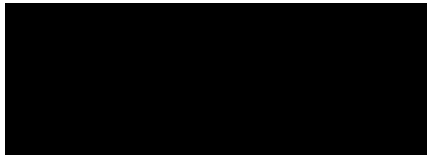


MEMORANDUM

May 16, 2011

To:



From:

omics, 7-7797

Subject: Energy Production by Source and Energy Tax Incentives

This memorandum responds to your request for an analysis of overall energy production relative to energy tax incentives available across energy sources. To complete this analysis, CRS has compiled data on primary energy production and the cost of energy-related tax provisions. Given time constraints, the analysis below has been confined to the broad categories of fossil fuels and renewables. Further, to provide this memorandum within the given time constraints, the analysis includes only federal tax incentives. Other types of federal financial support for energy, such as research and development (R&D) funding, are not included in the analysis below.

Energy Production

The Energy Information Administration (EIA) provides annual data on energy production. This memorandum uses EIA data on primary energy production in the analysis below. EIA defines primary energy as energy that exists in a naturally occurring form, before being converted into an end-use product. For example, coal is considered primary energy, which can be converted to synthetic gas and later electricity.¹

Table 1 provides data on U.S. primary energy production for 2009.² Coal and natural gas are the two largest primary energy production sources, representing 29.6% and 29.5% of primary energy production, respectively, in 2009. Crude oil constitutes 15.4% of primary energy production.³ Taken together, fossil energy sources were used for 77.9% of 2009 primary energy production (see **Table 2**).

¹ Definitions and data can be found in Energy Information Administration, *Annual Energy Review, 2010*, Washington, DC, August 19, 2010, <http://www.eia.doe.gov/totalenergy/data/annual/>.

² 2009 is the most recent year available. These figures are preliminary and may be subject to revision.

³ The figures for primary energy consumption differ from those for primary energy production. For example, while crude oil was the source for 15.4% of primary energy production in 2009, 37.3% of primary energy consumed was attributed to petroleum. Much of this difference reflects U.S. reliance on imported petroleum.

Table 1. Primary Energy Production by Source

2009

Source	Fossil Fuels				Nuclear	Renewable Energy				Total	
	Coal	Natural Gas	Crude Oil	Natural Gas Plant Liquids	Nuclear Electric	Hydro-Electric Power	Geothermal	Solar/PV	Wind		Biomass
Quadrillion Btu	21.6	21.5	11.2	2.5	8.3	2.7	0.4	0.1	0.7	3.9	73.0
Percent of Total	29.6%	29.5%	15.4%	3.5%	11.4%	3.7%	0.5%	0.1%	1.0%	5.3%	100%

Source: CRS analysis of data from Energy Information Administration, *Annual Energy Review, 2010*.

Notes: Rows may not sum due to rounding.

Table 2. Primary Energy Production: Fossil Fuels, Nuclear, and Renewables

2009

	Fossil Fuels	Nuclear	Renewable Energy	Total
Quadrillion Btu	56.9	8.3	7.8	73.0
Percent of Total	77.9%	11.4%	10.6%	100%

