100
Amortize All Geological and Geophysical Expenditures over 2 Years	158	100
Capital Gains Treatment of Royalties on Coal	53	90
Credit for Holding Clean Renewable Energy Bonds[b]	74	70
Allowance for the Deduction of Certain Energy Efficient Commercial Building Property	63	70
Alcohol Fuel Credits	74	40
Exclusion of Special Benefits for Disabled Coal Miners	41	30
Partial Expensing for Advanced Mine Safety Equipment	3	27
Exception from Passive Loss Limitation for Working Interests in Oil and Gas Properties	32	20
Qualified Energy Conservation Bonds	0	20
Biodiesel and Small Agri-Biodiesel Producer Tax Credits	21	20
Alternative Fuel Production Credit	179	10

Table 1. Estimates of energy-specific tax expenditures, FY 2010 and FY 2013 (cont.)

million 2013 dollars

Tax Provision	FY 2010	FY 2013
Alcohol Fuel Exemption[a]	5,989	10
Mine Rescue Training Credit	-	1
Deferral of Gain from Disposition of Transmission Property to Implement FERC Restructuring Policy	-53	-
Credit for Production from Advanced Nuclear Power Facilities	-	-
Expensing of Capital Goods with Respect to Complying with EPA Sulfur Regulations	-	-
5-Year Net Operating Loss Carryover for Electric Transmission Equipment	-	-
Total	17,348	12,428

[a]The alcohol fuel exemption or Volumetric Ethanol Excise Tax Credit (VEETC) is essentially the excise tax exemption equivalent to the alcohol fuel credits. The biodiesel producer tax credit is the excise tax exemption to the biodiesel and small agri-biodiesel producer tax credits. These are both listed as footnotes to an OMB, *Analytical Perspectives*, table which includes energy tax expenditures.

[b] In addition, the provision has an outlay effect of $10 million and $40 million in 2010 and 2013, respectively.

Notes: Totals may not equal sum due to independent rounding.

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.

Tax expenditure estimation issues, including the Alternative Minimum Tax (AMT)

Each year the Treasury estimates tax expenditures for the upcoming fiscal year budget. This data appears in OMB, *Analytical Perspectives of the United States Budget*. It is important to recognize that tax expenditure data are estimates and forecasts. Furthermore, prior year tax expenditure estimates may be substantially revised. However, a particular year's revision will not necessarily affect all past estimates. Additionally, the methodology used to estimate tax expenditures by the Department of the Treasury is subject to periodic modification, and these changes are not always applied to revisions of all historical tax expenditure data.

This report presents energy tax expenditure estimates for FYs 2010 and 2013. Sizable changes in the dollar value of particular expenditures over time often reflect changes in their utilization due to changes in the IRC, key interpretations of the IRC, or in other key market and policy drivers. The historical data also reveal when particular energy programs were implemented and terminated, illustrating the magnitude of various tax policies affecting energy production and consumption over time. Although there are gaps in the data for some years, generalized trends in tax expenditures are still apparent. Readers of this report are cautioned that some of the tax expenditure data presented in this report will be revised in the future and that some of the historical data presented here have not been fully revised.

This report sums annual tax expenditures across various programs. These summations should be treated with care as the Department of the Treasury cautions that the estimates would be different if tax expenditures were changed simultaneously because of potential interactions among provisions.

In many cases, the level of energy production or investment determines the potential value of the tax expenditure for qualified taxpayers. However, the value of the tax expenditure received by eligible taxpayers may not equal the potential value of the expenditure based upon production or investment. One factor that mitigates against the eligible taxpayer receiving the full value of the tax expenditure is the alternative minimum tax (AMT), a separately calculated tax that eliminates many deductions and credits for which many tax expenditures are not exempt. Another mitigating factor is that the tax expenditure, in many cases, may not be received in the year in which the investment or production took place, but may, by law, be carried back or forward a number of years. Finally, most of the energy-related tax credits discussed in this report are not "refundable;" that is, the credit may not be claimed in excess of a taxpayer's tax liability (i.e., the credit cannot cause their tax burden to go negative). Hence, a taxpayer with insufficient gross tax burden may be unable to fully claim a credit.

The Department of the Treasury does not provide estimates of *de minimis* tax expenditures, i.e., $5 million or less. Therefore, the impact of such tax expenditures is not reported in either OMB budget documents or tabulations in this report.

Energy-specific tax expenditure programs

Coal-related tax expenditures

The electric power sector accounts for more than 90% of total U.S. coal consumption, and coal-fired generation accounted for 39% of total electricity generation in 2013.[23] Despite its leading role as a fuel source for U.S. electricity generation, however, coal was a relatively small recipient of total electricity-related tax expenditures in both FYs 2013 and 2010. Coal-related tax expenditures had an estimated value of $779 million in FY 2013, up slightly from an estimated $664 million in FY 2010 (see Table 2). More than half of the estimated tax expenditures for coal in FY 2013 was accounted for by provisions established under the Tax Reform Act of 1969 and the Energy Policy Act of 2005 (EPACT 2005, that allow for a shortened amortization period for the cost of new certified pollution control equipment.

[23] U.S. Energy Information Administration, *Monthly Energy Review,* January 2015, DOE/EIA-0035(2015/01) (Washington, DC, January 2015), Table 6.2, http://www.eia.gov/totalenergy/data/monthly/.

Table 2. Estimates of coal-related energy-specific tax expenditures, FY 2010 and FY 2013

million 2013 dollars

Tax Provision	FY 2010	FY 2013
Amortization of Certain Pollution Control Facilities	105	400
Credit for Investment in Clean Coal Facilities	253	180
Capital Gains Treatment of Royalties on Coal	53	90
Energy Production Credit (Refined coal and Indian coal)	28	40
Exclusion of Special Benefits for Disabled Coal Miners	41	30
Partial Expensing for Advanced Mine Safety Equipment	3	27
Advanced Energy Manufacturing Facility Investment Tax Credit	1	1
Mine Rescue Training Credit	-	1
Subtotal Coal Tax Expenditures	**485**	**769**
Alternative Fuel Production Credit (synthetic coal, coke and coke oven gas, and steel industry fuel)	179	10

Notes: Totals may not equal sum due to independent rounding. The Advanced Energy Manufacturing Facility Investment Tax Credit was allocated by fuel using data appearing in: http://www.whitehouse.gov/the-press-office/fact-sheet-23-billion-new-clean-energy-manufacturing-tax-credits and http://energy.gov/articles/energy-department-announces-150-million-tax-credits-invest-us-clean-energy-manufacturing. For FY 2010, EIA estimated that $12 million of the Energy Production Credit went to producers of Refined Coal and $16 million was for coal produced on Indian Lands. The FY 2013 estimate for the Energy Production Credit is based on data published by the Joint Committee on Taxation.
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.

Amortization of Pollution Control Equipment (26 U.S.C. 169). EPAct 2005, Section 1309 modified Section 169 of the IRC, which permitted a 60-month amortization of qualifying pollution control facilities used in connection with plants placed in service before January 1, 1976. For plants placed in service after 1975, the EPAct 2005 modification provides that a taxpayer can recover the cost of any certified pollution control facility (but not a water pollution control facility) over a period of 84 months for one placed in service after April 11, 2005 and used in connection with an electric generation plant or other property which is primarily coal fired. The pre-existing 60-month amortization period remains in effect for any newly constructed certified air pollution control facility added at a plant in operation prior to January 1, 1976. The JCT estimated the value of this expenditure to be $400 million for FY 2013 and $105 million for FY 2010.

Credit for Investment in Clean Coal Facilities (26 U.S.C. 48A and 48B). This credit has an estimated value of $253 million in FY 2010 and $180 million in FY 2013. Section 1307 of the EPAct 2005 provided for a 20% credit to advanced coal projects using integrated gasification combined-cycle (IGCC) technology, and a 15% credit to other advanced coal technologies. This legislation allocated $800 million tax credits towards electricity-related IGCC projects and $500 million towards other advanced coal technologies. An additional $350 million was applied to coal gasification technologies for industrial use,

with an allowable tax credit of 20%. EPAct 2005 required that qualifying advanced coal projects be capable of achieving a 99% removal rate for sulfur dioxide (SO_2) and a 90% removal rate for mercury. The Energy Improvement and Extension Act of 2008 (Public Law 111-343) authorized an additional $1.5 billion in tax credits for advanced coal and gasification projects, with $1.25 billion allocated to qualifying advanced coal projects that capture and sequester at least 65% of carbon dioxide (CO_2) and $250 million allocated to qualifying gasification projects that sequester at least 75% of CO_2. The Energy Improvement and Extension Act increased the investment tax credit for qualifying advanced coal and gasification projects to 30%. In FY 2013, the IRS announced three separate tax credit awards to qualified advanced coal projects totaling $762 million. The awards went to Hydrogen Energy California, LLC ($104 million); STCE Holdings, LLC ($324 million); and SCS Energy California, LLC ($335 million). These represented the final allocation of investment tax credits for advanced coal projects.[24] The final allocation of investment tax credits for qualifying gasification projects took place in 2010.[25]

Capital Gains Treatment of Royalties on Coal (26 U.S.C. 631(c)). The estimated value of this credit in FY 2013 was $90 million, up from $53 million in FY 2010. Owners of coal mining rights who lease their property usually receive royalties on mined coal. If the owners are individuals, these royalties can be taxed at a lower individual capital gains rate rather than at the higher individual top tax rate.

Energy Production Credit (Refined coal and Indian coal). The total value of these credits were estimated to be $40 million in FY 2013 and $28 million in FY 2010.

> **Refined Coal (26 U.S.C. 45).** This tax credit was created in the American Jobs Creation Act of 2004 (Public Law 108-357). Section 45 of the IRC, dealing with the refined coal production credit, provides guidance for the refined coal tax credit. This tax credit was originally set to expire on December 31, 2009, but was extended until the end of 2011 as part of the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 (Public Law 111-312). In 2013, the section 45 tax credit was $6.59 per ton of refined coal.
>
> The estimated tax credit for refined coal in FY 2013, based on estimates provided by the Joint Committee on Taxation, is $20 million. The estimated credit for FY 2010 was $12 million. Based on 19.6 million tons of refined coal production reported to EIA by 13 refined coal facilities in FY 2013 and an available credit of $6.59 per ton of refined coal produced, the total value of the tax credits generated by refined coal plants during FY 2013 would have been nearly $130 million. [26]

[24] U.S. Department of the Treasury, Internal Revenue Service (IRS), *Internal Revenue Bulletin: 2013-46, Announcement of the Results of the 2012-2013 Phase III Allocation Round of the Qualifying Advanced Coal Project Program* (Announcement 2013-43, November 12, 2013), http://www.irs.gov/irb/2013-46_IRB/ar10.html; and IRS, *Internal Revenue Bulletin: 2013-2, Announcement of the Results of the 2011-2012 Allocation Round of the Qualifying Advanced Coal Project Program* (Announcement 2013-2, January 7, 2013), http://www.irs.gov/irb/2013-02_IRB/ar10.html.

[25] U.S. Department of the Treasury, Internal Revenue Service, *Internal Revenue Bulletin: 2010-39, Announcement of the Results of 2009-10 Allocation Round of the Qualifying Advanced Coal Project Program and the Qualifying Gasification Project Program* (Announcement 2010-56, September 27, 2010), http://www.irs.gov/irb/2010-39_IRB/ar09.html.

[26] U.S. Energy Information Administration, Form EIA-3, "Quarterly Coal Consumption and Quality Report, Manufacturing and Transformation/Processing Coal Plants and Commercial and Institutional Users".

The company Clean Coal Solutions, LLC (a subsidiary of ADA-ES, Inc.) built and qualified 28 refined coal facilities, with two completed prior to the initial deadline of December 31, 2009 and 26 built in 2011.[27] The refined coal tax credit is a component of the general business credit, allowing excess credits to be carried back one year and forward up to 20 years.

Indian Coal (26 U.S.C. 45). Section 1301 of the EPAct 2005 established a tax credit for Indian coal production facilities for the 7-year period beginning on January 1, 2006. The American Taxpayer Relief Act of 2012 (Public Law 112-240, referred to as ATRA 2012) extended this credit to the end of 2013. The credit in 2013 for coal produced from reserves owned by an Indian tribe or held in trust by the United States for an Indian tribe was $2.31 per ton. The estimated tax credit for FY 2013, based on estimates provided by the JCT, is $20 million. The previous estimate for FY 2010 was $16 million.

Exclusion of Special Benefits for Disabled Coal Miners (30 U.S.C. 922(c)). Disability payments to former coal miners out of the Black Lung Trust Fund are generally excluded from taxable income. This provision is categorized by the Department of the Treasury as an income security tax expenditure. The value of these expenditures is estimated at $30 million for FY 2013 and $41 million for FY 2010.

Partial Expensing of Mine Safety Equipment (26 U.S.C. 179E). Section 404 of the Tax Relief and Welfare Act of 2006 (Public Law 109-432) allowed qualified mine safety equipment to be expensed rather than capitalized. While this tax expenditure was originally set to expire on December 31, 2008, the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 extended it through the end of 2011, and ATRA 2012 further extended the credit to the end of 2013. The estimated value of this tax expenditure was $27 million in 2013 and $3 million in 2010.

Advanced Energy Manufacturing Facility Investment Tax Credit (26 U.S.C. 48C). The estimated value of this tax expenditure for coal-related projects was $1 million for both FYs 2010 and 2013, and represented less than 1% of total estimated tax expenditures for this credit in both years.

Mine Rescue Team Training Credit (26 U.S.C. 45N). Section 405 of the Tax Relief and Welfare Act of 2006 (Public Law 109-432) allowed an eligible employer to claim a general business credit against income tax with respect to each qualified mine rescue team employee. While this original tax expenditure expired on December 31, 2008, the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 extended this credit through the end of 2011 and ATRA 2012 further extended the credit to the end of 2013. The estimated value of this tax credit was $1 million for FY 2013 and zero for FY 2010.

Alternative fuel production credit (coke and coke gas credit, and steel industry fuel). In total, these credits are estimated to be $10 million in FY 2013 and $179 million in FY 2010.

[27] ADA-ES, Inc., *Annual Report for the Fiscal Year Ended December 31, 2012,* http://www.advancedemissionssolutions.com/wp-content/uploads/Annual_2013.pdf.

Coke and Coke Gas (26 U.S.C. 45K). Section 1301 of the EPAct 2005 established a tax credit for facilities producing coke or coke gas which were placed in service before January 1, 1993, or after June 30, 1998 and before January 1, 2010. EIA data indicate that one coke plant began operations in 2009, and would have been eligible to receive tax credits for coke or coke gas produced and sold during the four-year period that began with its in-service date[28]. For 2013, the value of the coke and coke gas tax credit was $3.59 per barrel-of-oil equivalent (5.8 million Btu), or about $15 per ton of coal coke sold.

Steel Industry Fuel (26 U.S.C. 45K). Steel industry fuel, which was included as a type of refined coal as part of Emergency Economic Stabilization Act of 2008 (Public Law 110-343), is produced through a process of liquefying coal waste sludge, distributing the liquefied product on coal, and using the resulting mixture as a feedstock for the manufacture of coke. The credit in 2010 was $2.87 per ton of barrel-of-oil equivalent (in 2010 dollars) of steel industry fuel sold.[29] Coke plants can claim either the coke and coke gas credit or the steel industry fuel credit, but not both within a given year. The time period for the steel industry fuel credit is 1 year from the placed-in-service date, which can be as late as December 31, 2010. As a result, the estimated tax credit for the production steel industry fuel is zero for FY 2013.

Renewable-related tax expenditures

In FY 2013, 44% of energy-related tax expenditures were spent on renewable fuels. At $5.5 billion, renewable-related tax expenditures in FY 2013 were down 36% from $8.5 billion in FY 2010 (see Table 3). The largest reduction, nearly $6 billion dollars, was due to the expiration of the alcohol fuel exemption, or VEETC, at the end of 2011.These savings were offset by increases of more than $1 billion for two other policies, the Energy Investment Credit, which primarily supports solar energy, and the biodiesel producer tax credit. Ethanol and biodiesel both provide significant volumes of the U.S. liquid fuels supply. Their market penetration has increased as the result of several policies that have resulted in significant income and excise tax expenditures**.** The excise tax policies were generally more important to biofuels producers than the income tax policies and had larger fiscal impacts**.** The biggest change between FY 2010 and FY 2013 was the expiration of the alcohol fuel exemption and three of the four alcohol fuel credits at the end of 2011.

[28] U.S. Energy Information Administration, Form EIA-5, "*Quarterly Coal Consumption and Quality Report, Coke Plants*."
[29] This credit was not available in 2013.

Table 3. Estimates of renewable-related energy-specific tax expenditures, FY 2010 and FY 2013

million 2013 dollars

Tax Provision	FY 2010	FY 2013
Energy Investment Credit	137	1,950
Energy Production Credit	1,595	1,630
Biodiesel Producer Tax Credit[b]	517	1,600
Advanced Energy Manufacturing Facility Investment Tax Credit	132	133
Credit for Holding Clean Renewable Energy Bonds[b]	74	70
Alcohol Fuel Credits	74	40
Biodiesel and Small Agri-Biodiesel Producer Tax Credits	21	20
Alcohol Fuel Exemption[b]	5,989	10
Alternative Fuel Production Credit[a]	-	-
Total	**8,539**	**5,453**

Notes: Totals may not equal sum due to independent rounding. The credit for business installation of qualified fuel cells and microturbine power plants is part of the energy investment tax credit (Section 48 of the Internal Revenue Code). The advanced energy property credit was allocated by fuel using data appearing in: http://www.whitehouse.gov/the-press-office/fact-sheet-23-billion-new-clean-energy-manufacturing-tax-credits and http://energy.gov/articles/energy-department-announces-150-million-tax-credits-invest-us-clean-energy-manufacturing.

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.

[a]The alternative fuel production credit in 2010 and 2013 went primarily to coal.

[b]The alcohol fuel exemption or Volumetric Ethanol Excise Tax Credit (VEETC) is essentially the excise tax exemption equivalent to the alcohol fuel credits. The biodiesel producer tax credit is the excise tax exemption to the biodiesel and small agri-biodiesel producer tax credits. These are both listed as footnotes to an OMB table which includes energy tax expenditures.

