

**Estimating U.S. Government Subsidies to
Energy Sources: 2002-2008**

Environmental Law Institute

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EXECUTIVE SUMMARY

The current energy and climate debate would benefit from a broader understanding of the explicit and hidden government subsidies that affect energy use throughout the economy. In an effort to examine this issue, the Environmental Law Institute (ELI) conducted a review of fossil fuel and renewable energy subsidies for Fiscal Years 2002-2008. This paper and Appendix describe the approach used to identify and quantify the subsidies presented in the accompanying graphic. ELI researchers used a standardized methodology to calculate government expenditures. Where this methodology was lacking or did not apply, ELI researchers calculated subsidy values on a case-by-case basis.

Applying a conservative approach, explained in further detail below, ELI found that

- The vast majority of federal subsidies for fossil fuels and renewable energy supported energy sources that emit high levels of greenhouse gases when used as fuel.
- The federal government provided substantially larger subsidies to fossil fuels than to renewables. Subsidies to fossil fuels—a mature, developed industry that has enjoyed government support for many years—totaled approximately \$72 billion over the study period, representing a direct cost to taxpayers.
- Subsidies for renewable fuels, a relatively young and developing industry, totaled \$29 billion over the same period.
- Subsidies to fossil fuels generally increased over the study period (though they decreased in 2008), while funding for renewables increased but saw a precipitous drop in 2006-07 (though they increased in 2008).
- Most of the largest subsidies to fossil fuels were written into the U.S. Tax Code as permanent provisions. By comparison, many subsidies for renewables are time-limited initiatives implemented through energy bills, with expiration dates that limit their usefulness to the renewables industry.
- The vast majority of subsidy dollars to fossil fuels can be attributed to just a handful of tax breaks, such as the Foreign Tax Credit (\$15.3 billion) and the Credit for Production of Nonconventional Fuels (\$14.1 billion). The largest of these, the Foreign Tax Credit, applies to the overseas production of oil through an obscure provision of the Tax Code, which allows energy companies to claim a tax credit for payments that would normally receive less-beneficial tax treatment.
- Almost half of the subsidies for renewables are attributable to corn-based ethanol, the use of which, while decreasing American reliance on foreign oil, raises considerable questions about effects on climate.

The subsidies examined fall roughly into two categories: (1) foregone revenues, mostly in the form of tax expenditures (provisions in the U.S. Tax Code to reduce the tax liabilities of particular entities), and lost government revenue from offshore leasing (through the under-collection of royalty payments); and (2) direct spending, in the form of expenditures on research and development and other programs.

ELI applied the conventional definitions of fossil fuels and renewable energy: fossil fuels include petroleum and its byproducts, natural gas, and coal products, while renewable fuels include wind, solar, biofuels and biomass, hydropower, and geothermal energy production. Nuclear energy, which also falls outside the operating definition of fossil and renewable fuels, was not included. Although the graphic draws a general conclusion about the overall emissions profile of fossil fuels (high) versus renewables other than corn-derived ethanol (low), the study did not identify the precise greenhouse gas emission profile of these fuels. Nor did it analyze other environmental effects of fossil fuel and renewable energy subsidies. ELI examined only fuel-specific subsidies, not those that are available to all industries.

As explained in further detail in this paper, the analysis does not include

- energy efficiency measures;
- non-fuel-specific transportation spending (on either roads or vehicles);
- non-fuel-specific subsidies to the electricity sector;
- the subsidizing effects of regulatory or procurement standards; and
- other measures that either are not fuel-specific or do not affect the federal budget.

Several limitations should be noted. The study, which calculates subsidies in aggregate fiscal terms, does not seek to determine how these subsidies affect energy production or consumption, or whether they ultimately benefit consumers or industry. Such an assessment requires a considerably more complex level of analysis, one that exceeds the scope of this study.