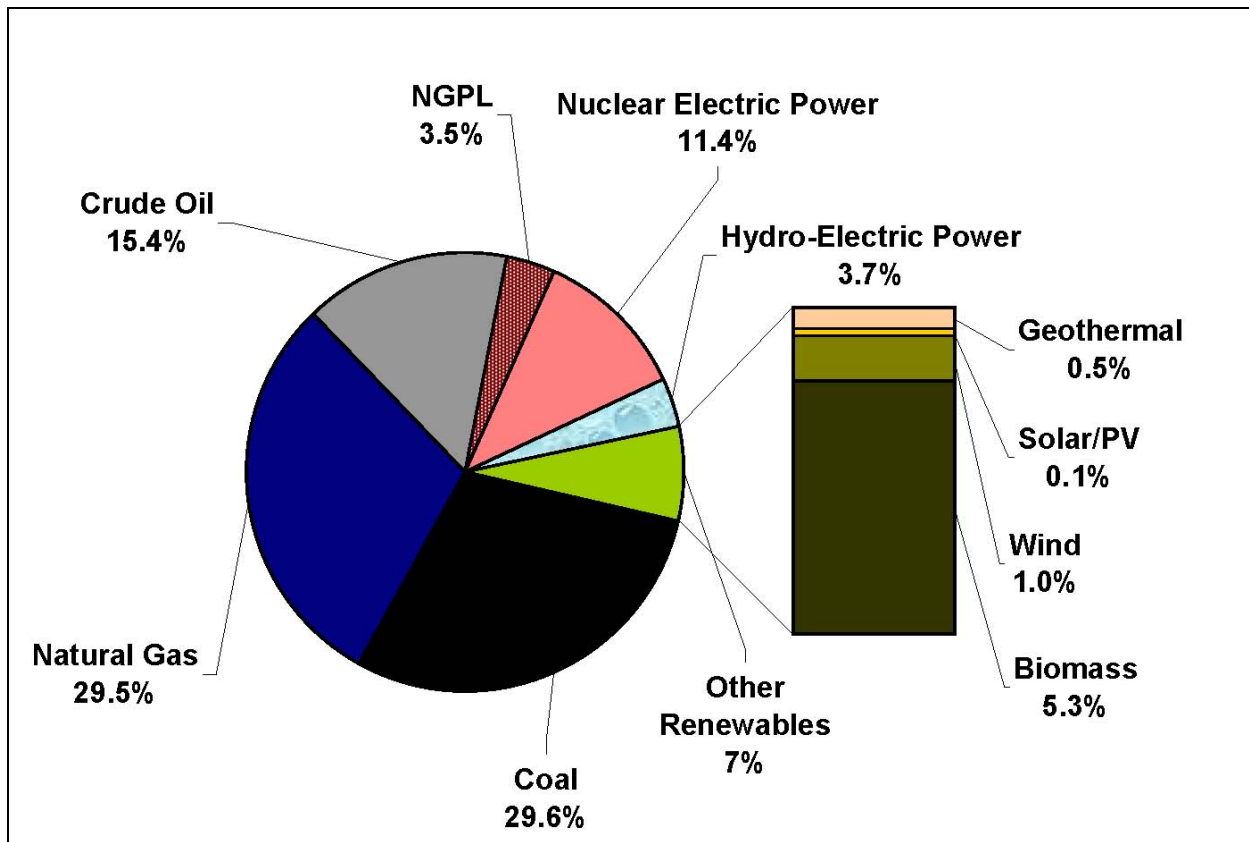
Source: CRS analysis of data from Energy Information Administration, *Annual Energy Review, 2010*.

Notes: Rows may not sum due to rounding.

The remaining U.S. primary energy production is attributable to nuclear electric and renewable energy resources. Overall, 11.4% of 2009 U.S. primary energy was produced as nuclear electric energy. Renewables constituted 10.6% of 2009 U.S. primary energy production (see **Table 2**). Biomass was the largest source of production amongst the renewables, accounting for 5.3% of overall primary energy production or approximately 50% of renewable energy production. This was followed by hydro-electric power at 3.7% of primary energy production. The remaining three resources, wind, geothermal, and solar were responsible for 1.0%, 0.5%, and 0.1% of 2009 primary energy production, respectively (see **Table 1**).