Table 4. U.S. renewable net generation, selected years

billion kilowatthours

Fuel	1970	1980	1990	2000	2010	2013
Conventional Hydroelectric	250.96	279.18	292.87	275.57	260.20	269.14
Biomass	**0.36**	**0.43**	**45.78**	**60.73**	**56.09**	**59.89**
Wood	0.14	0.28	32.52	37.59	37.17	39.94
Waste	0.22	0.16	13.26	23.13	18.92	19.96
Geothermal	0.53	5.07	15.43	14.09	15.22	16.52
Solar/PV	-	-	0.37	0.49	1.21	9.25
Wind	-	-	2.79	5.59	94.65	167.66
Total	**251.84**	**284.69**	**357.24**	**356.48**	**427.38**	**522.46**

Source: U.S. Energy Information Administration, *Monthly Energy Review*, DOE/EIA-0035 (2014/102009) (Washington, DC, October 2014), Table 7.2a.

Alcohol Fuel Exemption (26 U.S.C. 6426). In FY 2010, blends of alcohol and gasoline received a credit against the federal motor fuels excise tax in proportion to the volume of alcohol blended. Blends of ethanol and gasoline were eligible for a credit of 45 cents per gallon of ethanol used to produce the blend under the VEETC, resulting in a tax expenditure of nearly $6 billion in FY 2010. The alcohol fuel exemption, however, did not expire until the end of 2011. The estimated tax expenditure associated with the policy fell to $10 million in FY 2013.

Biodiesel Producer Tax Credit (26 U.S.C. 6426). Since 2005, blends of biodiesel or renewable diesel with diesel fuel or heating oil have periodically been eligible for a credit of $1.00 per gallon of biodiesel or renewable diesel used to produce the blend. This is similar to the alcohol fuel exemption, but the IRS ruled that 1 gallon of diesel fuel in 999 gallons of biodiesel or renewable diesel qualified as a blend that was eligible for the tax credit. The IRS rule allowed producers and importers who are not generally fuel blenders to benefit from the excise tax credit, effectively making it a producer tax credit. Unlike the alcohol fuel exemption, the biodiesel producer tax credit has not been consistently available. It expired at the end of 2009, was renewed late in 2010 for 2011 and made retroactive to 2010, expired again at the end of 2011, and then late in 2012 was reestablished for 2013 and again made retroactive to 2012. Biodiesel and renewable diesel blending are also supported by the Renewable Fuels Standard (RFS), which increased from a combined standard of 1.15 billion gallons for 2009 and 2010 to 1.28 billion gallons in 2013. Because of the RFS and the retroactive application of the credit, the fiscal impact increased from $517 million in FY 2010 to $1.6 billion in FY 2013. The biodiesel producer tax credit expired at the end of 2013 and has yet to be renewed.

Alcohol Fuel Credits (26 U.S.C. 40). These credits are the income tax counterparts to the alcohol fuel exemption with some additional features. The alcohol fuel credits include an alcohol mixture credit that can be taken instead of the alcohol fuel exemption, a credit for pure alcohol used for fuel (45 cents per gallon of ethanol), a credit for ethanol production from small producers (10 cents per gallon in addition to other applicable credits), and a credit for second-generation biofuels ($1.01 per gallon), defined as fuels derived from cellulosic materials or algae meeting certain quality standards. The small producer credit was applicable to the first 15 million gallons of ethanol production from an entity with no more than 60 million gallons of annual capacity. The second-generation biofuels credit expired at the end of 2013; all the other alcohol credits expired at the end of 2011. The volumes of pure alcohol for fuel use and the production of second-generation biofuels were very small in FY 2010 and FY 2013; nearly all the fiscal impact of this policy was the small producer credit. The expiration of the small producer credit at the end of 2011 and the trend toward larger ethanol plants—standard plant size is now 100 million gallons per year—combine to reduce the fiscal impact of the alcohol fuel credits from $74 million in FY 2010 to $40 million in FY 2013.

Biodiesel and Small Agri-Biodiesel Producer Tax Credits (26 U.S.C. 40A). These credits are the income tax counterparts to the biodiesel producer tax credit with additional provisions for the use of pure biodiesel (B100) and for small biodiesel producers. Very little biodiesel or renewable diesel is used in unblended form; most is used in blends with petroleum diesel at a level of 5% or less biodiesel by volume. Despite the expansion of biodiesel and renewable diesel production, the fiscal impact of the biodiesel and small agri-biodiesel producer tax credits was 5% lower in FY 2013 as FY 2010 ($20 million versus $21 million).

Production Tax Credit (26 U.S.C. 45). Because of complexities involving the production tax credit (PTC), some background material will be presented prior to providing PTC estimates for FY 2010 and FY 2013.

Renewables accounted for 13% of total electricity production in 2013; just over half of that came from conventional hydroelectricity, which does not receive significant support from renewable-related tax expenditures. However, wind power has shown considerable growth in recent years, and in 2013 provided 4 percent of total U.S. electricity generation. Wind power has received significant support from the production tax credit (PTC) and the ARRA Section 1603 grant program that is discussed in the "Direct Expenditures" section of this section. With enactment of ARRA, wind energy also became eligible for the investment tax credit (ITC). Because of the ability to exclusively claim one of these three subsidies during the FY 2010 and FY 2013 timeframe, and because of the different temporal impacts of these provisions, it is not possible to accurately determine how much wind (or other similarly affected renewables) claimed the PTC or ITC for either year. EIA has generally assumed that wind energy projects will prefer the PTC over the ITC, and thus assume that those projects not taking the Section 1603 grant received the PTC instead.

The PTC is frequently referred to as the "Section 45 credit" for its applicable provision in the IRC. [30,31] It provides an inflation-adjusted tax credit worth 2.3 cents per kilowatthour (kWh) in 2013 to qualifying electricity production from wind, closed-loop biomass, geothermal, and certain waste energy facilities. I also provides a "half-value" credit of 1.1 cents per kWh for qualifying electricity production from open-loop biomass, incremental hydroelectric, marine, tidal, and certain other waste energy facilities. Facilities qualify to receive the PTC if they are built within the timeframe specified by the law and its various extension, and may claim the tax credit on generation during their first 10 years of operation. The production tax credit for renewable resources is estimated at $1.63 billion in FY 2013 versus $1.60 billion in FY 2010. Wind power is estimated to be the primary beneficiary of the credit in FY 2013, which includes facilities built from 2004 through 2013.

The Energy Investment Tax Credit (26 U.S.C. 48). The Investment Tax Credit (ITC) is the sole federal tax credit currently available to commercial solar facilities. It is also available as an alternative to the PTC discussed above. Originally established in the 1970's at a value of 10%, the Energy Policy Act of 2005 (EPACT 05) temporarily increased the ITC value to 30% of capital costs and modified the expiration date for projects entering service to yearend 2016. The ITC is also known as the "business credit" and does not apply to projects owned by individuals. A separate credit, also worth 30% of investment costs, was subsequently established for individual (residential) owners of solar and other end-use electrical equipment. This latter credit reverts to zero at the end of 2016. ARRA expanded the scope of the business credit to include most renewable electricity technologies. However, EIA estimates that most of the nearly $2 billion FY 2013 ITC tax expenditure went to solar and other end-use equipment, and that other eligible renewables either took the PTC or the 1603 grant. This represents a 14-fold increase in expenditures for the ITC over FY 2010.

[30] In the 2007 version of this report, the Production Tax Credit was reported aggregated with the Investment Tax Credit as the "New Technology Credit", to be consistent with OMB reporting. However, current reporting separates these two credits. In the 2010 and current report, we report the PTC and ITC separately.

[31] Note that Section 45 of the Internal Revenue Code now contains several provisions which are accounted for elsewhere in this report. As noted above, this report will reference only the renewable electricity production as the PTC.

The Credit for Holding Clean Renewable Energy Bonds (26 U.S.C. 54C). This credit was established under Section 1303 of EPAct2005, which provided for the issuance of Clean Renewable Energy Bonds (CREBs) through December 31, 2007, and was subsequently amended and expanded. In essence, CREBs allowed not-for-profit electricity providers to issue interest-free bonds to finance qualified energy projects. CREBs applied to the following sources of energy: wind, closed-loop biomass, open-loop biomass, geothermal, solar, small irrigation hydro, land fill gas, municipal solid waste, refined coal, and qualifying hydro. The value of the tax credit for holding clean renewable energy bonds is estimated at $70 million in FY 2013, a slight decrease from the $74 million estimated for FY 2010.

New CREBs (NCREBs) were added by Section 107 of EIEA and subsequently amended. With them, the bond purchaser can claim a 70-percent tax credit versus the 100-percent tax credit claimable under CREBs.

Table 5. New CREBs allocations by project technology type and issuer, 2009

million nominal dollars, unless otherwise specified

	Municipal Utilities		Electric Cooperatives		Government Entities (states, cities, counties, territories, and Indian tribal governments)		Total	
Source	Number of Projects	Bonds	Number of Projects	Bonds	Number of Projects	Bonds	Number of Projects	Bonds
Solar	13	55	4	70	694	714	711	839
Wind	9	395	8	161	30	63	47	619
Landfill Gas	0	0	0	0	0	0	0	0
Biomass	1	6	11	204	3	8	15	218
Hydropower	12	345	8	175	6	11	26	531
Geothermal	0	0	0	0	3	4	3	4
Total	**35**	**800**	**31**	**609**	**736**	**800**	**802**	**2,209**

Notes: Totals may not equal sum due to independent rounding. The list of qualifying technologies used for CREBs is generally the same as that used for the federal renewable energy production tax credit (PTC).
Source: U.S. Department of Energy, National Renewable Energy Laboratory, *Financing Renewable Energy at Government Facilities*, https://financere.nrel.gov/finance/content/financing-renewable-energy-government-facilities, accessed January 24, 2015. These estimates are incomplete as they lack some private placements.

Advanced Energy Property Investment Tax Credit (26 U.S.C. 45M; Renewables) Section 1302 of ARRA established a 30-percent credit for investment in eligible property used in a qualified advanced energy manufacturing project. This credit had a $133-million estimated value in FY 2013 directed at renewables. Manufacturers of solar PV units, and wind towers, turbines, and blades were the largest recipients of this credit, accounting for the 64% of the recipients in 2013.

Natural gas and petroleum-related tax expenditures

Natural gas and petroleum-related tax expenditures decreased from $2.7 billion in FY 2010 to $2.3 billion in FY 2013 (see Table 6). Natural gas-fired generation accounted for an estimated 24 percent of total electricity production in 2013, while oil provided less than one percent of electricity generation.

Table 6. Estimates of natural gas- and petroleum-related energy-specific tax expenditures, FY 2010 and FY 2013

million 2013 dollars

Tax Provision	FY 2010	FY 2013
Temporary 50-Percent Expensing for Equipment used in the Refining of Liquid Fuels	801	600
Expensing of Exploration and Development Costs	422	550
Excess of Percentage over Cost Depletion	1,033	530
Alternative Fuel and Fuel Mixture Credit	179	350
Natural Gas Distribution Pipelines being Treated as 15-Year Property	127	100
Amortize All Geological and Geophysical Expenditures over 2 Years	158	100
Exception from Passive Loss Limitation for Working Interests in Oil and Gas Properties	32	20
Expensing of Capital Goods with Respect to Complying with EPA Sulfur Regulations	-	-
Total	**2,752**	**2,250**

Notes: Totals may not equal sum due to independent rounding. A portion of the tax expenditures, but indeterminate amount, of the Excess of Percentage over Cost Depletion and the Expensing of exploration and Development Costs goes to coal. "Alternative Fuel and Fuel Mixture Tax Credit" for FY 2010 was computed from “Estimated Consumption of Vehicle Fuels in Thousand Gasoline Equivalent Gallons, by Fuel Type, 2007-2011,” released April 8, 2013, http://www.eia.gov/renewable/afv/xls/c1-fuel-consumption-gges-2011.xlsx. The tax expenditure for FY 2010 was assumed to be a simple average of the tax expenditures for calendar years 2009 and 2010.
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.

The Temporary 50-Percent Expensing of Equipment Used in the Refining of Liquid Fuels (26 U.S.C. 179C) This provision was established under Section 1323 of EPAct2005 and expired on December 31, 2013. This provision is available for qualified refinery property used for processing liquid fuel from crude oil or qualified fuels. It allows for an accelerated recovery of the cost of certain refinery investment under Section 179C of the IRC by allowing a partial expensing of the cost. It is estimated to have decreased from $801 million in FY 2010 to an estimated $600 million in 2013.

The Expensing of Exploration and Development Costs (26 U.S.C. 263(c) and 291) This provision allows energy producers, principally oil and natural gas producers, to expense exploration and development (E&D) expenditures (to include certain intangible drilling and development costs) rather than capitalize and depreciate them over time. In FY 2013, this tax expenditure estimate, at $550 million, was up from the $422 million estimated for FY 2010.

The Excess of Percentage over Cost Depletion Deferral Percentage depletion for oil and gas properties became law with the passage of the 1926 Revenue Act (26 U.S.C. 611-613A and 291) Under cost depletion, the annual deduction is equal to the non-recovered cost of acquisition and development of the resource times the proportion of the resource removed during that year. Under percentage depletion, taxpayers deduct a percentage of gross income from resource production. In FY 2013 this provision had a value of $530 million versus $1.03 billion in FY 2010.

Alternative Fuel and Fuel Mixture Credit (26 U.S.C. 6426 and 6427e) This credit became law in 2005 and was extended in the Tax Relief, Unemployment Reauthorization, and Job Creation Act of 2010. It includes the alternative fuel credit (a credit of 50 cents per gallon of pure alternative fuel) and the alternative fuel mixture credit (a credit of 50 cents per gallon of a mixture of alternative fuel and a taxable fuel). An alternative fuel is defined as liquid petroleum gas, P Series Fuel (as defined by the Secretary of Energy under Section 13211 (2) of Title 42), compressed or liquefied natural gas, liquefied hydrogen, any liquid fuel which is derived through the Fischer-Tropsch process from coal produced at a gasification facility which separates and sequesters not less than the applicable percentage of the facility's total carbon dioxide emissions, and liquid fuel derived from biomass. The term does not apply to ethanol, methanol, biodiesel, or any fuel derived from paper or pulp. This credit was estimated to have increased to $350 million in FY 2013 from $179 million in FY 2010, and expired December 31, 2013.

The Natural Gas Distribution Pipelines Treated as 15-Year Property (26 U.S.C. 168(e)(C)(iv)) This provision was established by EPAct2005 (Section 1308) and is estimated to have a value of $100 million in FY 2013 and a value of $127 million in FY 2010. Section 1308 accelerated the recovery period for natural gas distribution lines from 20 years to 15 years and allows depreciation of natural gas distribution pipelines placed in service between 2005 and 2011 over a period of 15 years.

The Amortization of all Geological and Geophysical Expenditures Over 2 Years (26 U.S.C. 167(h)) This provision provides that geological and geophysical expenditures for domestic exploration of oil and natural gas be amortized over 2 years, subsequently amended to 5 years for integrated petroleum companies. This tax expenditure was enacted in EPAct2005, Section 1329. This tax expenditure is estimated to be worth $100 million in 2013 versus $158 million in FY 2010.

The Exception from Passive Loss Limitation for Working Interest in Oil and Natural Gas Properties (26 U.S.C. 469) The value of this tax credit in FY 2013 is $20 million versus an estimated $32 million in FY 2010. The exception allows owners of working interests to offset their losses from passive activities against active income. Under normal rules, passive losses that remain after being netted against passive income can only be carried forward to apply against passive income in future years. The exception from passive loss limitation provision on oil and natural gas properties applies principally to partnerships and individuals rather than corporations.

Nuclear-related tax expenditures

EPAct 2005 extended the production tax credit to approved new nuclear facilities. The credit for the production from advanced nuclear power facilities had no value in FY 2010 or FY 2013 as this credit does not go into effect until qualifying new nuclear power plants produce electricity (see Table 7). The IRC was also modified to eliminate impediments to the transfer of ownership of nuclear plants arising from

the tax treatment of qualified and nonqualified nuclear decommissioning trust funds. Because these particular revisions to the Code were not itemized by OMB, EIA relied on the estimates of the value of these tax expenditures prepared by the JCT. A small portion of the advanced energy property tax credit was also directed to nuclear facilities.

The Modification to Special Rules for Nuclear Decommissioning Costs (26 U.S.C. 468A). Section 1310 of EPAct2005 changed the IRS rules for qualified nuclear decommissioning trust funds by repealing the cost of service requirement for contributions to a qualified decommissioning trust fund created under IRC Section 468A. This change permitted full present value funding of a qualified nuclear decommissioning fund and the transfer of pre-1984 decommissioning funds held in nonqualified trusts. The provision also required that nuclear plant owners obtain a new schedule of ruling amounts from the IRS upon renewal of a plant's operating license by the NRC. In FY 2013, the estimated value of this tax expenditure is $1.1 billion versus $949 billion in FY 2010. Modification of section 468A of the Code was done to eliminate an impediment to nuclear plant sales arising from the structural change in the electric utility industry.

Advanced Energy Property Credit (26 U.S.C. 48C; Nuclear). By early 2010, there were two nuclear recipients of this credit. Alstom will establish a new turbine manufacturing facility designed to manufacture the world's largest steam turbines, with unit output up to 1700 MW. The new facility will focus on turbines used in advanced nuclear power plants, and retrofitting existing turbines in nuclear power plants with higher efficiency technologies. The other recipient, Shaw Modular Solutions LLC, will fabricate modules used in advanced, passively-safe, nuclear stations. This credit had an estimated $8 million value in 2010 (see Table 7).

The Credit for the Production of Advanced Nuclear (26 U.S.C 48). This credit was established under EPAct2005 (Section 1306). Over the Department of the Treasury's 2010 through 2015 tax expenditure forecast horizon, the value of this credit remains at zero as no eligible nuclear power plants are expected to come on line during that time frame. The credit is worth 1.8 cents per kilowatthour of electricity produced during the first 8 years of operation from plants having a Nuclear Regulatory Commission (NRC) approved design. The legislation limits the capacity for this production tax credit (PTC) to 6,000 megawatts. The Secretary of Energy is responsible for the allocation of this credit by capacity. The provision has an additional limitation of $125 million per thousand megawatts of capacity per taxable year.

Table 7. Estimates of nuclear-related energy-specific tax expenditures, FY 2010 and FY 2013

million 2013 dollars

Tax Provision	FY 2010	FY 2013
Nuclear Decommissioning	949	1,100
Advanced Energy Manufacturing Facility Investment Tax Credit	8	9
Credit for Production from Advanced Nuclear Power Facilities	-	-
Total	**957**	**1,109**

Notes: Totals may not equal sum due to independent rounding.
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.