The study also does not offer normative judgments about these subsidies. That is, the identification of fuel-specific subsidies does not constitute a recommendation that each one of these subsidies be phased out, but is simply intended to show how federal tax dollars support fossil fuel and renewable energy production and use. For example (and as explained further below), the value of fossil fuel subsidies generated by the Low-Income Home Energy Assistance Program (LIHEAP) was calculated, although providing heating assistance for low-income households may be a worthwhile policy goal. Similarly, the study counts funds used to support carbon capture and storage programs¹ as a fossil fuel subsidy, despite their potential to reduce the emissions associated with burning coal. This is because carbon capture and storage expenditures, consistent with the definition above, are directed at the fossil fuel sector. On the renewable side, subsidies to corn ethanol were tallied as a renewable fuel subsidy, although whether the production of corn-based ethanol constitutes a net subtraction of greenhouse gas emissions has been subject to significant debate.²

The paper describes in further detail the methods used to identify and quantify the subsidies presented in the accompanying graphic.

¹ Carbon capture and storage is a developing technology that would allow coal-burning utilities to capture and store their carbon dioxide emissions. While decreasing a plant's efficiency, this technology would also reduce greenhouse gas emissions compared to coal plants that do not use the technology, or those using oil or natural gas to generate electricity.

² Recognizing that the production and use of corn-based ethanol may generate significant greenhouse gas emissions, the data depict renewable subsidies both with and without ethanol subsidies.

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Introduction

This study examines fossil fuel (petroleum, natural gas, and coal products) and renewable energy (wind, solar, hydropower, ethanol, and geothermal) subsidies. The study's definition of subsidies focuses on actions by the U.S. government that provide an identifiable financial benefit associated with the use or production of a fossil or renewable fuel. Potential beneficiaries may include manufacturers, supply chains, workers, and consumers within a fuel sector. The study takes into account taxes, fees, and other government levies on these fuel sources that served to increase government revenues. If these levies supported services beneficial to the fuel sector from which they were raised, they were not counted against subsidy amounts (otherwise known as offsetting). Where researchers identified government levies that did not support specific fuel sectors, however, these amounts were subtracted from the gross subsidy amount to produce net government expenditure figures.

The study measures subsidy value through the cost of a subsidy to the government, rather than through its value to the recipient; the latter requires a more difficult and less reliable approach. The subsidy values are presented as absolute sums, rather than by unit of production (e.g., "X dollars per megawatt of coal energy"). Researchers did not employ a unit-of-measurement approach because the study did not seek to determine the effects of the subsidies examined.

Researchers chose to use a recent seven-year timeframe (FY 2002-2008), in order to show general subsidy trends over a period of time. This timeframe includes all policies in effect at any time during the seven-year period. These data are not intended to illustrate a present-date "snapshot" of expenditure levels, but to demonstrate historic spending levels over a representative time period that includes economic downturns, upswings, and shifts in policy over time (e.g., changes brought about by the Energy Policy Act of 2005).

Rather than establishing a *de minimis* cut-off, in all cases the study includes the most accurate quantitative data available. In the case of foregone revenues calculations, estimates are generally rounded to the nearest \$1 million.

The study employs a definition of subsidies that is narrower than the universe of energy-related policies. Part III lists categories of government actions or policies that do not fall under the study's definition, even though they may have a financial impact on specific energy sources. The Appendix discusses the sources used to quantify the subsidy amounts.

I. Fossil Fuels (\$72,473 million)

This section lists and describes the items that researchers counted as subsidies to fossil fuels. It is broken down into two main components: a) tax expenditures and other foregone revenues, and b) direct expenditures. The individual provisions are presented in order of magnitude, followed by more detailed explanations of certain expenditures and programs whose quantification required additional steps. The section also lists specific items that were not counted as subsidies to fossil fuels.

The numbers presented are in millions of dollars, spanning the entire study period (FY 2002-2008).

a. Tax Expenditures and Other Foregone Revenues (\$54,164)

“Tax expenditures,” also known as tax breaks, are provisions in the Internal Revenue Code (IRC) that Congress has enacted to benefit a specific sector or segment of society. Because tax expenditures represent foregone government revenues, they are counted as a cost to government. Both the Joint Committee on Taxation (JCT) within Congress and the Office of Management and Budget (OMB) within the Executive Branch provide annual estimates of lost government revenue due to tax expenditures. The study relied primarily on these sources for the numbers presented below.

a.1. All fossil fuel tax expenditures

Foreign Tax Credit (\$15,300) - IRC Section 901. This is a generally applicable credit that is intended to enable taxpayers earning income or profits abroad to avoid double taxation. Special rules under this provision allow characterization of royalty payments to foreign governments as corporate income taxes, which have provided special benefits to oil and gas producers. IRC Section 907 imposes limitations on those benefits but does not eliminate them. See box at the end of this section for further details.