Figure 1 and **Figure 2** provide visual representations of the data presented in Table 1 and Table 2. Non-hydro renewable energy resources constituted approximately 7% of primary energy production in 2009 (see **Figure 1**). Of this, the majority was attributable to biomass.⁴

Figure 1. Primary Energy Production by Source
2009



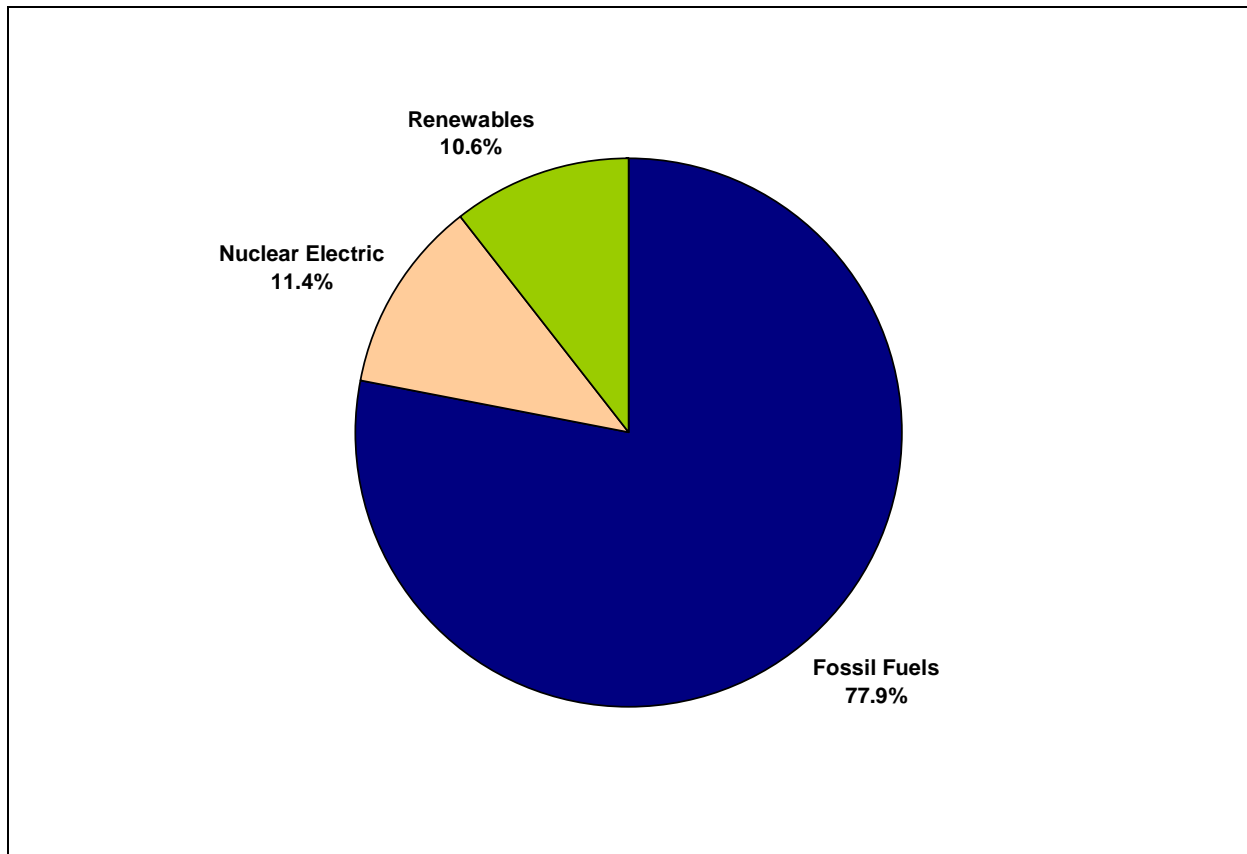
Source: CRS graphic using data from the Energy Information Administration, Annual Energy Review, 2010.

Notes: NGPL are Natural Gas Plant Liquids. Percentages may not sum to 100% due to rounding.

⁴ Biomass is an organic, nonfossil material of biological origin. Biomass waste can include landfill waste and agricultural crop byproducts. Biomass energy sources include biofuels (including ethanol), wood and wood-derived fuels, and other biomass waste.