Energy efficiency and conservation-related tax expenditures

Efficiency and conservation-related tax provisions have been used more frequently over the past decade. Since 2005, Congress has enacted several major energy laws: the Energy Policy Act of 2005 (EPACT 2005; the Energy Independence and Security Act of 2007 (EISA; Public Law 110-140); the Energy Improvement and Extension Act (EIEA), enacted as Division B of the Emergency Economic Stabilization Act; the American Recovery and Reinvestment Act (ARRA; Public Law 111-5), of the Tax Relief, Unemployment Reauthorization, and Job Creation Act of 2010 and the ATRA 2012. Each of these laws established, expanded, or modified policies and programs related to energy efficiency and conservation.

ATRA, for FY 2013, represents the latest comprehensive change of energy tax provisions affecting these types of tax provisions. Of the nine tax provisions listed in Table 8, ATRA 2012 directly extended or modified five tax provisions to the end of 2013: the nonbusiness energy property (26 U.S.C. 25C; also referred to as the credit for energy efficiency improvements to existing homes), the credit for alternative fuel vehicle refueling property (26 U.S.C. 30C), the credit for electric motorcycles and three-wheeled vehicles[32] (26 U.S.C. 30D), the credit for energy efficient new homes (26 U.S.C. 45L), and the energy efficient appliance credit[33,34] (26 U.S.C. 45M). Four tax provisions, under current law, have no expiration but some have volume caps: exclusion from income of conservation subsidies provided by public utilities (26 U.S.C. 136), the qualified energy conservation bonds (26 U.S.C. 54D), the advanced energy manufacturing facility investment tax credit (26 U.S.C. 48C; also referred to as the advanced energy property credit), and the base credit for plug-in electric-drive motor vehicles (26 U.S.C. 30D).

ATRA 2012 did not change or extend all energy-related tax provisions. The credit for residential energy efficiency property (26 U.S.C. 25D; also referred to as the residential renewable energy tax credit) was not changed and, under current law, expires on December 31, 2016. Further, the allowance for the deduction of certain energy efficient commercial building property (26 U.S.C. 179D) expired on December 31, 2013. Also, the collective tax credit and deduction for clean-burning vehicles combines tax provisions for alternative fuel refueling property, fuel cell vehicles, plug-in electric-drive motor vehicles, and two- and three-wheeled plug-in electric vehicles, with expiration dates on December 31, 2014 for fuel cell vehicles and for hydrogen refueling property and December 31, 2013 for the other clean-burning vehicle tax provisions. The conversion credit for plug-in electric vehicles (December 31, 2011) and qualified green building and sustainable design project bonds (26 U.S.C. 142) expired before the start of 2013. Subsequent to ATRA 2012, the Tax Increase Prevention Act of 2014, signed in December 2014, extended many of these provisions.

These tax provisions are primarily directed at individuals (residential households) and commercial taxpayers in the form of tax expense deductions, tax credits, or exclusion of certain receipts from gross income. Conservation- and energy efficiency-related tax expenditures are estimated to have decreased

[32] The provision combines the credit for electric motorcycles and three-wheeled vehicles (but not low-speed vehicles) with the credit for plug-in electric drive motor vehicles (26 U.S.C 30D).

[33] Additionally, the new provision updates the home construction standard from the 2003 International Energy Conservation Code to the 2006 International Energy Conservation Code as in effect on January 1, 2006.

[34] The $25 dishwasher credit and the $175 clothes washer credit are not extended through 2013.

by over 40 percent since FY 2010 (see Table 8). In FY 2010, the tax code provided an estimated $4.4 billion in support for conservation and energy efficiency. In FY 2013, the tax code provided an estimated $2.6 billion, having declined $1.7 billion between FYs 2010 and 2013. Much of this decline between FYs 2010 and 2013 can be explained by the decrease in the Credit for Energy Efficiency Improvements of Existing Homes, which had been the most prominent conservation tax provision in FY 2010 with respect to estimated revenue losses.

The Credit for Energy Efficiency Improvements of Existing Homes has maximum credit amounts as follows:

- Insulation to international energy conservation code standard and energy efficient windows, doors, skylights, roofs - $500 (overall Section 25C credit maximum) and $200 (for windows and skylights)
- Advanced main air circulating fans - $50
- Qualified natural gas, propane, or oil furnace or hot water boilers - $150
- Qualified electric heat pump water heaters or natural gas, propane, or oil water heaters - $300
- Qualified central air conditioners - $300
- Qualified biomass fuel property (wood stoves) - $300

Of the nine tax provisions listed in Table 8, the Treasury estimates that nearly all of the other tax code provisions will increase between FY 2010 and FY 2013. The Credit for Residential Energy Efficiency Property is estimated to be the tax provision associated with the largest increase, accounting for over one-third of the total revenue losses, up nearly 4-fold in absolute terms and 7-fold in percentage terms. Conversely to the Section 25D credit, this Section 25C credit is mostly uncapped, although the fuel cell property has a cap of $500 per half kilowatt of capacity.

Table 8. Estimates of conservation, efficiency, and end-use energy-specific tax expenditures, FY 2010 and FY 2013

million 2013 dollars

Tax Provision	FY 2010	FY 2013
Credit for Residential Energy Efficient Property	232	960
Credit for Energy Efficiency Improvements to Existing Homes	3,364	610
Exclusion from Income of Conservation Subsidies Provided by Public Utilities	232	340
Tax Credit and Deduction for Clean-Burning Vehicles	264	270
Credit for Construction of New Energy Efficient Homes	21	150
Credit for Energy Efficient Appliances	158	150
Allowance for the Deduction of Certain Energy Efficient Commercial Building Property	63	70
Advanced Energy Manufacturing Facility Investment Tax Credit	41	57
Qualified Energy Conservation Bonds	-	20
Total	**4,375**	**2,627**

Notes: Totals may not equal sum due to independent rounding. The advanced energy property credit was allocated by fuel using data appearing in: http://www.whitehouse.gov/the-press-office/fact-sheet-23-billion-new-clean-energy-manufacturing-tax-credits and http://energy.gov/articles/energy-department-announces-150-million-tax-credits-invest-us-clean-energy-manufacturing.
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.

Credit for Residential Energy Efficient Property (26 U.S.C. 25D). This credit has an estimated value of $960 million in FY 2013 and $232 million in FY 2010. Section 1335 of EPAct2005 established a 30-percent personal tax credit, not to exceed $2,000, for the purchase of solar electric and solar water heating property. A 30-percent tax credit up to $500 per 0.5 kilowatt (kW) of capacity is also available for fuel cells. The fuel cell provision of EPAct2005 was due to expire at the end of 2007. It was extended through the end of calendar year 2008 by Section 206 of the Tax Relief and Health Care Act of 2006 (Public Law 109-432). Section 106 of EIEA removed the cap on the tax credit for purchase of residential solar photovoltaic installations and extended the credit out to December 31, 2016. Section 104 of EIEA extended the credit to include small wind properties (under 100 kilowatts) through December 31, 2016; and, Section 105 extended the tax credit to include geothermal heat pumps through December 31, 2016. Finally, Section 1122 of ARRA removed some of the previous maximum amounts and allowed a credit equal to 30 percent of the cost of qualified property.

Credit for Energy Efficiency Improvements to Existing Homes (26 U.S.C 25C). This credit was established in EPAct2005, Section 1333, and is estimated at a value of $610 million in FY 2013 down sharply from an estimated $3.4 billion in FY 2010, with most of this growth traceable to the higher credit amounts made available due to ARRA. This credit applies to windows, furnaces, boilers, furnace fans, and building envelope components, such as exterior doors and any metal roof that has appropriate pigmented coatings. Initially, the credit was available to houses constructed before December 31, 2007.

Exclusion from Income of Conservation Subsidies Provided by Public Utilities (26 U.S.C. 136). This exclusion was established by Section 1912 of EPAct1992 (Public Law 108-486) and amended by the Small Job Protection Act of 1996 (Public Law 104-188), Section 1617. Section 136 (amended) of the tax code provides tax benefits to individual consumers for participating in utility-sponsored energy conservation programs. Payments to individual consumers from utilities for investing in energy conversation measures are nontaxable and may be excluded from gross income for purposes of calculating taxable income. The value of this credit is estimated at $232 million for FY 2010 and $340 million for FY 2013.

Tax Credit and Deduction for Clean-Burning Vehicles (26 U.S.C. 30, 30B, 30C, and 30D). The set of credits and deductions for alternative fuel and electric vehicles was initiated under Section 1913 of the EPACT1992. Subsequent legislation has further expanded this credit to a number of different categories of alternative fuel and electric vehicles. More recently, Section 711 of the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 extended this credit for two years. The tax provision for fuel cell vehicles and qualified plug-in electric drive motor vehicles expired on December 31, 2014 and the expiration for all other relevant vehicles expired on or before December 31, 2011. The value of the tax credit is estimated at $270 million in FY 2013 and $264 million in FY 2010.

Credit for Construction of New Energy Efficient Homes (26 U.S.C. 45L). This credit was established in EPAct2005, Section 1332 for homes constructed in 2006 and 2007 and amended under the Tax Technical Correction Act of 2007 (Public Law 110-172). Subsequent amendments modified the program and extended it. Most recently, the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, Section 703 retroactively reinstated this credit for homes acquired after December 31, 2009, and before January 1, 2012. Under current law, ATRA, this credit expired on December 31, 2013. It provides home builders a tax credit of up to $2,000 for the construction of a new energy-efficient home,

including manufactured homes constructed in accordance with the Federal Manufactured Construction and Safety Standards, since modified to conform to the International Energy Conservation Code. The value of this credit is estimated at $21 million for FY 2010 and $150 million in FY 2013.

Credit for Energy Efficient Appliances (26 U.S.C. 45M). Established by Section 1334(a) of EPAct2005, this credit has an estimated value of $150 million in FY 2013 versus an estimated $158 million for FY 2010. Each appliance manufacturer receives a tax credit for manufacturing energy-efficient dishwashers, clothes washers, and refrigerators. The credit has been extended and modified over time. The ATRA, Section 409, extended this credit for two years through the end of 2013 and also limits the total combined credit to $25 million for 2011, 2012, and 2013 tax years, with the exception that the $25 dishwasher credit and the $175 clothes washer credit are not extended.

The Allowance of Deduction for Certain Energy-Efficient Commercial Building Property (26 U.S.C. 179D). This deduction was established under EPAct2005, Section 1331(a). A tax deduction of $1.80 per square foot is available to owners of new or existing buildings who install interior lighting, building envelope, or systems dealing with heating, cooling, ventilation, or hot water that reduce the building's total energy and power cost by 50% or more in comparison to a building that meets the minimum requirements. Originally set to expire at the end of 2007 and subsequently extended, Section 303 of EIEA extended this tax deduction through December 31, 2013. The value of this credit is estimated at $70 million for FY 2013, up from the estimated $63 million for FY 2010.

Advanced Energy Manufacturing Facility Investment Tax Credit (26 U.S.C. 48C; Conservation, Vehicles and Industrial). This credit is commonly referred to as the Advanced Energy Property Credit and had an estimated value of $57 million in FY 2013, up from $41 million in FY 2010. Established under ARRA, Section 1303, 30% of the qualified investment is allowed as a tax credit. Initially funded at $2.3 billion, the tax credit was made available to 183 domestic clean energy manufacturing facilities during Phase I of the program. Phase II was launched to utilize $150 million in tax credits that were not used by awardees from the first round. Phase I applications are no longer being accepted, but Phase II concept papers were due to the DOE by April 9, 2013. Phase II projects approved by Treasury, in partnership with the DOE include $30 million to Cree, Inc., another $30 million to Ford Motor Company, $20 million to General Motors Company and $10.6 million to Delphi Automotive Systems LLC.[35]

The Credit for Holding Qualified Energy Conservation Bonds (26 U.S.C. 54D). Established by EIEA and subsequently amended, Qualified Energy Conservation Bonds (QECBs) provided a new category of tax credit bonds to finance state, local, and tribal governments initiatives designed to reduce greenhouse gases. QECBs do not have a termination date and are directed at qualified conservation purposes, such as projects which reduce energy consumption in publicly owned buildings, green community programs, and rural development involving renewable energy production. Wind, biomass, geothermal, landfill gas, municipal solid waste, and qualified hydroelectric power facilities were also made eligible for this credit as were certain energy research activities. The Treasury estimated the income tax effect of QECBs to be

[35] U.S. Department of Energy, *48C Phase II Advanced Energy Manufacturing Tax Credit Program Selections*, http://energy.gov/downloads/48c-phase-ii-advanced-energy-manufacturing-tax-credit-program-selections, accessed January 27, 2015.

$20 million in FY 2013, having had no value in prior years. There is, however, an associated outlay, which appears as a direct expenditure.

Electricity transmission-related tax expenditures

Overall, the Treasury estimates that the electricity transmission tax expenditures had a nearly 4-fold increase between FY 2010 and FY 2013, from $61 million in FY 2010 to $211 million in FY 2013 (see Table 9). This increase is largely a result of deferred taxes coming due in FY 2010 as part of the value of the deferred gain from the disposition of transmission property to implement FERC restructuring policy, as well as the estimated increase in the value of the transmission property treated as fifteen-year property, which increased $95 million from FY 2010 to FY 2013.

Table 9. Estimates of electricity transmission-related energy-specific tax expenditure, FY 2010 and FY 2013

million 2013 dollars

Tax Provision	FY 2010	FY 2013
Transmission Property Treated as Fifteen-Year Property	105	200
Advanced Energy Manufacturing Facility Investment Tax Credit	8	11
Deferral of Gain from Disposition of Transmission Property to Implement FERC Restructuring Policy	-53	-
5-Year Net Operating Loss Carryover for Electric Transmission Equipment	-	-
Total	**61**	**211**

Note: Totals may not equal sum due to independent rounding. The advanced energy property credit was allocated by fuel using data appearing in: http://www.whitehouse.gov/the-press-office/fact-sheet-23-billion-new-clean-energy-manufacturing-tax-credits and http://energy.gov/articles/energy-department-announces-150-million-tax-credits-invest-us-clean-energy-manufacturing.
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.

The Transmission Property Treated as 15-year Property (26 U.S.C. 168(e)). This permanent provision was set forth in Section 1308 of EPAct2005 and modified Section 168 of the Code by shortening the recovery period for specified assets from 20 to 15 years. To be eligible, an asset must be used in the transmission of electricity following sale of the property or related land improvements. Specifically, this applies to Section 1245 property, (i.e., personal property and real property subject to depreciation or amortization) used in the transmission of electricity that is energized at 69 kilovolts or more. The provision applies to transmission facilities placed in service by the taxpayer after April 11, 2005, but excludes any transmission facilities for which the taxpayer or related party had entered into a binding construction contract for or initiated self-construction on or before April 11, 2005. This tax provision is permanent, under current statutes.[36] For FY 2013, the estimated value of accelerating the standard recovery period by 5 years is $200 million, up $95 million from FY 2010 ($105 million).

[36] Joint Committee on Taxation, *Report to the House Committee on Ways and Means on Present Law and Suggestions for Reform, Tax Reform Working Groups submissions*, JCS-3-13, May 6, 2013.

The Deferral of Gain from Disposition of Transmission Property to Implement Federal Energy Regulatory Commission (FERC) Restructuring Policy (26 U.S.C. 451(i)). Provided for by Section 1305 of EPAct2005, this provision has in previous years been the largest tax credit directly affecting the provision of electricity, as opposed to an electricity-related fuel. Tax deferrals are front-loaded benefits, which are offset in later years when the deferral reverses. The estimated value of this deferral begins to reverse in FY 2009. Consequently, the value of this provision was a negative $53-million in FY 2010, as previously deferred taxes came due. However, the FY 2013 value of this tax provision expenditure was estimated at zero dollars. Subsequent laws have extended this credit to dispositions after December 31, 2011 and prior to January 1, 2014.

Energy-specific direct expenditure program descriptions

Direct expenditures, as the name implies, are federal payments made to entities using or producing a particular energy end-use technology or fuel. FY 2013 direct expenditures amounted to $12.9 billion, compared with $14.8 billion in FY 2010.

The fuel mix of direct expenditures changed considerably between FY 2010 and FY 2013.

Renewables. Renewable-related direct expenditures increased to 65% of total direct expenditures from 37% (Table 11). Each major renewable fuel increased its share except biofuels, reflecting Section 1603-related grant activity. Direct payments for solar energy alone accounted for $2.5 billion in additional subsidies between FY 2010 and FY 2013. Total renewable direct expenditures increased $2.9 billion to $8.4 billion in FY 2013.

Conservation and end-use technologies. Funding in both areas dropped considerably, by $2.3 billion and $2.5 billion, respectively. The major reason for the decline was substantial decreases in or elimination of Department of Energy programs, discussed in the "Department of Energy" section area below. In addition, End-Use funding returned to pre-2010 levels after ARRA provided substantial additional funds in FY 2010. Combined, their share of direct expenditures declined from nearly 62% in FY 2010 to just under 34% in FY 2013.

Coal. Direct expenditures for coal are relatively small, amounting to $74 million in FY 2013. This is a $28-million increase over FY 2010, largely due to a new program for carbon capture and storage (CFDA 81.130).

Natural gas and petroleum liquids. Increases in the Department of the Interior's Environmental Studies program (CFDA 15.423) and the Department of Transportation's Clean Fuels (CFDA 20.519) and Pipeline Safety Program State Base Grant (CFDA 20.700) were more than offset by a $27-million drop in EPA's direct expenditures for its state clean diesel program (CFDA 66.040). As a result, subsidies fell to $62 million from $80 million in FY 2010.

Nuclear. Nuclear direct expenditures declined from $66 million to $37 million, mostly due to a $34-million decrease in the Department of Energy program regarding the transport of transuranic waste (CFDA 81.106). Its purpose was to enlist cooperation among the Tribal and southern, western, and midwestern state governments.

Smart grid and transmission. The Department of Agriculture provides assistance to rural communities with high energy costs (CFDA 10.859) for a variety of energy-related items, including electricity transmission. Most of the FY 2013 funding of $8 million supported communities in Alaska.

Low-Income Home Energy Assistance (LIHEAP). LIHEAP (CFDA 93.568) funding returned to pre-FY 2010 levels in FY 2013, equaling $3.1 billion. LIHEAP subsidies in FY 2010 were $5.4 billion.