Credit for Production of Nonconventional Fuels (\$14,097)- IRC Section 45K. This provision provides a tax credit for the production of certain fuels. Qualifying fuels include: oil from shale, tar sands; gas from geopressurized brine, Devonian shale, coal seams, tight formations, biomass, and coal-based synthetic fuels. This credit has historically primarily benefited coal producers.

Oil and Gas Exploration & Development Expensing (\$7,100)- IRC Section 617. Intangible Drilling Costs (IDC) (for example, wages, costs of machinery, or unsalvageable materials) may be deducted as business expenses rather than amortized. Integrated oil companies may deduct only 70 percent and must amortize the remainder.

Oil and Gas Excess Percentage over Cost Depletion (\$5,441)- IRC Section 613. Independent producers and royalty owners can deduct 15 percent of gross income earned from qualifying oil, gas, and oil shale deposits.

Credit for Enhanced Oil Recovery Costs (\$1,575) - IRC Section 43. This tax credit is available for hydrocarbon-based tertiary injectant methods defined by IRC Section 193.

Characterizing Coal Royalty Payments as Capital Gains (\$986) - IRC Section 631(c). Income from the sale of coal under royalty contract may be treated as a capital gain rather than ordinary income for qualifying individuals.

Exclusion of Benefit Payments to Disabled Miners (\$438) - 30 U.S.C. 922(c). Disability payments out of the Black Lung Disability Trust Fund are not treated as income to the recipients.

Exclusion of Alternative Fuels from Fuel Excise Tax (\$343) - IRC Section 6426(d). This section applies to liquefied petroleum gas (LPG), P-series fuels (defined at 42 U.S.C. 13211(2)), compressed

natural gas (CNG), liquefied natural gas (LNG), liquefied hydrogen,³ liquid coal, and liquid hydrocarbon from biomass.

Other-Fuel Exploration & Development Expensing (§342) - IRC Section 617. Identical provisions as applied to oil and gas (above). Including, for example, the costs of surface stripping, and construction of shafts and tunnels.

Other-Fuel Excess of Percentage over Cost Depletion (§323)- IRC Section 613. Taxpayers may deduct 10 percent of gross income from coal production.

Deduction for Clean Fuel Vehicles and Refueling Property-Fossil Fuels (§209) - IRC Section 179A. This deduction is equal to the cost of property with certain limitations. Qualifying fuels: natural gas, LNG, LPG, hydrogen, electric, E85, methanol, and other alcohol fuels. Amounts were prorated between fossil fuels and renewables (see Section II, below).

Exception from Passive Loss Limitations for Oil and Gas (§190) - IRC Section 469(c)(3). Owners of working interests in oil and gas properties may aggregate negative taxable income from qualifying sources with all other income sources.

Credit for Clean Coal Investment (§186)- IRC Sections 48A and 48B. Available for 20 percent of the basis of integrated gasification combined cycle property and 15 percent of the basis for other advanced coal-based generation technologies.

Expensing Liquid Fuel Refineries (§164) - IRC Section 179C. This deduction is available to refiners of crude oil and other fuels defined at IRC Section 45K(c) (above).

Special Rules for Mining Reclamation Reserves (§159) - IRC Section 468. This deduction is available for early payments into reserve trusts, with eligibility determined by the Surface Mining Control and Reclamation Act and the Solid Waste Management Act. The amounts attributable to mines rather than solid-waste facilities are conservatively assumed to be one-half of the total.

Natural Gas Distribution Lines Treated as Fifteen-Year Modified Accelerated Cost Recovery System (MACRS) Property (§138) - IRC Section 168(e)(3)(E)(viii). The normally applicable depreciation period is shortened for qualifying natural gas distribution lines.