Figure 2 illustrates the respective shares of energy production from fossil fuel, nuclear electric, and renewable energy sources. As was noted above, nearly 78% of U.S. primary energy production comes from fossil fuel sources, with the remainder split close to evenly between nuclear electric and renewable sources.

Figure 2. Primary Energy Production by Source Category
2009



Source: CRS graphic using data from the Energy Information Administration, *Annual Energy Review, 2010*.

Notes: Percentages may not sum to 100% due to rounding.

Energy Tax Incentives

The tax code supports the energy sector by providing a number of targeted tax incentives, or tax incentives only available for the energy industry. In addition to targeted tax incentives, the energy sector may also benefit from a number of broader tax provisions that are available for energy and non-energy related taxpayers.⁵ These broader tax incentives are not included in the analysis. The following section presents a list of energy-related tax provisions.

⁵ For example, oil and gas producers currently benefit from the Section 199 domestic production deduction. This incentive is available to all domestic manufacturers, and is specifically targeted towards the oil and gas sector.

Revenue Losses Associated with Energy-Related Tax Expenditures

Joint Committee on Taxation (JCT) tax expenditure estimates are used to tabulate federal revenue losses associated with energy tax provisions.⁶ The tax expenditure estimates provided by the JCT are forecasted revenue losses. These revenue losses are not re-estimated on the basis of actual economic conditions. Thus, revenue losses presented in this memorandum are projected, as opposed to actual revenue losses.

The JCT advises that individual tax expenditures cannot be simply summed to estimate the aggregate revenue loss from multiple tax provisions. This is because of interaction effects. When the revenue loss associated with a specific tax provision is estimated, the estimate is made assuming that there are no changes in other provisions or in taxpayer behavior. When individual tax expenditures are summed, the interaction effects may lead to different revenue loss estimates. Consequently, aggregate tax expenditure estimates, derived from summing the estimated revenue effects of individual tax expenditure provisions, are unlikely to reflect the actual change in federal receipts associated with removing various tax provisions.⁷ Thus, total tax expenditure figures presented below are an estimate of federal revenue losses associated with energy tax provisions, and should not be interpreted as actual federal revenue losses.

Table 2 provides information on revenue losses and outlays associated with energy-related tax provisions during 2009 and 2010.⁸ In 2009, the tax code provided an estimated \$19.9 billion in support for the energy sector. For 2010, the estimated amount of support was \$19.1 billion.

Table 3. Energy Tax Provisions: 2009 and 2010
(\$ billions)

Provision	2009	2010
Fossil Fuels		
Expensing of Exploration and Development Costs for Oil and Gas	0.3	0.7
Percentage Depletion for Oil and Gas	1.3	0.5
Amortization of Geological and Geophysical Costs for Oil and Gas Exploration	(i)	0.1
15-year Depreciation for Natural Gas Distribution Lines	0.1	0.1
Election to Expense 50% of Qualified Refinery Costs	0.5	0.7
Credit for Producing Fuels from a Non-Conventional Source	0.1	(i)
Amortization of Air Pollution Control Facilities	(i)	0.1
Credits for Investments in Clean Coal Facilities	0.2	0.2

⁶ The Congressional Budget and Impoundment Act of 1974 (the Budget Act; P.L. 93-344) defines tax expenditures as “revenue losses attributable to provisions of the 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 liability.” JCT is the official scorekeeper for Congressional budget purposes. The Treasury also provides a list of tax expenditures annually.

⁷ See CRS Report RL33641, *Tax Expenditures: Trends and Critiques*, by Thomas L. Hungerford and U.S. Congress, Senate Committee on the Budget, *Tax Expenditures: Compendium of Background Material on Individual Provisions*, committee print, prepared by Congressional Research Service, 111th Cong., 2nd sess., December 2010, [henceforth referenced as the “2010 Tax Expenditure Compendium”].

⁸ Energy-related tax provisions are those listed under the “Energy” heading in the Joint Committee on Taxation’s annual tax expenditure list. Although technically not tax expenditures, the cost associated with excise tax credits and outlays under the Section 1603 grants in lieu of tax credits program are also included in **Table 2**.