Direct expenditures by fuel, department, and program

The Department of the Treasury provided more direct expenditures than any other department in FY 2013. The Department of the Treasury provided $8.2 billion, or 63% of total direct expenditures (see Table 10). All of these funds were made for renewable energy technologies under the ARRA Section 1603 grant program (commonly termed Energy Investment Grant in this report).

Excluding Energy Investment Grants, direct expenditures declined over 45% between FY 2010 and FY 2013. Direct expenditures excluding Section 1603 subsidies were $10.3 billion in FY 2010, compared with only $4.7 billion in FY 2013 (see Table 10). Two-thirds of FY 2013 non-Energy Investment Grant direct expenditures were subsidies provided by the Low-Income Home Energy Assistance (LIHEAP) program (CFDA 93.568), operated by the Department of Health and Human Services. Payments are provided to state governments and other jurisdictions that redistribute funds to eligible households.

The next-largest program area in FY 2013 (excluding energy investment grants) was to support conservation, accounting for 18% of non-Section 1603 grant subsidies. There were no Section 1603 subsidies for conservation. In support of conservation, the Department of Energy's Energy Efficiency and Conservation Block Grant Program (EECBG) program (CFDA 81.128) was by far the most prominent, providing $419 million in subsidies of the Department of Energy's total of $812 million conservation direct expenditures and $833 million provided by all agencies. The Department of Energy's $812 million of Conservation funds also included $300 million for Weatherization Assistance for Low-Income Persons in FY 2013 (CFDA 81.042).

Eight (8) percent of FY 2013 non-Section 1603 direct expenditures were to support other end uses. Of the $397 million expended in FY 2013, the largest amount was $286 million for the Department of Energy's Industrial Carbon Capture and Storage program (CFDA 81.134). This was one of the few programs to provide significantly more subsidies than in FY 2010 ($59 million).

Even though the amounts were comparatively small, non-Section 1603 direct expenditures for renewables were severely curtailed in FY 2013. Total FY 2013 renewable direct expenditures excluding Section 1603 were only $194 million in FY 2013, compared with $1.0 billion in FY 2010. The largest decrease was in the Department of Agriculture's Biomass Crop Assistance Program ($257 million to $9 million, CFDA 10.087), designed to improve crop characteristics for the production of biofuels. The second-largest decrease was in the renewable portion of the Department of Energy's State Energy Program ($251 million to $69 million, CFDA 81.041.[37]

[37] There is also a second State Energy Program, CFDA 81.119. However, it does not support renewable energy. In addition, CFDA 81.041 also supports End-Use and Conservation projects.

Direct expenditures by agency

Department of Energy

Total DOE direct expenditures were $1.4 billion in FY 2013, only 40% of the $3.4 billion provided in FY 2010 (see Table 10). DOE ranked third among agencies in FY 2013 direct expenditures. Roughly 75% were related to energy efficiency and renewable energy, which at $982 million represented only 30% of the FY 2010 funding level. The largest reduction was $1.4 billion for weatherization (see Table 10). The three largest direct expenditures in the energy efficiency and renewable energy areas were for the EECBG program, weatherization, and state government energy assistance programs, all discussed previously. Combined, these programs provided $922 million, or 94% of all direct expenditures in these subsidy and support areas.

The second-largest area of direct expenditures for DOE in FY 2013 was fossil energy. All of the $359 million spent in FY 2013 involved carbon capture and storage. In addition to the two programs mentioned previously, DOE funding expanded the Clean Coal Power Initiative (CFDA 81.131), which seeks to reduce emissions from coal-fired power plants by means other than sequestering carbon dioxide.

The Department of Energy supported biofuels with $1 million for Regional Biomass Energy Programs (CFDA 81.079) in FY 2013. The grant recipient was Michigan's Forestry Biofuel Statewide Collaboration Center, which develops technologies to convert woody biomass from Michigan's forests into liquid fuels.

Department of the Interior

The Department of the Interior had three programs in FY 2013 that provided a total of $23 million in direct expenditures.

Louisiana State University Coastal Marine Institute (CFDA 15.422): The purpose of the Louisiana State University Coastal Marine Institute (CMI) is to use highly qualified scientific expertise at local levels to collect and disseminate environmental information needed for OCS oil and gas and marine minerals decisions; address local and regional OCS-related environmental and resource issues of mutual interest; and strengthen the Bureau of Ocean Energy Management (BOEM)-State partnership in addressing OCS oil and gas and marine minerals information needs.

BOEM Environmental Studies Program (CFDA 15.423): The purpose of the Environmental Studies Program is to obtain the information needed for the assessment and management of environmental impacts; to predict impacts on marine biota; and to monitor the human, marine, and coastal environments to provide time series and data trend information.

Minerals and Mining on Indian Lands (CFDA 15.038): Funding supports native tribes in conducting their own assessments regarding energy issues on Indian lands, including data, technology assistance, and outreach capabilities.

Department of Transportation

At $85 million, the Department of Transportation's FY 2013 direct expenditures are roughly one-third of the $260 million provided in FY 2010. The major decrease was a $193-million reduction in a Federal

Transit Administration greenhouse gas emissions program (CFDA 20.523), which funds the purchase of capital transit items (e.g., buses) that reduce energy consumption or greenhouse gas emissions.

The two principal programs which the Department of Transportation funded in FY 2013 were:

Pipeline Safety Program State Base Grant (CFDA 20.700): The purpose of this program is to develop, support and maintain state gas and hazardous liquid pipeline safety programs.

Clean Fuels (CFDA 20.519): Clean Fuels provides funding to purchase passenger vehicles used for public transportation (e.g., vans).

The Department of Transportation provided $9 million in direct expenditure support of biofuels in FY 2013. $1 million was spent under the Air Emissions and Energy Initiative (CFDA 20.817), and $8 million of spending under the Clean Fuels program benefited biofuels.

Environmental Protection Agency (EPA)

EPA's FY 2013 direct expenditures were just $17 million, as its two energy-related programs related to assistance in meeting the clean diesel standards active in FY 2010 were largely completed. The principal program is given below.

National Clean Diesel Emissions Reduction Program (CFDA 66.039): In FY 2013, the U.S. Environmental Protection Agency (EPA) awarded a total of $13 million through 27 project grants under the National Clean Diesel Emissions Reduction program. This was a decrease of $84 million (87%) from FY 2010. As part of the Energy Policy Act of 2005, the Diesel Emissions Reduction Act (DERA) authorizes funding of up to $100 million annually for FY 2012 through FY 2016 to help fleet and equipment owners reduce their diesel emissions.

Department of Health and Human Services (HHS)

With the government-wide reductions in energy direct expenditures between fiscal years 2010 and 2013, the Department of Health and Human Services ranked second in FY 2013, providing $3.1 billion. HHS direct expenditures involve a single program, Low-Income Home Energy Assistance, or LIHEAP (CFDA 93.568), discussed previously.

Department of Agriculture

The Department of Agriculture made direct expenditures of $118 million on 6 programs that supported energy in FY 2013, down from $348 million spent on 9 programs in FY 2010. Four of these programs were related to biofuels in FY 2013:

- The Bioenergy Program for Advanced Biofuels (CFDA 10.867) provided grants for producers of fuels with lifecycle carbon dioxide emissions at least 50% below the petroleum fuel that is replaced by the biofuel. Corn-based ethanol is not eligible for this program. Grants totaling $47 million were given to producers in FY 2013, more than double the value of FY 2010 grants.
- The Biomass Crop Assistance Program (CFDA 10.087) aims to incentivize the production of biomass for production of electricity, fuels, or bio-based chemicals. Increased production of biomass may require changes in the management of existing crops and forests or possibly the cultivation of entirely new crops. These changes may take several years to yield a return, which makes landowners

reluctant to invest. The Biomass Crop Assistance Program provided grants totaling $9 million in FY 2013, down considerably from $257 million in FY 2010.

- The Rural Energy for America Program (CFDA 10.868) provides grants and loan guarantees to agricultural producers and rural small businesses for energy efficiency upgrades and renewable energy systems. Four($4) million was awarded by this program in FY 2013.
- The Sun Grant Program (CFDA 10.320) established six regional centers in partnership with land grant universities to carry out research into new, sustainable feedstocks for the production of biofuels and bio-based products. In FY 2013, the program awarded grants totaling $2 million.

Department of the Treasury

The Department of the Treasury provided $8.2 billion, or 63% of total direct expenditures. All of these funds were made for renewable energy technologies under the ARRA Section 1603 Energy Investment Grant program. Table 13 shows the eligible percentages for various energy technologies.

Departments of Labor, Housing and Urban Development

Neither of these agencies provided energy direct expenditures in FY 2013, but both had done so in FY 2010. In FY 2010, based on ARRA-related funding, DOL operated programs that provided training for employment in the energy sector and HUD supported building retrofits to assisted housing.

Table 10. Estimates of direct expenditures in energy, FY 2010 and FY 2013

million 2013 dollars

Department, Office, and Program - CFDA Number	FY 2010	FY 2013
Department of Agriculture	**348**	**118**
Farm Service Agency	**257**	**9**
Biomass Crop Assistance Program - 10.087	257	9
Forest Service	**4**	**3**
Wood Utilization Assistance - 10.674	4	3
National Institute of Food and Agriculture	**3**	**2**
Biodiesel (Biodiesel Fuel Education Program) - 10.306	1	0
Sun Grant Program - 10.320	2	2
Rural Business-Cooperative Service	**74**	**90**
Bioenergy Program for Advanced Biofuels - 10.867	20	47
Repowering Assistance - 10.866	2	-
Rural Energy for America Program - 10.868	53	43
Rural Utilities Service	**9**	**14**
Assistance to High Energy Cost Rural Communities - 10.859	8	14
State Bulk Fuel Revolving Fund Grants - 10.857	1	-
Department of Energy	**3,427**	**1,363**
Office of Energy Efficiency and Renewable Energy	**3,276**	**982**
Energy Efficiency and Conservation Block Grant Program (EECBG) - 81.128	526	419

Table 10. Estimates of direct expenditures in energy, FY 2010 and FY 2013 (cont.)

million 2013 dollars

Department, Office, and Program - CFDA Number	FY 2010	FY 2013
Energy Efficiency and Renewable Energy Information Dissemination, Outreach, Training and Technical Analysis/Assistance - 81.117	40	45
Energy Efficiency and Renewable Energy Technology Deployment, Demonstration and Commercialization - 81.129	3	1
Energy Efficient Appliance Rebate Program (EEARP) - 81.127	205	0
Inventions and Innovations - 81.036	0	2
National Industrial Competitiveness through Energy, Environment, and Economics - 81.105	0	-
Regional Biomass Energy Programs - 81.079	1	1
State Energy Program - 81.041	751	203
State Energy Program Special Projects - 81.119	8	11
Weatherization Assistance for Low-Income Persons - 81.042	1,741	300
Office of Environmental Management	**38**	**4**
Transport of Transuranic Wastes to the Waste Isolation Pilot Plant: States and Tribal Concerns, Proposed Solutions - 81.106	38	4
Office of Fossil Energy	**103**	**359**
Carbon Capture and Storage-FutureGen 2.0 - 81.130	-	23
Expand and Extend Clean Coal Power Initiative - 81.131	44	50
Industrial Carbon Capture and Storage (CCS) Application - 81.134	59	286
Office of Health, Safety and Security	**1**	**13**
Epidemiology and Other Health Studies Financial Assistance Program - 81.108	1	13
Office of Nuclear Energy	**9**	**5**
Nuclear Waste Disposal Siting - 81.065	9	5
U.S. Energy Information Administration	**-**	**0**
State Heating Oil and Propane Program - 81.138	-	0
Department of Health and Human Services	**5,378**	**3,116**
Administration for Children and Families	**5,378**	**3,116**
Low-Income Home Energy Assistance - 93.568	5,378	3,116
Department of Housing and Urban Development	**248**	**-**
Office of Housing-Federal Housing Commissioner	**248**	**-**
Assisted Housing Stability and Energy and Green Retrofit Investments Program - 14.318	**248**	**-**
Multifamily Energy Innovation Fund - 14.319	-	-
Department of Labor	**478**	**-2**
Employment Training Administration	**478**	**-2**
Green Jobs Innovation Fund Grants - 17.275	478	-2
Department of the Interior	**11**	**9**
Bureau of Indian Affairs	**9**	**3**
Minerals and Mining on Indian Lands - 15.038	9	3
Tribal Energy Development Capacity Grants - 15.148	-	-
Bureau of Ocean Energy Management	**2**	**5**
BOEM Environmental Studies Program - 15.423	0	4
Louisiana State University (LSU) Coastal Marine Institute CMI - 15.422	1	1
U.S. Geological Survey	**0**	**0**
Energy Cooperatives to Support the National Coal Resources Data System (NCRDS) - 15.819	0	0
Department of Transportation	**260**	**85**
Federal Transit Administration (FTA)	**218**	**38**

Table 10. Estimates of direct expenditures in energy, FY 2010 and FY 2013 (cont.)

million 2013 dollars

Department, Office, and Program - CFDA Number	FY 2010	FY 2013
Capital Assistance Program for Reducing Energy Consumption and Greenhouse Gas Emissions - 20.523	207	14
Clean Fuels - 20.519	12	23
Maritime Administration	**-**	**1**
Air Emissions and Energy Initiative - 20.817	-	1
Pipeline and Hazardous Materials Safety Administration	**42**	**45**
PHMSA Pipeline Safety Program One Call Grant - 20.721	1	1
Pipeline Safety Program State Base Grant - 20.700	41	44
Department of the Treasury	**4,481**	**8,170**
Energy Investment Grant	4,481	8,170
Environmental Protection Agency	**128**	**17**
Office of Air and Radiation	**128**	**17**
National Clean Diesel Emissions Reduction Program - 66.039	97	13
State Clean Diesel Grant Program - 66.040	31	4
Nuclear Regulatory Commission	**19**	**15**
Nuclear Regulatory Commission-Unspecified	**19**	**15**
U.S. Nuclear Regulatory Commission Minority Serving Institutions Program (MISP) - 77.007	2	1
U.S. Nuclear Regulatory Commission Nuclear Education Grant Program - 77.006	5	-
U.S. Nuclear Regulatory Commission Scholarship and Fellowship Program - 77.008	12	14
Total	**14,779**	**12,891**

Notes: Totals may not equal sum due to independent rounding. Excludes programs not funded in either FY 2010 or FY 2013 but have been funded in other years.

Sources: U.S. Department of Energy, Office of the Chief Financial Officer, *Base Financial Data*, FY 2010 and FY 2013; Office of Management and Budget, *USASpending.gov - Government spending at your fingertips;* website: http://www.usaspending.govaccessed December 1, 2014 and 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.

Table 11. Estimates of direct expenditures in energy by beneficiary, FY 2010 and FY 2013

million 2013 dollars

Beneficiary (Fuel/End-Use)	FY 2010	FY 2013
Coal	46	74
Natural Gas and Petroleum Liquids	80	62
Nuclear	66	37
Renewables	**5,491**	**8,363**
Biomass	178	332
Geothermal	65	312
Hydropower	60	197
Solar	461	2,969
Wind	4,063	4,274
Other	317	209
Biofuels	348	72
Electricity - Smart Grid and Transmission	**4**	**8**
Conservation	**3,091**	**833**
End-Use	**6,001**	**3,513**
LIHEAP	5,378	3,116
Other	623	397
Total	**14,779**	**12,891**

Notes: 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. Refined coal was not included as a beneficiary because it received no support in either FY 2010 or FY 2013. 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. EIA used generation estimates to calculate credits associated with the PTC for captured wind and geothermal plants that came online in 2004 and later, as well as MSW and open-loop biomass plants that came online in 2006 and later.

Sources: U.S. Department of Energy, Office of the Chief Financial Officer, *Base Financial Data*, FY 2010 and FY 2013; Office of Management and Budget, *USASpending.gov - Government spending at your fingertips;* website: http://www.usaspending.gov/accessed December 1, 2014 and 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.