Sulfur Regulatory Compliance Incentives for Small Diesel Refiners (Combined) (§109)- IRC Sections 179B and 45H. This tax credit is available for fuel that complies with EPA Highway Diesel Fuel Sulfur Control Requirements. Small refiners may claim a current-year deduction in lieu of depreciation for up to 75 percent of associated capital costs.

³ Although hydrogen is often thought of as a renewable fuel, 96% of hydrogen is produced from natural gas, petroleum, and coal. The remaining 4% is produced through an energy-intensive water electrolysis process. See National Hydrogen Association, Frequently Asked Questions, <http://www.hydrogenassociation.org/general/faqs.aspx#howmuchproduced> (last visited Sept. 17, 2009).

84-month Amortization Period for Coal Pollution Control (§102) - IRC Section 169(d)(5). Extends the amortization period used in calculating the deduction from the generally applicable 60-month period available for other types of pollution control facilities.

Expensing Advanced Mine Safety Equipment (§32) - IRC Section 179E. The costs of qualifying mine safety equipment may be expensed rather than recovered through depreciation.

Credit for Clean Fuel Vehicles and Refueling Property-Fossil Fuels (§14)- IRC Section 30C. This tax credit is available for up to 30 percent of the cost of the property. Qualifying fuels include: E85, natural gas, LNG, CNG, LPG, hydrogen, and 20 percent biodiesel. Amounts were prorated between fossil fuels and biofuels (above).

Natural Gas Gathering Lines Treated as Seven-year Property with Alternative Minimum Tax (AMT) Relief (§6) - IRC Section 168(e)(3)(C)(iv). Depreciation period shortened for qualifying natural gas gathering lines.

Natural Gas Arbitrage Exemption (§6) - IRC Section 148(b)(4). This provision excludes prepayments under qualified natural gas supply contracts from the definition of “investment-type property,” creating an exception to the general rule that tax-exempt bonds do not include bond issues used to obtain higher-yielding investments.

Amortization of Oil and Gas Geological and Geophysical Costs (-\$145) - IRC Section 167(h). This provision allows a shortened depreciation period of two years for non-integrated oil companies and seven years for integrated companies.

a.2. Foreign Tax Credit & Reduced Government Take from Federal Oil and Gas Leasing

Foreign Tax Credit (§15,300)

The Foreign Tax Credit (IRC Section 901) is available generally to all U.S. taxpayers, both corporate and individual. When a taxpayer has earned income abroad subject to another country’s income tax, it may take a tax credit on its U.S. taxes equal to the amount it paid in foreign taxes (i.e. the income taxes due to the United States are reduced by the amount paid to the foreign government). The policy rationale behind this is to avoid double taxation of those taxpayers. There are several limitations on this general rule discussed below.

In addition to taxes, oil and gas producers pay royalties to the owners of oil or gas deposits based on a percentage of revenues. In many countries, the resource owner is the government itself. These payments to governments are technically not a form of taxation but rather compensation to the owner of oil and gas resources for the “specific economic benefit” gained from extracting these resources. Typically, oil, gas, and other resource-extracting industries take a tax deduction for royalty payments to resources owners, including foreign governments, as a business expense. In general, foreign taxes are creditable, but royalty payments to foreign governments are only deductible. Tax credits are more valuable than deductions because they reduce taxes dollar-for-dollar, whereas deductions reduce the amount of income subject to tax and are thus valued at the marginal tax rate of the taxpayer, generally 35 percent for the period of this study.