<i>Subtotal, Fossil Fuels</i>	2.5	2.4
Renewables		
Production Tax Credit (PTC)	1.3	1.4
Accelerated Depreciation for Renewable Energy Property	0.3	0.3
Section 1603 Grants in Lieu of Tax Credits ^a	1.1	4.2
Credit for Clean Renewable Energy Bonds (CREBs)	(i)	0.1
Residential Energy Efficient Property Credit	0.1	0.2
Credit for Investment in Advanced Energy Property	0.1	0.5
<i>Subtotal, Renewables</i>	2.9	6.7
Renewable Fuels		
Credits for Alcohol Fuels ^b	6.5	0.1
Excise Tax Credits for Alcohol Fuels ^a	5.2	5.7
Excise Tax Credits for Biodiesel ^a	0.8	0.5
<i>Subtotal, Renewable Fuels</i>	12.5	6.3
Efficiency & Conservation		
Energy Efficiency Improvements to Existing Homes	0.3	1.7
Credit for Production of Energy Efficient Appliances	0.1	0.2
Energy Efficient Commercial Building Deduction	0.1	0.2
<i>Subtotal, Efficiency & Conservation</i>	0.5	2.1
Alternative Technology Vehicles		
Credits for Alternative Technology Vehicles	0.5	0.8
Credit for Hybrid Vehicles	0.2	(i)
<i>Subtotal, Alternative Technology Vehicles</i>	0.7	0.8
Other		
Percentage Depletion for Other Fuels	0.2	0.2
15-year Depreciation for Electric Transmission Property	0.1	0.1
Exceptions for Publicly Traded Partnerships with Qualified Income from Energy-Related Activities	0.4	0.5
Exclusion of Interest on State and Local Private Activity Bonds for Energy Production Facilities	0.1	(i)
<i>Subtotal, Other</i>	0.8	0.8
Total	19.9	19.1

Source: Joint Committee on Taxation and the Department of the Treasury

Notes: (i) indicates a positive estimated revenue loss of less than \$50 million. Provisions with a revenue score of less than \$50 million during 2009 and 2010 are omitted from the table.

- a. The figures reported for the Section 1603 grants in lieu of tax credits and the excise tax credits for alcohol fuels and biodiesel and the are the outlays as reported in the President's FY2012 budget.
- b. The \$6.5 billion tax expenditure reported by the JCT for alcohol fuels is largely attributable to "black liquor" qualifying for a tax credit as an alternative fuel mixture. Black liquor is no longer eligible for federal tax incentives designed for alcohol fuels or biofuels.

Over the 2009-2010 period, the largest provision in terms of federal revenue loss is the excise tax credit for alcohol fuels.⁹ During 2009 and 2010 combined, \$10.9 billion was spent on tax credits for alcohol fuels. The excise tax credit for alcohol fuels was scheduled to expire at the end of 2010. The provision was recently extended through the end of 2011, in the Tax Relief, Unemployment Reauthorization, and Job Creation Act of 2010 (P.L. 111-312).

In 2010, 22% (\$4.2 billion) of tax-related support for energy was attributable to the Section 1603 Grants in Lieu of Tax Credit program.¹⁰ This program was initially established in the American Recovery and Reinvestment Act of 2009 (ARRA; P.L. 111-5), and was later extended as part of the Tax Relief, Unemployment Reauthorization, and Job Creation Act of 2010 (P.L. 111-312). Between 2009 and 2016, this provision is expected to result in an estimated \$23 billion in outlays.¹¹

Figure 3 compares estimated revenue losses associated with energy tax provisions by category for 2009.¹² Tax incentives for renewables (including renewable electricity and renewable fuels) constituted an estimated 76% of the estimated total revenue loss associated with energy tax provisions. Revenue losses associated with fossil fuels related tax incentives were an estimated \$2.5 billion, or 13% of the estimated sum of cost of energy tax incentives.