Table 12. Estimates of direct expenditures in energy by beneficiary, department, and program, FY 2010 and FY 2013

million 2013 dollars

Beneficiary (Fuel/End Use), Department, and Program - CFDA Number	FY 2010	FY 2013
Coal	**46**	**74**
Department of Energy	**44**	**73**
Carbon Capture and Storage-FutureGen 2.0 - 81.130	-	23
Expand and Extend Clean Coal Power Initiative - 81.131	44	50
Department of the Interior	**2**	**1**
Energy Cooperatives to Support the National Coal Resources Data System (NCRDS) - 15.819	0	0
Minerals and Mining on Indian Lands - 15.038	1	0
Natural Gas and Petroleum Liquids	**80**	**62**
Department of Agriculture	**1**	**-**
State Bulk Fuel Revolving Fund Grants - 10.857	1	-
Department of Energy	**-**	**0**
State Heating Oil and Propane Program - 81.138	-	0
Department of the Interior	**2**	**5**
BOEM Environmental Studies Program - 15.423	0	4
Louisiana State University (LSU) Coastal Marine Institute CMI - 15.422	**1**	**1**
Department of Transportation	**46**	**53**
Clean Fuels - 20.519	4	8
PHMSA Pipeline Safety Program One Call Grant - 20.721	1	1
Pipeline Safety Program State Base Grant - 20.700	41	44
Environmental Protection Agency	**31**	**4**
State Clean Diesel Grant Program - 66.040	31	4
Nuclear	**66**	**37**
Department of Energy	**48**	**22**
Epidemiology and Other Health Studies Financial Assistance Program - 81.108	1	13
Nuclear Waste Disposal Siting - 81.065	9	5
Transport of Transuranic Wastes to the Waste Isolation Pilot Plant: States and Tribal Concerns, Proposed Solutions - 81.106	38	4
Nuclear Regulatory Commission	**19**	**15**
U.S. Nuclear Regulatory Commission Minority Serving Institutions Program (MISP) - 77.007	2	1
U.S. Nuclear Regulatory Commission Nuclear Education Grant Program - 77.006	5	-
U.S. Nuclear Regulatory Commission Scholarship and Fellowship Program - 77.008	12	14
Biomass	**178**	**332**
Department of Agriculture	**5**	**22**
Assistance to High Energy Cost Rural Communities - 10.859	0	1
Rural Energy for America Program - 10.868	-	18
Wood Utilization Assistance - 10.674	4	3
Department of Energy	1	-

Table 12. Estimates of direct expenditures in energy by beneficiary, department, and program, FY 2010 and FY 2013 (cont.)

million 2013 dollars

Beneficiary (Fuel/End Use), Department, and Program - CFDA Number	FY 2010	FY 2013
Regional Biomass Energy Programs - 81.079	1	-
Department of Labor	**60**	**0**
Green Jobs Innovation Fund Grants - 17.275	60	0
Department of Treasury	**112**	**310**
Energy Investment Grant – 21.999	112	310
Geothermal	**65**	**312**
Department of Agriculture	**-**	**1**
Rural Energy for America Program - 10.868	-	1
Department of Energy	**0**	**0**
Energy Efficiency and Renewable Energy Technology Deployment, Demonstration and Commercialization - 81.129	0	0
Department of Labor	**60**	**0**
Green Jobs Innovation Fund Grants - 17.275	60	0
Department of the Treasury	**4**	**310**
Energy Investment Grant – 21.999	4	310
Hydropower	**60**	**197**
Department of Agriculture	**-**	**1**
Rural Energy for America Program - 10.868	-	1
Department of Energy	**0**	**0**
Energy Efficiency and Renewable Energy Technology Deployment, Demonstration and Commercialization - 81.129	0	0
Department of Labor	**60**	**0**
Green Jobs Innovation Fund Grants - 17.275	60	0
Department of the Treasury	**-**	**196**
Energy Investment Grant – 21.999	-	196
Solar	**461**	**2,969**
Department of Agriculture	**21**	**4**
Assistance to High Energy Cost Rural Communities - 10.859	3	4
Rural Energy for America Program - 10.868	18	-
Department of Energy	**20**	**23**
Energy Efficiency and Renewable Energy Information Dissemination, Outreach, Training and Technical Analysis/Assistance - 81.117	20	22
Inventions and Innovations - 81.036	0	0
Department of Labor	**60**	**0**
Green Jobs Innovation Fund Grants - 17.275	60	0
Department of the Interior	1	0
Minerals and Mining on Indian Lands - 15.038	1	0
Department of the Treasury	**359**	**2,941**

Table 12. Estimates of direct expenditures in energy by beneficiary, department, and program, FY 2010 and FY 2013 (cont.)

million 2013 dollars

Beneficiary (Fuel/End Use), Department, and Program - CFDA Number	FY 2010	FY 2013
Energy Investment Grant – 21.999	359	2,941
Wind	**4,063**	**4,274**
Department of Agriculture	**-**	**0**
Assistance to High Energy Cost Rural Communities - 10.859	-	0
Department of Energy	**0**	**0**
Inventions and Innovations - 81.036	0	0
Department of Labor	**60**	**0**
Green Jobs Innovation Fund Grants - 17.275	60	0
Department of the Interior	**1**	**1**
BOEM Environmental Studies Program - 15.423	-	0
Minerals and Mining on Indian Lands - 15.038	1	0
Department of the Treasury	**4,002**	**4,273**
Energy Investment Grant – 21.999	4,002	4,273
Other (Renewables)	**317**	**209**
Department of Energy	**252**	**70**
Energy Efficiency and Renewable Energy Information Dissemination, Outreach, Training and Technical Analysis/Assistance - 81.117	1	2
Inventions and Innovations - 81.036	0	0
State Energy Program - 81.041	251	68
Department of Labor	**60**	**0**
Green Jobs Innovation Fund Grants - 17.275	60	0
Department of the Interior	**-**	**0**
Minerals and Mining on Indian Lands - 15.038	-	0
Department of the Treasury	**4**	**139**
Energy Investment Grant – 21.999	4	139
Biofuels	**348**	**72**
Department of Agriculture	**282**	**62**
Biodiesel (Biodiesel Fuel Education Program) - 10.306	1	0
Bioenergy Program for Advanced Biofuels - 10.867	20	47
Biomass Crop Assistance Program - 10.087	257	9
Repowering Assistance - 10.866	2	-
Rural Energy for America Program - 10.868	-	4
Sun Grant Program - 10.320	2	2
Department of Energy	**2**	**1**

Table 12. Estimates of direct expenditures in energy by beneficiary, department, and program, FY 2010 and FY 2013 (cont.)

million 2013 dollars

Beneficiary (Fuel/End Use), Department, and Program - CFDA Number	FY 2010	FY 2013
Energy Efficiency and Renewable Energy Information Dissemination, Outreach, Training and Technical Analysis/Assistance - 81.117	1	-
Energy Efficiency and Renewable Energy Technology Deployment, Demonstration and Commercialization - 81.129	1	0
Industrial Carbon Capture and Storage (CCS) Application - 81.134	1	-
Regional Biomass Energy Programs - 81.079	-	1
Department of Labor	**60**	**0**
Green Jobs Innovation Fund Grants - 17.275	60	0
Department of Transportation	**4**	**9**
Air Emissions and Energy Initiative - 20.817	-	1
Clean Fuels - 20.519	4	8
Electricity - Smart Grid and Transmission	**4**	**8**
Department of Agriculture	**4**	**8**
Assistance to High Energy Cost Rural Communities - 10.859	4	8
Conservation	**3,091**	**833**
Department of Agriculture	**35**	**20**
Assistance to High Energy Cost Rural Communities - 10.859	0	1
Rural Energy for America Program - 10.868	34	19
Sun Grant Program - 10.320	0	0
Department of Energy	**2,743**	**812**
Energy Efficiency and Conservation Block Grant Program (EECBG) - 81.128	526	419
Energy Efficiency and Renewable Energy Information Dissemination, Outreach, Training and Technical Analysis/Assistance - 81.117	12	14
Energy Efficiency and Renewable Energy Technology Deployment, Demonstration and Commercialization - 81.129	1	0
Energy Efficient Appliance Rebate Program (EEARP) - 81.127	205	0
Inventions and Innovations - 81.036	0	1
State Energy Program - 81.041	250	68
State Energy Program Special Projects - 81.119	8	11
Weatherization Assistance for Low-Income Persons - 81.042	1,741	300
Department of Housing and Urban Development	**248**	**-**
Assisted Housing Stability and Energy and Green Retrofit Investments Program - 14.318	248	-
Department of Labor	**60**	**0**
Green Jobs Innovation Fund Grants - 17.275	60	0
Department of the Interior	**5**	**2**
Minerals and Mining on Indian Lands - 15.038	5	2
LIHEAP	**5,378**	**3,116**
Department of Health and Human Services	**5,378**	**3,116**

Table 12. Estimates of direct expenditures in energy by beneficiary, department, and program, FY 2010 and FY 2013 (cont.)

million 2013 dollars

Beneficiary (Fuel/End Use), Department, and Program - CFDA Number	FY 2010	FY 2013
Low-Income Home Energy Assistance - 93.568	5,378	3,116
End-Use (Other)	**623**	**397**
Department of Energy	**316**	**362**
Energy Efficiency and Renewable Energy Information Dissemination, Outreach, Training and Technical Analysis/Assistance - 81.117	7	7
Energy Efficiency and Renewable Energy Technology Deployment, Demonstration and Commercialization - 81.129	0	0
Industrial Carbon Capture and Storage (CCS) Application - 81.134	59	286
Inventions and Innovations - 81.036	0	0
National Industrial Competitiveness through Energy, Environment, and Economics - 81.105	0	-
State Energy Program - 81.041	250	68
Department of Transportation	**211**	**22**
Capital Assistance Program for Reducing Energy Consumption and Greenhouse Gas Emissions - 20.523	207	14
Clean Fuels - 20.519	4	8
Environmental Protection Agency	**97**	**13**
National Clean Diesel Emissions Reduction Program - 66.039	97	13
Total	**14,779**	**12,891**

Note: Totals may not equal sum due to independent rounding.
Sources: U.S. Department of Energy, Office of the Chief Financial Officer, *Base Financial Data*, FY 2010 and FY 2013; Office of Management and Budget, *USASpending.gov - Government spending at your fingertips;* website: http://www.usaspending.gov/accessed December 1, 2014 and 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.

Table 13. Section 1603 facility property eligibility amounts

percent

Eligible Property/Technology	Eligible Funding
Closed-Loop Biomass	30
Fuel Cells	30
Geothermal under IRC Section 45 (26 U.S.C. 45)	30
Landfill Gas Facility	30
Large Wind	30
Marine and Hydrokinetic	30
Open-Loop Biomass	30
Qualified Hydropower	30
Small Wind	30
Solar	30
Trash Facility	30
Combined Heat and Power	10
Geothermal Heat Pumps	10
Geothermal under IRC Section 48 (26 USC 48)	10
Microturbine	10

Source: American Recovery and Reinvestment Act of 2009, Section 1603 (Public Law 111-5).

3. Federal Energy Research and Development

At one time, virtually all energy R&D was concentrated in a single government agency, the Energy Research and Development Administration (ERDA).[38] Congress created ERDA on October 11, 1974, in response to the nation's growing need for additional sources of energy. ERDA's mission was to coordinate energy programs formerly scattered among many federal agencies, and serve as the focal point for a major effort by the federal government to expand energy research and development efforts.

However, energy issues quickly broadened, and federal energy research spread again to other agencies, especially the National Science Foundation. ERDA became part of DOE as a result of the Department of Energy Organization Act (Public Law 95-91).

In FY 2013, six federal agencies and the National Science Foundation (NSF) expended funds on energy R&D totaling $3.5 billion, providing 12% of total subsidies and support for energy that is within the scope of this report (see Table 14). Federal agencies spent virtually an identical amount in FY 2010.

Based on the broad scope of its numerous programs, DOE leads in energy R&D expenditures. In FY 2013, it funded $3.3 billion of energy R&D, a 1.4% increase over FY 2010. Given DOE's preeminent role in R&D, the discussion of that topic is largely organized by agency, following a brief fuel-related discussion.

Research and development by fuel

R&D expenditures have varied somewhat by fuel since FY 2010, but far less than direct expenditures.

Renewables. The plurality of R&D funding went to renewables in both FY 2010 and FY 2013, accounting for 33% and 30%, respectively, of total R&D expenditures (see Table 15). Within renewables, R&D funding varied somewhat by fuel between FY 2010 and FY 2013. Spending for biomass and solar dropped 16% and 17%, respectively, between FY 2010 and FY 2013, while rising slightly for other renewables (e.g., batteries, ocean energy, and energy storage). These 3 categories accounted for 87% of FY 2013 renewables R&D funding.

The overall level of R&D spending directed to biofuels declined modestly, from $79 million in FY 2010 to $74 million in FY 2013. The majority of biofuels R&D spending in FY 2013 ($42 million) was concentrated in DOE. The single largest program within DOE was the Office of Science Financial Assistance Program (CFDA 81.049), at $28 million. Between FY 2010 and FY 2013, this program provided more than 5,000 grants for energy-related basic and applied research, of which about 120 were attributable to biofuels. Spending on biofuels research under this program was up by $5 million from FY 2010. The second-largest source of biofuels R&D funding was the National Science Foundation Engineering Grants (CFDA 47.041). This program provides grants on a variety of engineering topics, some energy related and some not. In FY 2013, about 18% of spending under this program was energy-related.[39] Grants and awards directed at biofuels totaled $26 million in FY 2013, double their level from FY 2010. More than 6,000 grants were made in FY 2010 and FY 2013, about 140 of which were related to biofuels. The Department

[39] EIA estimated the percentage of NSF engineering grant funding directed towards energy by examining the program summaries for the 1,000 largest NSF engineering grants in FY 2013. These programs accounted for over 85% of total NSF engineering grant funding.

of Defense, on the other hand, decreased its biofuels-related R&D from $12 million in FY 2010 to $1 million in FY 2013, divided among 3 programs.

Electricity smart grid and transmission. This category received the second-greatest share, 24% in FY 2013. This represented a $300-million increase since FY 2010, when it accounted for 15% of total R&D funding.

Conservation and end use. R&D spending for the Conservation and End Use categories remained fairly constant, amounting to nearly $1 billion (28%) combined in FY 2013.

Nuclear energy. R&D for nuclear energy amounted to $406 million in FY 2013, a 9% decrease from FY 2010. The decrease was in funding for Nuclear Energy Research, Development and Demonstration (CFDA 81.121).

Coal. Coal R&D spending in FY 2013 was $202 million, 34% less than in FY 2010.

Natural gas and petroleum liquids. R&D spending increased from $9 million in FY 2010 to $34 million in FY 2013. Funding for the DOE's Advanced Research and Projects Agency's Energy Financial Assistance Program (CFDA 81.135) rose to an estimated value of $8 million in FY 2013; Fossil Energy Research and Development (CFDA 81.089) spending grew by $7 million from FY 2010 to an estimated value of $10 million in FY 2013. The Department of Transportation expanded its funding of the Pipeline Safety Research and Development (CFDA 20.723) from an estimated value of $5 million in FY 2010 to $16 million in FY 2013.

Research and development by agency

Department of Energy

DOE R&D spending has remained level between FY 2010 and FY 2013. R&D funding was $3.3 billion in both years. The largest R&D program is the Office of Science Research program (CFDA 81.049), which spent $1.1 billion in FY 2013. This office funds basic, early stage research projects. DOE's second-largest R&D program is Electricity Delivery and Energy Reliability, Research, Development and Analysis (CFDA 81.122), which funded $791 million of R&D. Its principal goal is to modernize the electric grid and enhance security and reliability of the energy infrastructure. R&D spending for renewable energy ranks third at $481 million (CFDA 81.087), followed by research on energy efficiency at $436 million (CFDA 81.086). These four programs covered 85% of DOE R&D spending in FY 2013.

However, funding priorities within DOE changed somewhat between FY 2010 and FY 2013. Although Office of Science research spending remained unchanged, Electricity Delivery and Energy Reliability, Research, Development and Analysis R&D rose $294 million and accounted for 24% of DOE's FY 2013 R&D, compared with 15% in FY 2010. More than offsetting this increase were decreases in conservation, renewables, and fossil fuel R&D funding. Spending for conservation and renewable energy declined about $230 million, or 20%. As a result, their combined share of DOE's R&D program equaled just 28% in FY 2013, compared with 35% in FY 2010. Fossil energy R&D, essentially for coal, decreased by nearly $100 million, or 31%.

In contrast, spending for the Advanced Research and Projects Agency - Energy Financial Assistance Program (ARPA-E, CFDA 81.135) rose from $28 million to $143 million. ARPA-E funds research and development of transformational energy-related technologies.

The Nuclear Energy Research, Development and Demonstration program (CFDA 81.121) examines advanced reactors, fuel and reactor concepts that minimize proliferation risks, nuclear fuel and fuel cycles, advanced instrumentation, controls, simulation, modeling and analyses, nuclear waste management, construction, manufacturing and fabrication technologies, and related fundamental nuclear science. Program spending declined from $166 million in FY 2010 to $127 million in FY 2013.

DOE's renewable R&D program emphasizes emerging technologies. Thirty-eight (38) percent of DOE's $954 million of FY 2013 renewable R&D funds supported Other Renewables. A sizable portion of these funds was directed towards battery technology. Other renewables also includes emerging forms such as energy storage for electricity (e.g., flywheel, pumped carbon dioxide, and add-ons to existing plants), ocean energy, and other novel forms. The support of solar and biomass consumed over half of DOE's renewable R&D, using 28% and 24% of funds, respectively (see Table 16). Much of the biomass support involved developing algae and ligno-cellulosic biomass as fuel sources.[40] Moreover, seven of the 10 largest program recipients over the past several years have been for biomass.[41] Wind received considerably less renewable research funding from DOE, amounting to only 4% of DOE's total R&D.

The class of recipients for different R&D programs varies. Since 2000, institutes of higher education have received approximately three-fourths of Office of Science R&D funding, with for-profit institutions receiving nearly 20%.[42] Virtually all subsidies are in the form of grants and cooperative agreements. In contrast, for-profit institutions have received over 60% of Renewable Energy R&D funding and 75% of Fossil Energy Research and Development program funding over the past several years.[43] Institutes of higher education have received over 20 and 16%, respectively, followed by non-profits receiving under 10% for both programs. Virtually all subsidies are in the form of grants and cooperative agreements.

National Science Foundation

The National Science Foundation (NSF) conducts a far-flung engineering grant-based research program into every area of science (CFDA 47.041). Of its $782 million FY 2013 R&D expenditures, 18%, or $140 million, was spent on over 3,000 individual energy projects. FY 2010 funding for energy was $133 million.

The NSF R&D program is the most diverse of all agencies. An examination of individual project descriptions on NSF's engineering project database revealed that in FY 2013, one-fourth of NSF energy R&D funds were spent on conservation projects, followed by biofuels (18%), biomass (15%), and other renewables, e.g., batteries, ocean energy, energy storage, 12%. Solar and wind also had modest shares of the NSF R&D program (10 and 6%, respectively). Smart Grid, hydropower, and nuclear (in that order)

[40] Center for Effective Government, Assistance for 81.087: Renewable Energy Research and Development (FY 2000-2012), accessed January 31, 2015.
[41] Ibid, Assistance for 81.087: Renewable Energy Research and Development (FY 2000-2012), accessed January 31, 2015.
[42] Ibid, Assistance for 81.049: Office of Science Financial Assistance Program (FY 2000-2012), accessed January 31. 2015.
[43] Ibid, Assistance for 81.087: Renewable Energy Research and Development (FY 2000-2012), accessed January 31, 2015.

combined for nearly 4% of NSF funding. NSF undertook no coal, natural gas/petroleum liquids, or geothermal projects.[44]

Higher education institutions are the recipients of most of NSF's R&D grants. Institutes of higher education typically receive nearly 65% of NSF engineering grant funding, while for-profit organizations receive 16%. Non-profits receive only 1%, and other types of organizations receive 18%.

Other agencies

Of the remaining agencies, the Department of Transportation had the largest FY 2013 R&D expenditures at $16 million (CFDA 20.723). The funds were directed to pipeline safety programs that sponsored projects focused on the development of new technologies for pipeline operators to use to improve safety performance, reduce environmental impact, and enhance the reliability of the pipeline transportation system

The Department of Defense spent $5 million on energy R&D in FY 2013 (CFDA 12.431). Eighty (80) percent was for projects which were a very small part of their basic science research program.

Similarly, the Department of Agriculture spent $4 million on energy R&D in FY 2013 as a small part of its basic science program (CFDA 10.001).[45]

The U.S. Environmental Protection Agency (EPA) spent approximately $3 million on energy R&D in both FY 2010 and FY 2013 (CFDA 66.034). In addition, under the purview given to it by the Clean Air Act of 1963 and the National Environmental Policy Act of 1969, EPA conducts Survey, Studies, Research, Investigations, Demonstrations, and Special Purpose Activities Relating to the Clean Air Act. Most of this program's $66 million R&D for FY 2013 activities involves monitoring of air pollutants. Some of this research, however, relates to energy systems such as pollution control systems for electric generating units.