In the early 1950s, at the suggestion of the State Department, several countries with state-owned oil and gas resources began reclassifying royalty payments from U.S. oil and gas companies operating in their countries as income taxes. The U.S. government allowed oil companies to claim these payments as a foreign income tax credit, despite the fact that it was an accounting fiction – one made all the more obvious by the fact that these countries charged far lower, if any, income taxes on non-oil and gas businesses. This in effect transferred tax revenues from oil and gas profits from the U.S. Treasury to foreign governments.⁴

In the wake of the oil crises of the 1970s, Congress imposed restrictions on the ability of oil companies to use the credit in this way. Section 907(a) of the IRC limits the credit available for “foreign oil and gas extraction income” to the amount of tax that would be imposed on that income by the U.S. Tax Code (generally 35% during the study period; see IRC Section 11(b)). Amounts of foreign taxes that exceed this limitation can be carried back one year or forward ten years for use in years when the Section 907(a) limitation is not reached.⁵ This limitation, however, does not halt the practice of taking a credit for royalties-disguised-as-taxes that exceed generally applicable tax rates up to the 35% limitation. The carry-forward and carry-back provisions also reduce the effect of the limitation.

The IRS also has the potential to end this practice through rules governing “dual-capacity taxpayers.” The IRS recognizes that certain foreign “levies” or portions of such levies are not taxes, but rather are imposed as compensation for the sale of “specific economic benefits” (e.g., royalty payments for government-owned oil and gas). Oil companies subject to a levy that is both a form of general taxation and a fee or charge for a specific economic benefit are known as “dual capacity taxpayers.”⁶ However, the IRS and U.S. courts have interpreted the rules governing these entities in such a way that it is still possible for oil companies to take advantage of the credit in ways that greatly exceed generally applicable foreign corporate income tax rates.⁷

Major oil-producing countries continue to direct higher tax rates at oil and gas extraction income. Generally speaking, the tax rates imposed by those countries on oil and gas income are 10-60% higher than the generally applicable tax rate. In Saudi Arabia, for example, the income tax on oil and gas extraction income is 85%, while the non-petroleum tax rate is 20%. In Nigeria, the petroleum tax rate is 85%, while the generally applicable rate is 30%. In the United Arab Emirates, the petroleum tax rate ranges from 55-85%, while the general rate is 20%.⁸ An analysis of corporate income tax rates in countries listed in IRS statistical tables related to the FTC confirms an average (weighted by oil and gas extraction income by country) generally-applicable corporate tax rate of

⁴ See DANIEL YERGIN, *THE PRIZE: THE EPIC QUEST FOR OIL, MONEY, AND POWER* 427-31 (1992). Although the beneficiary of this arrangement may be the foreign country rather than an oil or gas company itself, the provision still fits within this study’s definition of a fuel-sector-specific government expenditure because the country receiving the benefit does so based on its character as an oil- or gas-producing state.

⁵ Joint Comm. on Taxation (JCT), *General Explanation of Tax Legislation in the 110th Congress* 359 (2009).

⁶ See Treas. Reg. 1.901-2A (dual capacity taxpayers).

⁷ See *Phillips Petroleum Co. v. Comm’n*, 104 T.C. 256 (1995) (Norwegian tax imposed only on oil producers available for credit because not for a specific economic benefit); Martin M. Van Brauman, *Federal Tax Considerations in Foreign Oil and Gas Operations by Domestic Oil Companies*, 9 J. NAT. RESOURCES & ENVTL. L. 31, 59 (1994) (noting that under Treasury Regulation 1.901-2A, levies must be different in kind and not just degree from levies on other entities to be disqualified from treatment as a tax in lieu of an income tax).

⁸ In a non-exhaustive survey, differential rates were also found in Thailand, Malaysia, Venezuela, Kazakhstan, Algeria, Angola, Vietnam, Ireland, and Papua New Guinea.

28.9%, a 6.1 point lower rate than the U.S. rate of 35%. The subsidy is the difference between 28.9% and 35%, which is the limitation on the tax credit imposed by Section 907.

Because neither JCT nor OMB scores the Foreign Tax Credit by fuel sector, ELI used available data to calculate an approximate value for that portion of the tax credit taken on foreign oil and gas taxes attributable to disguised royalties.