The data presented in **Figure 2** and **Figure 3** show that, while the majority of U.S. primary energy production comes from fossil energy resources, the majority of energy tax related revenue losses are associated with provisions designed to support renewables.

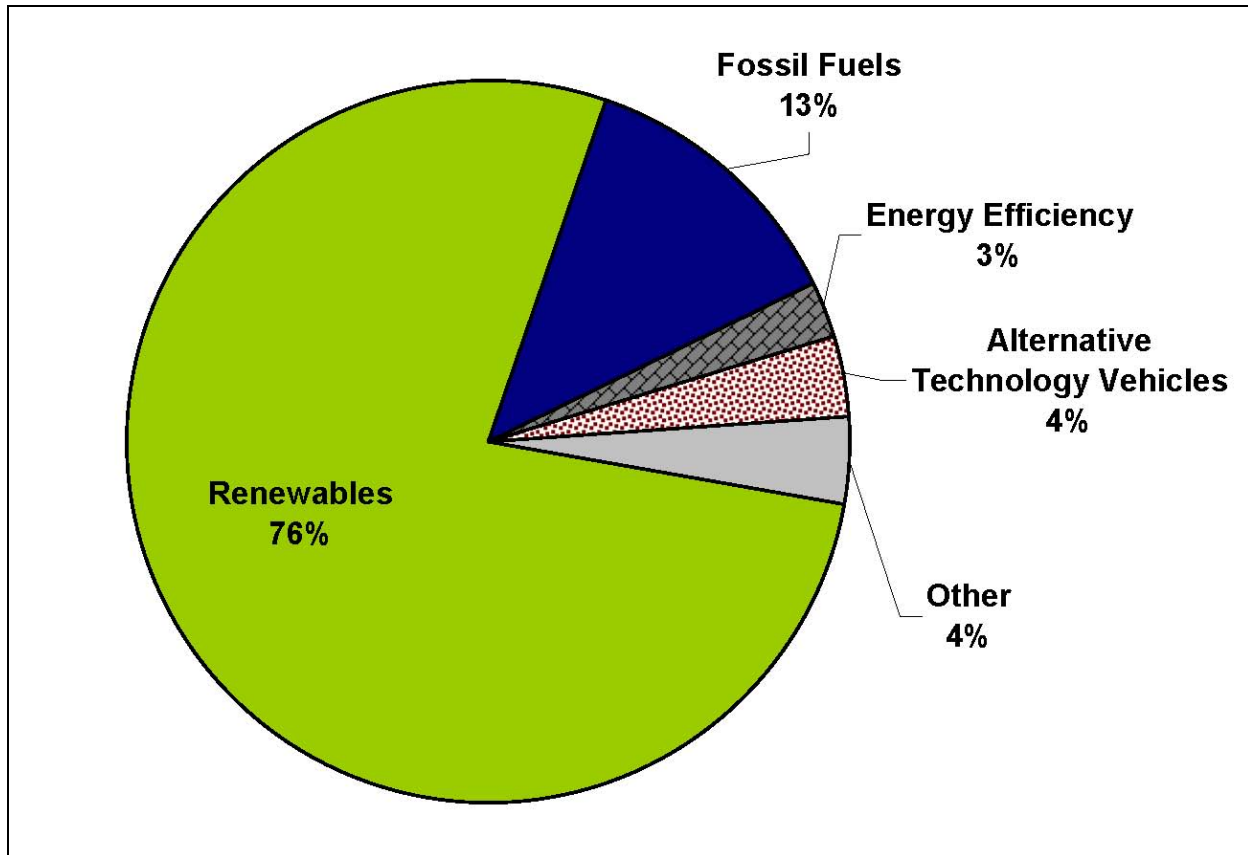
⁹ Most of the revenue loss here can be attributed to the Volumetric Ethanol Excise Tax Credit (VEETC).