The Department of the Interior and the Nuclear Regulatory Commission did not support energy-related R&D in FY 2013.[46]

[44] Program shares were considered zero if they accounted for under 0.1% of total R&D project funds.
[45] The amount spent on energy-related agricultural science research was $6 million, but total agriculture R&D spending had a $2-million rescission in FY 2013.
[46] See footnote 45.

Table 14. Estimates of research and development expenditures in energy, FY 2010 and FY 2013

million 2013 dollars

Department, Office, and Program - CFDA Number	FY 2010	FY 2013
Department of Agriculture	**33**	**4**
Agricultural Research Service	**2**	**6**
Agricultural Research Basic and Applied Research - 10.001	2	6
National Institute of Food and Agriculture	**30**	**-2**
Biomass Research and Development Initiative Competitive Grants Program (BRDI) - 10.312	30	-2
Department of Defense	**21**	**5**
Advanced Research Projects Agency	**8**	**0**
Research and Technology Development - 12.910	8	0
Office of the Secretary	**6**	**1**
Basic, Applied, and Advanced Research in Science and Engineering - 12.630	6	1
U.S. Army Materiel Command	**7**	**4**
Basic Scientific Research - 12.431	7	4
Department of Energy	**3,276**	**3,323**
Advanced Research Projects Agency - Energy	**28**	**143**
Advanced Research and Projects Agency - Energy Financial Assistance Program - 81.135	28	143
Office of Electricity Delivery and Energy Reliability	**497**	**791**
Electricity Delivery and Energy Reliability, Research, Development and Analysis - 81.122	497	791
Office of Energy Efficiency and Renewable Energy	**1,147**	**916**
Conservation Research and Development - 81.086	562	436
Renewable Energy Research and Development - 81.087	584	481
Office of Fossil Energy	**312**	**215**
Fossil Energy Research and Development - 81.089	308	209
Geologic Sequestration Training and Research Grant Program - 81.133	3	3
University Coal Research - 81.057	2	2
Office of Nuclear Energy	**166**	**127**
Nuclear Energy Research, Development and Demonstration - 81.121	166	127
Office of Science	**1,126**	**1,131**
Office of Science Financial Assistance Program - 81.049	1,126	1,131
Department of the Interior	**1**	**0**
Bureau of Ocean Energy Management	**1**	**0**
Marine Gas Hydrate Research Activities - 15.428	1	0
Department of Transportation	**5**	**16**
Pipeline and Hazardous Materials Safety Administration	**5**	**16**
PHMSA Pipeline Safety Research and Development Other Transaction Agreements - 20.723	5	16
Research and Innovative Technology Administration	**0**	**-**
Biobased Transportation Research - 20.761	0	-
Environmental Protection Agency	**3**	**3**
Office of Air and Radiation	**3**	**3**

Table 14. Estimates of research and development expenditures in energy, FY 2010 and FY 2013 (cont.)

million 2013 dollars

Department, Office, and Program - CFDA Number	FY 2010	FY 2013
Surveys, Studies, Research, Investigations, Demonstrations, and Special Purpose Activities Relating to the Clean Air Act - 66.034	3	3
National Science Foundation	**133**	**140**
Directorate for Engineering	**133**	**140**
Engineering Grants - 47.041	133	140
Nuclear Regulatory Commission	**2**	**0**
Nuclear Regulatory Commission-Unspecified	**2**	**0**
U.S. Nuclear Regulatory Commission Office of Research Financial Assistance Program - 77.009	2	0
Total	**3,473**	**3,491**

Notes: Totals may not equal sum due to independent rounding. Excludes programs not funded in either FY 2010 or FY 2013 but have been funded in other years.

Sources: U.S. Department of Energy, Office of the Chief Financial Officer, *Base Financial Data*, FY 2010 and FY 2013; Office of Management and Budget, *USASpending.gov - Government spending at your fingertips;* website: http://www.usaspending.gov/accessed December 1, 2014 and 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.

Table 15. Estimates of research and development expenditures in energy by beneficiary, FY 2010 and FY 2013

million 2013 dollars

Beneficiary	FY 2010	FY 2013
Coal	307	202
Natural Gas and Petroleum Liquids	9	34
Nuclear	446	406
Renewables	**1,140**	**1,051**
Biomass	301	251
Geothermal	2	2
Hydropower	11	10
Solar	320	284
Wind	58	49
Other	368	380
Biofuels	79	74
Electricity - Smart Grid and Transmission	**534**	**831**
Conservation	**610**	**501**
End-Use	**427**	**466**
LIHEAP	-	-
Other	427	466
Total	**3,473**	**3,491**

Notes: Totals may not equal sum due to independent rounding. Refined coal was not included as a beneficiary because it received no support in either FY 2010 or FY 2013.

Sources: U.S. Department of Energy, Office of the Chief Financial Officer, *Base Financial Data*, FY 2010 and FY 2013; Office of Management and Budget, *USASpending.gov - Government spending at your fingertips;* website: http://www.usaspending.gov/; accessed December 1, 2014 and 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.

Table 16. Estimates of research and development expenditures in energy by beneficiary, department, and program, FY 2010 and FY 2013

million 2013 dollars

Beneficiary (Fuel/End Use), Department, and Program - CFDA Number	FY 2010	FY 2013
Coal	**307**	**202**
Department of Energy	**307**	**202**
Advanced Research and Projects Agency - Energy Financial Assistance Program - 81.135	1	2
Fossil Energy Research and Development - 81.089	305	199
University Coal Research - 81.057	2	2
Natural Gas and Petroleum Liquids	**9**	**34**
Department of Energy	**3**	**18**
Advanced Research and Projects Agency - Energy Financial Assistance Program - 81.135	0	8
Fossil Energy Research and Development - 81.089	3	10
Department of the Interior	**1**	**0**
Marine Gas Hydrate Research Activities - 15.428	1	0
Department of Transportation	**5**	**16**
PHMSA Pipeline Safety Research and Development Other Transaction Agreements - 20.723	5	16
Nuclear	**446**	**406**
Department of Energy	**444**	**405**
Nuclear Energy Research, Development and Demonstration - 81.121	166	127
Office of Science Financial Assistance Program - 81.049	277	278
National Science Foundation	**0**	**0**
Engineering Grants - 47.041	0	0
Nuclear Regulatory Commission	**2**	**0**
U.S. Nuclear Regulatory Commission Office of Research Financial Assistance Program - 77.009	2	0
Biomass	**301**	**251**
Department of Agriculture	**15**	**-1**
Biomass Research and Development Initiative Competitive Grants Program (BRDI) - 10.312	15	-1
Department of Defense	**3**	**1**
Basic, Applied, and Advanced Research in Science and Engineering - 12.630	3	1
Department of Energy	**259**	**230**
Advanced Research and Projects Agency - Energy Financial Assistance Program - 81.135	1	2
Office of Science Financial Assistance Program - 81.049	80	80
Renewable Energy Research and Development - 81.087	179	147
National Science Foundation	**23**	**22**
Engineering Grants - 47.041	23	22
Geothermal	**2**	**2**
Department of Energy	**2**	**2**
Office of Science Financial Assistance Program - 81.049	1	1
Renewable Energy Research and Development - 81.087	1	1

Table 16. Estimates of research and development expenditures in energy by beneficiary, department, and program, FY 2010 and FY 2013 (cont.)

million 2013 dollars

Beneficiary (Fuel/End Use), Department, and Program - CFDA Number	FY 2010	FY 2013
Hydropower	**11**	**10**
Department of Energy	**10**	**9**
Advanced Research and Projects Agency - Energy Financial Assistance Program - 81.135	-	1
Renewable Energy Research and Development - 81.087	10	8
National Science Foundation	**1**	**1**
Engineering Grants - 47.041	1	1
Solar	**320**	**284**
Department of Defense	**3**	**2**
Basic Scientific Research - 12.431	3	2
Department of Energy	**304**	**269**
Advanced Research Projects Agency - Energy Financial Assistance Program - 81.135	1	11
Office of Science Financial Assistance Program - 81.049	47	48
Renewable Energy Research and Development - 81.087	255	210
National Science Foundation	**14**	**13**
Engineering Grants - 47.041	14	13
Wind	**58**	**49**
Department of Defense	**3**	**2**
Basic Scientific Research - 12.431	3	2
Department of Energy	**47**	**39**
Advanced Research Projects Agency - Energy Financial Assistance Program - 81.135	0	3
Office of Science Financial Assistance Program - 81.049	3	-
Renewable Energy Research and Development - 81.087	44	36
National Science Foundation	**8**	**8**
Engineering Grants - 47.041	8	8
Other (Renewable)	**368**	**380**
Department of Energy	**350**	**363**
Advanced Research Projects Agency - Energy Financial Assistance Program - 81.135	6	20
Office of Science Financial Assistance Program - 81.049	327	328
Renewable Energy Research and Development - 81.087	17	14
National Science Foundation	**18**	**17**
Engineering Grants - 47.041	18	17
Biofuels	**79**	**74**
Department of Agriculture	**17**	**5**
Agricultural Research Basic and Applied Research - 10.001	2	6
Biomass Research and Development Initiative Competitive Grants Program (BRDI) - 10.312	15	-1
Department of Defense	**12**	**1**
Basic Scientific Research - 12.431	2	0
Basic, Applied, and Advanced Research in Science and Engineering - 12.630	2	0
Research and Technology Development - 12.910	8	0

Table 16. Estimates of research and development expenditures in energy by beneficiary, department, and program, FY 2010 and FY 2013 (cont.)

million 2013 dollars

Beneficiary (Fuel/End Use), Department, and Program - CFDA Number	FY 2010	FY 2013
Department of Energy	**36**	**42**
Advanced Research Projects Agency - Energy Financial Assistance Program - 81.135	1	3
Office of Science Financial Assistance Program - 81.049	23	28
Renewable Energy Research and Development - 81.087	13	10
Department of Transportation	**0**	**-**
Biobased Transportation Research - 20.761	0	-
Environmental Protection Agency	**0**	**0**
Surveys, Studies, Research, Investigations, Demonstrations, and Special Purpose Activities Relating to the Clean Air Act - 66.034	0	0
National Science Foundation	**13**	**26**
Engineering Grants - 47.041	13	26
Electricity - Smart Grid and Transmission	**534**	**831**
Department of Energy	**530**	**827**
Advanced Research Projects Agency - Energy Financial Assistance Program - 81.135	1	10
Electricity Delivery and Energy Reliability, Research, Development and Analysis - 81.122	497	791
Renewable Energy Research and Development - 81.087	33	27
National Science Foundation	**4**	**4**
Engineering Grants - 47.041	4	4
Conservation	**610**	**501**
Department of Energy	**573**	**466**
Advanced Research Projects Agency - Energy Financial Assistance Program - 81.135	4	23
Conservation Research and Development - 81.086	562	436
Office of Science Financial Assistance Program - 81.049	7	7
Renewable Energy Research and Development - 81.087	0	0
National Science Foundation	**37**	**35**
Engineering Grants - 47.041	37	35
Other (End-Use)	**427**	**466**
Department of Energy	**410**	**451**
Advanced Research Projects Agency - Energy Financial Assistance Program - 81.135	14	61
Geologic Sequestration Training and Research Grant Program - 81.133	3	3
Office of Science Financial Assistance Program - 81.049	361	360
Renewable Energy Research and Development - 81.087	32	26
Environmental Protection Agency	**3**	**2**
Surveys, Studies, Research, Investigations, Demonstrations, and Special Purpose Activities Relating to the Clean Air Act - 66.034	3	2
National Science Foundation	**14**	**13**
Engineering Grants - 47.041	14	13
Total	**3,473**	**3,491**

Notes: Totals may not equal sum due to independent rounding.

Sources: U.S. Department of Energy, Office of the Chief Financial Officer, *Base Financial Data*, FY 2010 and FY 2013; Office of Management and Budget, *USASpending.gov - Government spending at your fingertips;* website: http://www.usaspending.gov/; accessed December 1, 2014 and 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.

4. Federal Electricity Programs

Introduction

The federal government provides financial support in the form of access to capital at interest rates below the market cost of capital commanded by investor-owned utilities (IOUs) to both electric utilities participating in the Rural Utility Service's (RUS) electric loan program and to federal utilities.[47] Similarly, the credit ratings of federal utilities are enhanced by a perceived federal guarantee on debt they issue to finance capital projects. The federally owned utilities include the Tennessee Valley Authority (TVA) and the four Power Marketing Administrations (PMAs): the Bonneville Power Administration (BPA), the Western Area Power Administration (WAPA), the Southeastern Power Administration (SEPA), and the Southwestern Power Administration (SWPA).[48]

RUS-supported utilities are considered to be rural cooperatives when they are member-owned, with at least 85% of their income coming from their members. They are established in rural areas to provide electricity to those members. Cooperatives are organized under state law. Electric cooperatives qualify as tax-exempt organizations under Section 501(c) (12) of the IRC and also have access to low-cost federal government loans and loan guarantees. In the United States, cooperatives account for about 12% of total electricity sales to U.S. consumers.[49]

Federal electric utilities are primarily transmitters and wholesale marketers of electricity generated by federally-owned generating facilities. As required by law, they are not-for-profit entities and are obligated to offer preferential access to power to statutorily defined customer sets. Preference customers include municipal utilities, cooperatives, Indian tribes, state utilities, and irrigation districts. They may also include state governments and federal agencies. After meeting commitments for electricity to preference customers, the PMAs and TVA can sell surplus electricity to IOUs in wholesale markets or directly to the industrial sector. They do not sell power directly to residential or commercial customers. Federally owned utilities are by federal statute obligated to set electricity rates to recover costs and enjoined by law from pricing power to make a profit.

In 2013, TVA received 86% of its revenue from sales from municipalities and cooperatives, 11% from industrial customers and 2% from Federal agencies.[50] BPA derived 55% of its electricity revenue from sales to publicly owned utilities, 24% from wheeling, 13% from sales outside its service region, and 5% from sales to IOUs or direct service industries.[51] WAPA sold 51% of its electric power to municipalities

[47] Due to their federal government ownership, federal utilities also receive support in the form of allowing these entities to price power at rates that yield less than competitive rates of return.

[48] The United States Department of Interior, Bureau of Indian Affairs owns or has interests in irrigations projects primarily engaged in irrigation that also provide electric service on Indian Reservations. See WAPA's, "Tribal Authority Process Case Studies: The Conversion of on-Reservation Electric Utilities to Tribal Ownership and Operation," September 2010. Any subsidies that may exist with respect to these government-owned projects are excluded from the analysis because their primary purpose is agricultural irrigation, not electricity production.

[49] U.S. Energy Information Administration, *Electric Power Monthly*, Retail sales of electricity to ultimate customers: By end-use sector by state and utility, All sectors by state and utility (Data from forms EIA-861- Schedules 4A & 4D and EIA-861S), December 12, 2014 http://www.eia.gov/electricity/data.cfm#sales

[50] Tennessee Valley Authority, 2013 *Annual Report on Form 10-K,* p. 10, http://www.snl.com/IRWebLinkX/FinancialDocs.aspx?iid=4063363

[51] Bonneville Power Administration, "2013 BPA Facts," http://www.bpa.gov/news/pubs/GeneralPublications/gi-BPA-Facts.pdf

and cooperatives, 19% to public utility districts, 12% to state age077ncies, 3% to federal agencies, 2% to IOUs, with the remainder going to a variety of other entities.[52] Cooperatives and municipalities accounted for 82% of SWPA's revenue from electricity sales, with Federal agencies accounting for less than 2% and the remainder going to a variety of entities.[53] Lastly, SEPA attributes 84% of its revenues to cooperatives and municipalities, 3% percent to states and counties, and the remaining 13% to other customers.

This section examines support provided by the federal government to certain electric power customers. This support differs significantly from that provided by the programs reviewed in other parts of this report as it is not a measure of federal outlays or tax expenditures measured by the Treasury Department and reported in federal budget documents. The market value of the interest subsidies provided to RUS borrowers, TVA, and the PMAs are values estimated by EIA and a function of both the long-term debts carried by these entities and prevailing interest rates.

Measuring the support

In this report, the federal support to RUS borrowers, TVA, and the PMAs are quantified by estimating the reduced cost of capital they receive because of their ability to borrow directly from the Treasury, access low-cost federal loans and loan guarantees, and, in the case of TVA and BPA, to access lower cost private financing because of the financial markets' perceptions of an implied federal guarantee of their non-federal obligations. This measure consists of a snapshot of the difference between the interest expense paid by RUS borrowers, TVA, and the PMAs at their embedded cost of debt relative to what they would have paid at a range of market interest rates. It compares interest actually paid on debt in the current year to interest that would have been paid under more common public or commercial terms available in the current year (not compared to public or commercial terms available in the year the debt was incurred).

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 Treasury's 30-year constant yield to maturity debt obligation. For private-sector rates, the benchmarks used are the Moody's utility bond ratings ranging from Aa down to Baa.[54]

These ratings indicate two different measures of support. When debt carried on the balance sheets of federal utilities has lower average 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. In FY 2010 and FY 2013, this type of support was only experienced by Bonneville.

The second measure of support assumes that federal utilities are advantaged to the extent that the associated average interest costs of their outstanding borrowing costs are at rates less than they would be if they were private entities. This measure of support compares the effective average borrowing

[52] Western Area Power Administration, 2013 Annual Report, p. 3, http://ww2.wapa.gov/sites/western/newsroom/pubs/Documents/AR-2013.pdf

[53] Southwestern Power Administration, 2013 Annual Report, p. 13, http://www.swpa.gov/PDFs/ARs/SWPA_FY2013_annual_report.pdf

[54] In previous versions of this report, an estimated Aaa value was also reported, however, since Moody's has not published a Aaa rating for public utilities since 2001, the Aaa rating was excluded from the bulk of this report. According to Moody's, the Aaa series has long since been discontinued since there are only some quasi-federal institutions available, and these indices exclude debt that would have some kind of federal government guarantee.

costs of the Federal utilities with the cost of capital commanded by risk-adjusted groups of IOUs that raise debt in the market place. As the comparable IOU that a federal utility would command were it to lose the borrowing benefits derived from Federal ownership or its implicit financial backing by the U.S. Treasury cannot be known, the tables in this section of the report display a range of ratings from Aa to Baa.[55] The change in these interest rates between 2010 and 2013 are summarized in the table below.

Table 17. Interest rates used to estimate federal utilities and RUS interest subsidies, 2010 and 2013

percent

Comparison Debt	2010	2013
30-Year Treasury	4.25	3.45
Investor-Owned Aa	5.22	4.24
Investor-Owned A	5.45	4.48
Investor-Owned Baa	5.95	4.98

Source: Moody's Investors Service.

The measure used to estimate the federal interest rate support for federally-owned utilities is also highly dependent on the spread between the interest rates for the various categories of investment grade bonds. Table 17 illustrates that the level of estimated support varies directly with the benchmark interest rate chosen. The spread between these rates could remain relatively stable or could change over time. In 2010, the average yield on 30-year Treasury bonds was 4.25 percent while the average yield on Aa-rated utility bonds was 5.22%, producing a spread of 97 basis points. In contrast, the 2013 spread between the 3.45% 30-year Treasury and the 4.24% investor-owned Aa rate is 79 basis points. The difference in yield between an Aa utility rating and Baa utility rating was 73 and 74 basis points in 2010 and 2013 respectively. In other words, there was a greater basis point spread between Treasury bonds and IOU debt in 2010 than in 2013, causing a higher value of implied support for the RUS borrowers and Federal utilities per dollar of debt, but there were not differences in the spread between IOU debt ratings further down the yield curve in the two periods.

The level of support rises and falls depending on three developments: (1) changes in the yield spread between different debt instruments (e.g., Treasury and utilities); (2) changes in the level of outstanding debt; (3) and the federal utilities and RUS borrowers embedded cost of debt versus the Treasury's and utilities' current cost of money. It should be pointed out that there are other approaches for measuring federal support to these utilities. These other methods are discussed broadly in the 2007 and 2010 versions of EIA's subsidy reports.

Rural Utilities Service, Electric Program

RUS is an office under the USDA that focuses on supporting finances for infrastructure or infrastructure improvements in rural communities. These include water and waste water treatment, telecommunications services, and electric power. The Electric Program lends the necessary capital to maintain, expand, upgrade and modernize rural electric infrastructure, including electric distribution, transmission and generation facilities.

[55] While this report does not use a standard point of comparison, the Moody's IOU indices are comprised of about 30 A rated instruments, 29 Baa instruments, only 10 instruments with the Aa rating, and Moody's no longer offers a Aaa index as it was comprised mainly of debt with the implied federal guarantee from BPA and TVA.

RUS programs can make three general types of loans and loan guarantees.[56] First, hardship loans are available to electric distribution borrowers that have experienced a natural disaster or meet a rate disparity and consumer income test. The interest rate on these loans is 5%. Second, RUS programs can also make direct loans that are tied to municipal bond or Treasury rates. These loans can be used to fund the construction of distribution assets and renewable generating facilities, as well as for financing operational costs. Third, RUS program also guarantees loans made by the Federal Financing Bank (FFB), through which government agencies obtain capital, or access financing from cooperative and not-for-profit lending institutions, such as the National Rural Utilities Cooperative Finance Corporation (CFC). These types of loans effectively remove the financial risk for these institutions to lend to RUS members at preferential rates.

RUS collects detailed financial data on utilities that currently have RUS direct loans. Included in these data are interest expenses and the dollar value of debt for two types of loans: RUS direct loans and loans made by the FFB/CFC and guaranteed by RUS. What is not reported is the amount of RUS guaranteed debt held by utilities that receive no RUS direct loans. Since the data of FFB/CFC loans guaranteed by RUS are incomplete, as was done in the previous versions of this report, only the subsidy resulting from RUS direct loans can be computed.[57]

The RUS borrowers' share of outstanding long-term debt is relatively unchanged from 2010 to 2013 at $36.6 billion and $36.5 billion, respectively (see Table 18). What has changed is that the implied subsidy support has decreased as the cost of that debt has gone down. In 2010, if all rural utilities had borrowed at the utility bond rating of Aa, costs would have been an additional $69 million (2013 dollars); an A rate would have cost an additional $153 million (2013 dollars); and a Baa rating would have cost an additional $337 million (2013 dollars). In contrast, in 2013, the computed interest rates at the Aa and A rates were less than zero, implying no subsidy, and paying off debt at the Baa rating would have only resulted in an increase, or implied subsidy, of $37 million dollars (2013 dollars).

[56] See the 2007 report for a more detailed description of the types of RUS loans and guarantees. U.S. Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 2007*, DOE/EIA-SR/CNEAF/2008-01 (Washington, DC, April 2008).

[57] Total interest expenses for RUS direct loans and guarantees are reported. The interest expenses for direct RUS loans were imputed using the ratio of RUS direct loans to total debt.

Table 18. Estimate of federal electricity interest rate support to RUS rural electricity borrowers, FY 2010 and FY 2013

million 2013 dollars

Comparison Debt	Treasury Rate	Aa IOU Rate	A IOU Rate	Baa IOU Rate
FY 2010				
1) Benchmark Interest Rates (%)	4.25	5.22	5.45	5.95
2) Outstanding Debt ($)	36,577	36,577	36,577	36,577
3) Average Cost of Outstanding Debt (%)	5.03	5.03	5.03	5.03
4) Actual Interest Expense ($)	1,840	1,840	1,840	1,840
5) Interest Expense Computed at Benchmark [(1)*(2)]	1,555	1,909	1,993	2,177
6) Estimated Interest Support at Benchmark Rate ($) [(5)-(4)]	NA	69	153	337
FY 2013				
1) Benchmark Interest Rates (%)	3.45	4.24	4.48	4.98
2) Outstanding Debt ($)	36,529	36,529	36,529	36,529
3) Average Cost of Outstanding Debt (%)	4.88	4.88	4.88	4.88
4) Actual Interest Expense ($)	1,783	1,783	1,783	1,783
5) Interest Expense Computed at Benchmark [(1)*(2)]	1,260	1,550	1,635	1,820
6) Estimated Interest Support at Benchmark Rate ($) [(5)-(4)]	NA	NA	NA	37

Notes: 2013 values for Outstanding Debt and Actual Interest Expense are preliminary values. NA indicates that some of the cost of outstanding debt exceeds the benchmark interest rate. There is no subsidy when benchmark rates are less than the weighted cost of capital. IOU denotes Investor-Owned Utility.
Sources: Rural Utility Service, Annual Statistical Report - Rural Electric Borrowers, 2010 and 2011, Moody's Investors Service.

It is important to note here that the 2011 values were used in place of 2013 values for the RUS estimates for outstanding debt and interest expense. The USDA was able to provide preliminary values, but they were too late for publication purposes, and the difference between these values had minimal impact on the overall results. USDA estimated the 2013 outstanding debt (line 2) to be $39.6 billion instead of $36.6 billion (2013 dollars) and the actual interest expense (line 4) to be $1.80 billion instead of $1.78 billion (2013 dollars). The resulting Baa estimated interest support (line 6) value calculated using the USDA values is larger at $169 million; however the change to the final results of the report was less than one percent.

Tennessee Valley Authority

The TVA was established in 1933 under the Tennessee Valley Authority Act (Public Law 73-17). Its original purpose was to promote economic development in the Tennessee Valley, to improve navigation, and to aid in flood control. TVA has an asset base greater than that of the four PMAs combined. Unlike the PMAs, TVA's hydropower accounts for a relatively small share of its total generation.

In FY 2013, generation from fossil fuels accounted for 52% of TVA's total generation, while nuclear generation accounted for 36%, and hydroelectric generation accounted for 12% of the total.[58] A fraction of a percent of TVA's electricity comes from methane, solar, and wind. TVA's service territory covers 9 million people located in nearly all of Tennessee and parts of Alabama, Kentucky, North Carolina,

[58] Tennessee Valley Authority, 2013 *Annual Report on Form 10-K*, p. 12, http://www.snl.com/IRWebLinkX/FinancialDocs.aspx?iid=4063363

Mississippi, Georgia, and Virginia. Tennessee accounted for 62% of TVA's revenues in 2013.[59] TVA received 86% of its revenue from cooperatives and municipalities in 2013. Memphis Light Gas and Water Division (MLGW) and Nashville Electric Services are the largest local power company customers of TVA accounting for a respective 9% and 8% of TVA's sales.[60]

One anomaly with TVA's balance sheet is that there are two other line items listed as "other liabilities" that are effectively types of long-term debt and are treated as such in this analysis. These liabilities are their lease/leaseback obligations and the energy prepayment obligations. The description and reasoning for why these were included is discussed in the 2007 and 2010 versions of this report.

TVA's debt in 2013 received an Aaa bond rating from Moody's Rating Service and AAA from Standard and Poor's and Fitch Ratings. [61] The imputed interest expense in TVA lease payments and the prepayment discount were not treated as interest expenses in TVA's financial documents. Therefore, TVA's interest costs in this report were estimated by applying an Aaa interest expense to TVA's adjusted long-term debt. The Aaa interest rate expense was then compared to what the TVA would pay in interest if its debt were priced at a lower bond rating.

In 2013, TVA had outstanding long-term debt of $24.9 billion (see Table 19), compared to $25.9 billion in debt in 2010 (2013 dollars). TVA's interest rate was benchmarked to an Aaa bond rating, which in 2013 was estimated to be 3.97 percent. Therefore, if TVA borrowed money at the Aa rate rather than the Aaa rate, its borrowing costs in 2013 would have increased 27 basis points, or $67 million (2013 dollars) in additional annual interest expense. An A bond rating would raise TVA's 2013 borrowing costs by $125 million (2013 dollars), and the Baa rating by $251 million (2013 dollars). As shown in the table below, TVA's implied interest support has remained relatively constant between fiscal year 2010 and 2013.

[59] Ibid, p. 9.
[60] Ibid, p. 10.
[61] Moody's Investors Service, "Rating Action: Moody's Assigns Aaa to TVA's Southaven Plant Lease Debt; outlook stable," August 2013, https://www.moodys.com/research/Moodys-Assigns-Aaa-to-TVAs-Southaven-Plant-Lease-Debt-outlook--PR_279397

Table 19. Estimate of federal electricity interest rate support to TVA, FY 2010 and FY 2013

million 2013 dollars

Comparison Debt	Treasury Rate	Aa IOU Rate	A IOU Rate	Baa IOU Rate
FY 2010				
1) Benchmark Interest Rates (%)	4.25	5.22	5.45	5.95
2) Outstanding Debt ($)	25,915	25,915	25,915	25,915
3) Average Cost of Outstanding Debt (%)	4.96	4.96	4.96	4.96
4) Actual Interest Expense ($)	1,286	1,286	1,286	1,286
5) Interest Expense Computed at Benchmark [(1)*(2)]	1,101	1,353	1,412	1,542
6) Estimated Interest Support at Benchmark Rate ($) [(5)-(4)]	NA	67	126	257
FY 2013				
1) Benchmark Interest Rates (%)	3.45	4.24	4.48	4.98
2) Outstanding Debt ($)	24,897	24,897	24,897	24,897
3) Average Cost of Outstanding Debt (%)	3.97	3.97	3.97	3.97
4) Actual Interest Expense ($)	989	989	989	989
5) Interest Expense Computed at Benchmark [(1)*(2)]	859	1,056	1,114	1,240
6) Estimated Interest Support at Benchmark Rate ($) [(5)-(4)]	NA	67	125	251

Notes: NA indicates that some of the cost of outstanding debt exceeds the benchmark interest rate. There is no subsidy when benchmark rates are less than the weighted cost of capital.
Sources: Tennessee Valley Authority, 2010 and 2013 Annual Report on Form 10-K. Moody's Investors Service.

Power Marketing Administrations

There are a total of four Power Market Administrations (PMAs), the largest being the Bonneville Power Administration (BPA), which was created in 1937 through the Bonneville Project Act (Public Law 75-329). The Act required BPA to market hydropower produced from the Columbia River and to promote regional economic development. The second-largest PMA, the Western Area Power Administration (WAPA), was created in 1977 with the Department of Energy Organization Act of 1977 (Public Law 95-91). WAPA was charged with marketing hydropower facilities in the western United States including power from the Hoover Dam, which was dedicated in 1935. The remaining two PMAs, Southwestern Power Administration (SWPA) and Southeastern Power Administration (SEPA), operate under the authority of the Flood Control Act of 1944 (Public Law 78-534) – although SEPA was not actually created until 1950.

The PMAs comprised about 3% of the nation's electricity market, virtually all of which is wholesale. BPA's service territory covers Washington, Oregon, Idaho, and parts of Montana, California, Nevada, Utah, and Wyoming. WAPA covers California, Nevada, Utah, Arizona, New Mexico, Montana, most of Wyoming, west Texas, North Dakota, South Dakota, Nebraska, Kansas, Colorado, and the western edges of Minnesota and Iowa. SWPA serves parts of Kansas, Missouri, Oklahoma, Texas, Arkansas, and Louisiana. SEPA serves all or parts of Illinois, Kentucky, Tennessee, Mississippi, Alabama, Georgia, the Florida panhandle, North Carolina, South Carolina, and Virginia.

For the PMAs, the debt values and interest expenses were obtained from their 2010-2013 annual reports. Having actual data on both PMAs' long-term debt and interest on long-term debt allows for a comparison of what that interest might be if PMAs borrowed at IOU rates. Unlike TVA, the PMAs have an advantage in that DOE requires the retirement of high-interest debt first whenever possible.

Therefore, borrowing costs for the PMAs were also measured against borrowing costs at the Treasury rate along with the interest rates for investment grade IOU bonds rated Aa, A, and Baa.

Bonneville Power Administration

As with all other federal utilities, Bonneville Power Administration is a not-for-profit enterprise and prices its power to recover its operating and capital costs. Unlike TVA, the PMAs are not government corporations; they are line agencies within DOE. Like TVA, however, BPA does benefit from the implicit support which results from its government status. BPA has nuclear-related obligations. BPA has a contractual obligation to pay the debt service on bonds issued by Energy Northwest, the successor to the Washington Public Power Supply System. Because of these circumstances, BPA carries three forms of debt: appropriated debt, long-term debt, and non-federal projects debt. A more detailed discussion of these debt categories can be found in the 2007 and 2010 versions of this report.

EIA estimated BPA's cost of long-term debt as being based upon its three sources. BPA's appropriated debt, which accounts for about 37% of all long-term debt in 2013, was benchmarked to the 30-year Treasury bond borrowing costs for 2010 and 2013. Long-term debt (24% of total debt) was benchmarked to a weighted average of BPA's reported long-term borrowing costs as a percentage of associated long-term debt issuances, as reported in BPA financial documents. BPA's non-federal power debt (40% of total debt) was benchmarked to municipal bond rates, as found in the Federal Reserve Bank's Form H-15.

The correct methodology to use for calculating municipal bond interest rates for non-federal debts is not without controversy, as the lower interest rates derived from municipals' tax-free status is not relevant to the calculation of interest support. Although much of BPA's Energy Northwest debt is exempt from federal taxation, BPA is obligated to pay the debt service on Energy Northwest bonds, and this debt appears on the balance sheet of a federally-owned utility.[62] In the end, however, the 2013 municipal bond yield was within 2 basis points of the Aa IOU rate, so the methodology was not changed.

The size of BPA's estimated federal interest rate support is a function of the interest rate chosen to reflect the appropriate "market" interest rate. Table 20 illustrates a computation of federal utility interest support, making alternative assumptions about the appropriate market interest rate. The estimated interest cost of BPA's total debt lies somewhere between where it would be if it were priced between the 30-year Treasury and a Baa utility bond rating.

[62] Certain Energy Northwest bond issues are also enhanced with bond insurance.

Table 20. Estimate of federal electricity interest rate support to BPA, FY 2010 and FY 2013

million 2013 dollars

Comparison Debt	Treasury Rate	Aa IOU Rate	A IOU Rate	Baa IOU Rate
FY 2010				
1) Benchmark Interest Rates (%)	4.25	5.22	5.45	5.95
2) Outstanding Debt ($)	14,885	14,885	14,885	14,885
3) Average Cost of Outstanding Debt (%)	4.29	4.29	4.29	4.29
4) Actual Interest Expense ($)	638	638	638	638
5) Interest Expense Computed at Benchmark [(1)*(2)]	633	777	811	886
6) Estimated Interest Support at Benchmark Rate ($) [(5)-(4)]	NA	139	173	248
FY 2013				
1) Benchmark Interest Rates (%)	3.45	4.24	4.48	4.98
2) Outstanding Debt ($)	15,730	15,730	15,730	15,730
3) Average Cost of Outstanding Debt (%)	3.85	3.85	3.85	3.85
4) Actual Interest Expense ($)	606	606	606	606
5) Interest Expense Computed at Benchmark [(1)*(2)]	543	667	704	784
6) Estimated Interest Support at Benchmark Rate ($) [(5)-(4)]	NA	61	98	177

Notes: NA indicates that some of the cost of outstanding debt exceeds the benchmark interest rate. There is no subsidy when benchmark rates are less than the weighted cost of capital.
Sources: Bonneville Power Administration, 2010 and 2013 Annual Reports, Moody's Investors Service.

From FY 2010 to FY 2013 BPA added nearly a billion dollars of debt to its balance sheet. Nevertheless, due to favorable changes in interest rates, BPA's implied subsidy decreased across the range of IOU rates. In FY 2010, borrowing at a public utility rating of Aa rating would have cost BPA an additional $139 million (2013 dollars); an A rate would have cost BPA an additional $173 million (2013 dollars); and a Baa rating would have cost an additional $248 million (2013 dollars). In contrast, FY 2013 had lower support values compared to 2010. An Aa rate would have increased BPA's borrowing costs by $61 million (2013 dollars); an A rate by $98 million (2013 dollars); and a Baa rate by $177 million (2013 dollars).

The smaller Power Marketing Administrations

The three smaller PMAs are the WAPA, SEPA, and SWPA. Each is headed by an 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. The PMAs receive appropriations from the Treasury for most of their operations and maintenance expenses, as well as for capital expenditures. The former is expected to be paid off in the year it is received; the latter can be paid back with interest over the service life of the investment, for a period not to exceed 50 years.