¹⁰ For more information, CRS Report R41635, *ARRA Section 1603 Grants in Lieu of Tax Credits for Renewable Energy: Overview, Analysis, and Policy Options*, by Phillip Brown and Molly F. Sherlock.

¹¹ Unlike other tax provisions, the Section 1603 program involves outlays, as eligible recipients receive a grant directly from the Treasury. The President's FY2012 Budget reports estimated outlays for the Section 1603 Grants in Lieu of tax credits of \$19 billion for 2010 through 2016. The one-year extension passed as part of P.L. 111-312 added an estimated \$3 billion to the cost of the program.

¹² The remainder of the analysis uses data from 2009, as this is the most recent year for which primary source energy production data are available.

Figure 3. Tax Incentives by Category
2009



Source: CRS graphic using data presented in **Table 3**.

Table 4 provide a side-by-side comparison of fossil fuel and renewable production, along with the cost of tax incentives supporting the two types of energy resources. During 2009, 77.9% of U.S. primary energy production could be attributed to fossil fuel sources. Of the federal tax support targeted to energy in 2009, an estimated 12.6% of went towards supporting fossil fuels. During 2009, an 10.6% of U.S. primary source energy was produced using renewable resources. Of the federal tax support targeted to energy in 2009, an estimated 77.4% went towards supporting renewables.

The data in **Table 4** can be used to provide an estimate of federal tax support per million Btu produced using fossil fuel and renewable energy resources. For fossil fuels, given primary source production of 56.9 quadrillion Btu, and estimated tax incentives of \$2.5 billion, estimated federal support per million Btu during 2009 is \$0.04. For renewables, given primary source production of 7.8 quadrillion Btu, and estimated tax incentives of \$15.4 billion, estimated federal support per million Btu during 2009 is \$1.97.

Table 4. Comparing Energy Production and Energy Tax Incentives: Fossil Fuels and Renewables
2009

	Production		Tax Incentives	
	Quadrillion Btu	% of Total	Billions of Dollars	% of Total
Fossil Fuels	56.9	77.9%	\$2.5	12.6%
Renewables	7.8	10.6%	\$15.4	77.4%

Source: Data presented in **Table 2** and **Table 3** above.

Comparing tax related support for fossil fuels and renewables, broadly, does not provide information specific to which types of fuels receive the most federal support on a per Btu basis. Tax incentives for energy tend to support certain technologies within each category. For example, in the renewables category, electricity produced using wind power is likely to receive more tax support than electricity produced using hydroelectric, on a per unit of production basis.¹³

In recent years, revenue losses associated with specific energy tax related provisions have varied from year-to-year. During 2009, the Joint Committee on Taxation estimated substantial revenue losses associated with tax incentives for alcohol fuels. These revenue losses were attributable to “black liquor” being able to claim tax incentives designed for alternative fuels.¹⁴ As shown in **Table 3**, revenue losses associated with provisions for renewable fuels declined between 2009 and 2010. However, the cost of tax provisions providing incentives for renewable electricity increased, due to the Section 1603 grants in lieu of tax credits program. Overall, the estimated cost of federal tax provisions designed to support renewables declined by \$2.4 billion between 2009 and 2010, from \$15.4 billion to \$13.0 billion. As revenue loss estimates fluctuate from year to year, the value of tax incentives relative to electricity production by source will fluctuate correspondingly.

¹³ The Energy Information Administration (EIA) periodically publishes a study that provides a more detailed and comprehensive analysis of federal financial support for energy per unit of production across different energy resource categories. This study was last published in 2008, using 2007 data. See Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 2007*, Report #: SR/CNEAF/2008-01, Washington, DC, April 2008, <http://www.eia.doe.gov/oiaf/servicerpt/subsidy2/>.

¹⁴ For additional background, see CRS Report R41227, *Energy Tax Policy: Historical Perspectives on and Current Status of Energy Tax Expenditures*, by Molly F. Sherlock.