Before 1983, the interest rate on the three smaller PMAs debt was set below prevailing Treasury rates. In 1983, DOE required the PMAs to pay a rate equal to the average Treasury yield during the previous fiscal year for new projects. According to an OMB study on PMA debt repayment, the Treasury has made a practice of borrowing money for the PMAs at 6 to 12 percent and accepting repayments on that debt at 2 to 4 percent. The PMAs are required to retire their high-cost debt first whenever possible, an

advantage unavailable to the Treasury itself.[63] This is another reason that the PMAs can realize an effective borrowing rate lower than the Treasury.[64]

The three PMAs' current interest expense was compared to what they would have paid had they borrowed at long-term Treasury rates or Aa, A, or Baa IOU rates. Depending on the comparative interest rate benchmarks, the three smaller PMAs received federal support ranging from $99 million (2013 dollars) if their debt were priced at an Aa rate to $160 million (2013 dollars) at the Baa rate in FY 2010 (see Table 21). This compares with estimated support at an Aa rate of $190 million (2013 dollars) and $251 million (in 2013 dollars) at the Baa rate in FY 2013. In addition, the three PMAs had a direct subsidy as compared to the Treasury rate of $17 million (2013 dollars) in FY 2010 and $124 million (2013 dollars) in FY 2013. This is due to the fact that their computed interest rate was below the Treasury rate.

Table 21. Estimate of federal electricity interest rate support to the three smaller PMAs Combined, FY 2010 and FY 2013

million 2013 dollars

Comparison Debt	Treasury Rate	Aa IOU Rate	A IOU Rate	Baa IOU Rate
FY 2010				
1) Benchmark Interest Rates (%)	4.25	5.22	5.45	5.95
2) Outstanding Debt ($)	8,413	8,413	8,413	8,413
3) Average Cost of Outstanding Debt (%)	4.05	4.05	4.05	4.05
4) Actual Interest Expense ($)	341	341	341	341
5) Interest Expense Computed at Benchmark [(1)*(2)]	358	439	458	501
6) Estimated Interest Support at Benchmark Rate ($) [(5)-(4)]	17	99	118	160
FY 2013				
1) Benchmark Interest Rates (%)	3.45	4.24	4.48	4.98
2) Outstanding Debt ($)	8,288	8,288	8,288	8,288
3) Average Cost of Outstanding Debt (%)	1.95	1.95	1.95	1.95
4) Actual Interest Expense ($)	161	161	161	161
5) Interest Expense Computed at Benchmark [(1)*(2)]	286	352	371	413
6) Estimated Interest Support at Benchmark Rate ($) [(5)-(4)]	124	190	209	251

Notes: NA indicates that some of the cost of outstanding debt exceeds the benchmark interest rate. There is no subsidy when benchmark rates are less than the weighted cost of capital.
Sources: 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.

In comparing the smaller PMAs for FY 2010 and FY 2013, it is important to note that, according to WAPA's Annual Report in 2013, a study conducted by the Bureau of Reclamation determined that a portion of WAPA's capital costs should be reallocated from the power function to protection of the Grand Canyon. The study indicated that $25.8 million of capital costs should be reallocated retroactive to FY 1993 and operation and maintenance costs totaling $10.1 million should be reallocated retroactive to FY 1999. This adjustment resulted in a reduction of interest payable to the U.S. Treasury of $137.0 million for FY 2013. If the $137 million were to be included in the FY 2013 interest payments, the weighted average cost of total debt for the three PMAs would have increased to approximately 3.60

[63] IOUs have the ability to issue callable bonds which allows them the same advantage. However, when a bond is called, typically the issuer of the bond pays the bondholder a premium above the par value of the bond.
[64] 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), p. 7.

percent, and the range of estimated interest subsidy at the benchmark interest rate would have ranged from an Aa value of $51 million to a Baa value of $110 million. These values would imply a lower subsidy in FY 2013 compared to FY 2010, which would be consistent with the RUS borrowers and other federal utilities. This result has minimal impact on the final results, since the total outstanding debt and interest expense of the three PMAs is a small portion when lumped in with the RUS borrowers and other federal utilities.

Summary

Table 22 below sums the long-term debt and interest expenses of RUS borrowers and federal utilities and calculates aggregate interest rate support, ranging from $84 million to $717 million in FY 2013, and $373 million (2013 dollars) to $1 billion (2013 dollars) in FY 2010.

The larger the spread between the IOU rate and the Treasury rate, the larger the value of implied federal support, all other things being equal. Because the difference between the market cost of financing energy projects and the 30-year Treasury rate was higher in FY 2010 than in FY 2013, and as RUS borrowers and federal utilities have moved to lower their effective long-term interest rates in the current low-rate environment, the report shows a higher implied subsidy in FY 2010 than in FY 2013. This is despite the fact that RUS borrowers and federal utilities expanded their total debt loads in that time period.

Table 22. Estimate of federal electricity interest rate support to RUS borrowers and federal utilities, FY 2010 and FY 2013

million 2013 dollars

Comparison Debt	Treasury Rate	Aa IOU Rate	A IOU Rate	Baa IOU Rate
FY 2010				
1) Benchmark Interest Rates (%)	4.25	5.22	5.45	5.95
2) Outstanding Debt ($)	85,790	85,790	85,790	85,790
3) Average Cost of Outstanding Debt (%)	4.78	4.78	4.78	4.78
4) Actual Interest Expense ($)	4,104	4,104	4,104	4,104
5) Interest Expense Computed at Benchmark [(1)*(2)]	3,646	4,477	4,674	5,106
6) Estimated Interest Support at Benchmark Rate ($) [(5)-(4)]	NA	373	570	1,002
FY 2013				
1) Benchmark Interest Rates (%)	3.45	4.24	4.48	4.98
2) Outstanding Debt ($)	85,444	85,444	85,444	85,444
3) Average Cost of Outstanding Debt (%)	4.14	4.14	4.14	4.14
4) Actual Interest Expense ($)	3,540	3,540	3,540	3,540
5) Interest Expense Computed at Benchmark [(1)*(2)]	2,948	3,625	3,825	4,257
6) Estimated Interest Support at Benchmark Rate ($) [(5)-(4)]	NA	84	285	717

Notes: NA indicates that some of the cost of outstanding debt exceeds the benchmark interest rate. There is no subsidy when benchmark rates are less than the weighted cost of capital.
Sources: 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.

Finally, an implied spread of the aggregate interest rate subsidy across fuels and electricity transmission was calculated. Using a large representative sample of the bond issues provided by Moody's credit service, a weighted average interest rate was estimated. This midpoint interest rate was 5.63 percent for FY 2010 and 4.65 percent for FY 2013. These interest rates were selected as representative of standard utilities and are not reflective of theoretical interest rates were the TVA/PMAs not federally supported utilities.

Next, despite the fact that TVA and the PMAs do not, in some cases, physically own generation facilities, their subsidies were divided up first between transmission/distribution and generation, and then generation was further broken down by fuel type. In most cases, the bulk of their subsidies went to transmission/distribution and hydroelectric support. The RUS Electricity Program provided detailed information between loans spent on transmission/distribution versus supply, but did not provide a detailed breakdown of their supply-based loans by fuel type. This breakdown was estimated using EIA's Form 860 survey data of the share of capacity by fuel type of rural utilities.

Table 23 below shows that the largest share of implied interest rate support was applied to the construction of transmission and distribution assets in both FY 2010 (29%) and FY 2013 (30%). The next-largest category based on assets is hydropower, followed by nuclear and then coal. It should be noted, however, that these breakouts do not fully reflect the mix of projects being financed by outstanding debts versus assets that are paid off.

Table 23. Estimate of federal electricity interest rate support to RUS borrowers and federal utilities using midpoint interest rate by fuel type, FY 2010 and FY 2013

million 2013 dollars

Estimated Interest Subsidy at Midpoint Interest Rate	FY 2010	FY 2013
Coal	100	30
Refined Coal	-	-
Natural Gas and Petroleum Liquids	77	-
Nuclear	144	109
Renewables	**189**	**176**
Biomass	-	-
Geothermal	-	-
Hydropower	181	171
Solar	-	-
Wind	1	-
Other	7	5
Electricity - Smart Grid and Transmission	**213**	**134**
Total	**723**	**449**

Sources: 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.

5. Loan Guarantee Programs

Introduction

This section describes energy-related loan guarantee programs and presents some estimates of the resulting subsidies. With the exception of RUS and the synthetic fuel program in the 1970s, energy-related explicit loan guarantee programs are relatively new federal interventions in energy financial markets when compared to other long-standing programs administered by federal agencies assisting in housing and education. A long-standing loan program example is the home loan guarantee program at the Department of Veterans Affairs.[65]

As Table 24 indicates, the size of federal credit programs in general has decreased slightly. Here, the dollar value of the additional loans agencies are authorized to issue in FY 2013 is used as the measure of volume. The total size of federal credit programs has more than doubled over the last nine years but has slightly decreased over the past three years.

DOE's initial loan guarantee program - Title 17, Section 1703 - was authorized by the EPAct2005, with the first guarantee issued in the fall of 2009.[66] With the enactment of the Energy Independence and Security Act of 2007, Congress added the Advanced Technology Vehicles Manufacturing Loan Program (ATVM), a direct loan program to support the development of advanced technology vehicles and associated components in the United States. In 2009, ARRA included provisions that established a new temporary program for the rapid deployment of renewable energy and electric power transmission projects under Title 17, Section 1705.

As in previous editions of this report, and consistent with the Federal Credit Reform Act of 1990, EIA assesses the "subsidy cost" of each DOE loan guarantee based on the year of loan initiation.[67] The three DOE loan programs did not execute any loans or guarantee any loans during FY 2013, so there is no subsidy activity to report for that year. Significantly, because the credit subsidy cost is accounted for as an upfront cost, the cost of defaulted loans not in excess of the implied credit reserve has already been accounted for in the year of initiation and is not directly accounted for in the year of default to avoid double-counting of costs. As indicated by "discontinued" on Table 25 below, a number of DOE loans have defaulted.

[65] The program was one of the major innovations and a most important part of the original Servicemen's Readjustment Act of 1944, Public Law 78-346.

[66] A conditional commitment to Solyndra, Inc. for a loan guarantee was offered under Title 1705, a temporary program for the rapid deployment of renewable energy and electric power transmission projects that was created by Section 406 of the American Recovery and Reinvestment Act of 2009, Public Law No. 111–5; http://www.energy.gov/lpo/about-us/history, accessed January 29, 2015.

[67] U.S. Energy Information Administration, *Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2010*, Washington, DC, 20585, July 2011, available at http://www.eia.gov/analysis/requests/subsidy/ and U.S. Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 2007*, DOE/EIA-SR/CNEAF/2001-01, Washington, DC, 20585, April 2008, available at http://www.eia.gov/oiaf/servicerpt/subsidy2/index.html.

Table 24. Additional lending authority for loan guarantee programs in selected federal government agencies, FYs 2004, 2010, and 2013

thousand nominal dollars

Selected Agency	FY 2004	FY 2010	FY 2013
Department of Agriculture excluding the Rural Utility Service	16,847,161	50,764,352	40,225,959
Department of Education	91,773,139	310,887,575	291,577,478
Department of Energy	0	47,367,293	25,651,789
Rural Utility Service: Electricity Program	3,989,410	7,100,000	4,742,000
Department of Housing and Urban Development	368,904,121	741,988,701	546,664,453
Department of Veteran Affairs	48,450,960	60,215,650	108,492,916
Department of Transportation	3,226,777	2,805,510	9,459,514
Small Business Administration	21,918,500	44,852,036	104,891,716
International Assistance programs	5,340,000	4,324,879	4,959,000
Total	**560,450,068**	**1,270,305,996**	**1,136,664,825**

Notes: In FY 2013, excluding the Rural Utility Service: Electricity Program, the Department of Agriculture's Rural Energy for America (formerly the Renewable Energy Systems and Energy Efficiency Improvements, and authorized under 7 U.S.C. 8106), Biorefinery Assistance programs, and Department of Transportation's Green Retrofit programs made less than 100 million in loans.
Sources: Office of Management and Budget, *Federal Credit Supplement, Budget of the United States Government*, Fiscal Years 2014, 2011, and 2005.

In FY 2010, EIA estimated a credit subsidy cost of $1.7 billion. The authority to enter into loan guarantees under Section 1705, a temporary program for the rapid deployment of renewable energy and electric power transmission projects, expired at the end of FY 2011. DOE's loan guarantee program announced in December 2014 $12.5-billion advanced nuclear energy loan guarantee solicitation which combined with open solicitations under Section 1703 and the ATVM loan program ($8 billion in advanced fossil energy projects, $4 billion in renewable energy and efficient energy projects, and $16-billion ATVM loan program) provides a total of $40 billion of loan guarantee authority.

Table 25. Characteristics and loan guarantee amounts for Department of Energy Loan Programs Office projects

million nominal dollars, unless otherwise specified

Beneficiary	Loan Program or Section of Title 17	Technology	Year of Agreement	Status	Loan Guarantee Amount
AREVA Enrichment Services, LLC	1703	Front-end Nuclear	2010	Conditional Commitment	2,000
Georgia Power Company (GPC), Oglethorpe Power Corporation (OPC), Municipal Electric Authority of Georgia (MEAG)	1703	Nuclear Generation	2010	Conditional Commitment	8,330
Abengoa Bioenergy Biomass of Kansas LLC	1705	Biofuel	2011	Closed	132
Stephentown Spindle (Beacon Power)	1705	Energy Storage	2010	Closed	43
Nevada Geothermal Power Company, Inc. (Blue Mountain)	1705	Geothermal	2011	Closed	99
Ormat Nevada, Inc.	1705	Geothermal	2011	Closed	350
US Geothermal, Inc.	1705	Geothermal	2011	Closed	97
Cogentrix of Alamosa, LLC	1705	Solar Generation	2011	Closed	90
Exelon (Antelope Valley Solar Ranch)	1705	Solar Generation	2011	Closed	646
Mesquite Solar 1, LLC (Sempra Mesquite)	1705	Solar Generation	2011	Closed	337
NextEra Energy Resources, LLC (Desert Sunlight)	1705	Solar Generation	2011	Closed	1,460
NRG Solar (California Valley Solar Ranch)	1705	Solar Generation	2011	Closed	1,237
NRG Solar, LLC (Agua Caliente)	1705	Solar Generation	2011	Closed	967
Abengoa Solar, Inc. (Mojave Solar)	1705	Solar Generation	2011	Closed	1,200
NextEra Energy Resources, LLC (Genesis Solar)	1705	Solar Generation	2011	Closed	852
SolarReserve, LLC (Crescent Dunes)	1705	Solar Generation	2011	Closed	737
NRG Energy, Inc. (BrightSource)	1705	Solar Generation	2011	Closed	1,600
Abengoa Solar, Inc. (Solana)	1705	Solar Generation	2010	Closed	1,446
1366 Technologies, Inc.	1705	Solar Manufacturing	2011	Closed	150
Abound Solar	1705	Solar Manufacturing	2010	Discontinued	400
Solyndra Inc.	1705	Solar Manufacturing	2009	Discontinued	535

Table 25. Characteristics and loan guarantee amounts for Department of Energy Loan Programs Office projects (cont.)

million nominal dollars, unless otherwise specified

Beneficiary	Loan Program or Section of Title 17	Technology	Year of Agreement	Status	Loan Guarantee Amount
LS Power Associates (ON Line - formerly known as SWIP-S)	1705	Transmission	2011	Closed	343
Granite Reliable	1705	Wind Generation	2011	Closed	169
Record Hill Wind	1705	Wind Generation	2011	Closed	102
Caithness Shepherds Flat	1705	Wind Generation	2010	Closed	1,300
Kahuku Wind Power (First Wind)	1705	Wind Generation	2010	Closed	117
The Vehicle Production Group LLC	ATVM		2011	Discontinued	50
Fisker Automotive	ATVM		2010	Discontinued	529
Nissan North America, Inc.	ATVM		2010	Closed	1,448
Tesla Motors	ATVM		2010	Closed	465
Ford Motor Company	ATVM		2009	Closed	5,907
Total					**33,138**

Notes: Totals may not equal sum of components due to independent rounding.
Source: U.S. Department of Energy, Loan Programs Office Projects, http://energy.gov/lpo/projects, accessed January 31, 2015.

Other energy-related loan guarantee programs

There are four other energy-related loan guarantee programs. The largest one is under the RUS, which was discussed in Section 4. The Rural Energy for America program provides loan guarantees to farmers, ranchers, and small rural businesses to purchase renewable energy systems and make energy-efficient improvements. The Biorefinery Assistance program provides loan guarantees to fund the development, construction, and retrofitting of commercial-size advanced biorefineries. Both of these programs are also in the Department of Agriculture. The last one is the Green Retrofit Program, which offers either grants or loans to owners of HUD's assisted multifamily housing properties in order to fund energy-efficient retrofits. As of 2013, excluding RUS, these programs have made less than $100 million in loans. Because they are so small, they are not considered in this analysis.

Appendix A. Request Letter

FRED UPTON, MICHIGAN
CHAIRMAN

HENRY A. WAXMAN, CALIFORNIA
RANKING MEMBER

ONE HUNDRED THIRTEENTH CONGRESS

Congress of the United States

House of Representatives

COMMITTEE ON ENERGY AND COMMERCE
2125 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–6115
Majority (202) 225–2927
Minority (202) 225–3641

September 15, 2014

The Honorable Adam Sieminski
Administrator
Energy Information Administration
U.S. Department of Energy
1000 Independence Ave., SW
Washington, D.C. 20585

Dear Administrator Sieminski:

This letter is to request an update to your reports entitled *Federal Financial Interventions and Subsidies in Energy Markets 2007* and *Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2010* with data for fiscal year 2013, which would provide a database with three year intervals. Fiscal year 2013 data should be readily available at this time. The information in these two reports has been used extensively by legislators and the public, providing a compendium of data on federal financial involvement in energy markets. An update using the same approach as the prior two reports would be very beneficial to Congress as policymakers seek to make informed, fiscally responsible decisions in support of policies that best utilize federal expenditures while eliminating wasteful and duplicative spending.

As in your prior reports, we are requesting that you provide a comparison of the overall annual cost of the subsidies in the electric power sector for each fuel type (oil, natural gas, coal, nuclear, wind, solar, geothermal, hydroelectric, and biomass). The scope of the study should focus on subsidies provided by the federal government that are energy specific and that provide a financial benefit with an identifiable federal budget impact. The analysis should include the following type of subsidies:

- Tax expenditures (deductions, credits, and loan guarantees),
- Direct expenditures (such as grants),
- Federal research and development programs targeting electricity and its fuel inputs, and
- Federal electricity programs including Power Marketing Administrations.

Please provide a detailed explanation in the report for any significant change to the amount or scope of a subsidy since the prior report.

Letter to The Honorable Adam Sieminski
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It would be most helpful if the updated report could be made available to Congress by January 31, 2015.

Sincerely,

Fred Upton
Chairman

Ed Whitfield
Chairman
Subcommittee on Energy and Power