Based on global data for the years 1990-2005, compiled from Form 1118, Schedule I, “Reduction of Oil and Gas Extraction Taxes,” and tabulated by the Statistics of Income Division within IRS, researchers made the following calculation:

$$X = .65(Y(6.1/35))$$

Where:

- X equals estimated revenue losses to the federal government in a given year;
- Y equals the tax credit taken by all taxpayers claiming a credit for foreign taxes paid on oil and gas extraction income. This is derived by taking the global total of all taxes paid or accrued on foreign oil and gas income for that year (reported by each taxpayer to the IRS at Form 1118, Schedule I, Column 14), minus the reduction in credit imposed by the Section 907 limitation for that year (reported at Form 1118, Schedule I, Part II, Line 6);
- (6.1/35) represents the global difference between generally applicable corporate income tax rates in oil producing countries and the maximum U.S. corporate income tax rate of 35%;
- (.65) is an offsetting multiplier to represent the fact that were the foreign taxes correctly treated as royalties, they would be available for deduction as a business expense, and this deduction is worth 35% (i.e., the U.S. tax rate under Section 11(b)) of the total credit amount.

Example A (current law): Company A has \$1200 in oil extraction income in Country Q. Country Q imposes a 28.9% generally applicable corporate income tax. Country Q imposes a special 50% tax on oil income. Company A pays \$600 in taxes to Country Q. It seeks and receives a tax credit from the U.S. of \$420 (35% of income). Company A holds the remaining \$180 for credit up to 10 years in the future.

Example B (royalties isolated from taxes): Company A has \$1200 in oil extraction income in Country Q. Country Q imposes a 28.9% generally applicable corporate income tax. Country Q imposes a special 50% tax on oil income and no royalty. Company A pays \$600 in “taxes” to Country Q, of which 21.2% is treated as a royalty payment. It seeks and receives a tax credit from the U.S. of \$346.80 (28.9% of income). The difference between \$420 and \$346.80 or \$73.20 is taken as a deduction (\$73.20 off gross income).

The lost government revenue from Example B to Example A is the difference between the \$420 credit and the \$346.80 credit (\$73.20), less the value of the deduction on that difference (.65(\$73.20) = \$47.58).

Because the data set only covered 1990-2005, researchers extrapolated data for 2006-2008 using a regression analysis based on the relationship between the known tax data and average annual world crude prices for those years, which strongly correlated over the 15-year time period. Based on these calculations, the total loss of revenue to the U.S. government resulting from these tax rules during the study period, adjusted to present value, is approximately \$15.3 billion.

For comparison, the Obama Administration has proposed a new rule for dual-capacity taxpayers such as oil and gas companies that “would treat a foreign levy that would otherwise qualify as an income tax . . . as a creditable tax only if the foreign country generally imposes an income tax.”⁹ This is a partial restriction that would have no impact on the practice in the majority of countries that do impose a general corporate income tax at a lower rate than that applied to oil and gas income. The Treasury estimates this proposal would raise an additional \$4.49 billion over the 2010-2019 period.¹⁰

Reduced Government Take from Federal Oil and Gas Leasing (\$7,049)

The federal government owns extensive tracts of land that it leases to the public for mineral extraction. The laws governing federal leasing, such as the Federal Land Management Policy Act and the Outer Continental Shelf Lands Act, generally require the agencies that manage these lands to secure a “fair market value” return for the taxpayers who ultimately own them.¹¹ Revenues come in the form of high bids from lease auctions, rents, bonuses, royalties, taxes, and other associated fees. These revenue streams are referred to collectively as the “government take” from the leases. Notwithstanding the general policy of obtaining fair market value, Congress has enacted a number of programs to promote production on federal leases, such as the Deep Water Royalty Act of 1995, that have the effect of reducing government revenues on those leases.

Because offshore leases are where the largest relief measures are directed, ELI chose to look at these leases alone and did not calculate losses associated with federal onshore leasing practices.¹² Calculating the extent to which these policies have reduced revenues to the government, and thus are a “cost to government” that constitutes a fuel subsidy under the study’s definition, presents difficult questions of economic theory. Previous studies have pointed out that government take will vary with market trends, production volumes, and lease bidding, and these in turn are influenced by the terms of leases (e.g., favorable royalty relief provisions might cause higher bidding at lease auctions).¹³ The study’s calculation of this subsidy relies on methodology developed by the GAO in a 2007 report that expresses the government’s take as a percentage of total lease revenues and

⁹ Dep’t of Treasury, *General Explanations of the Administration’s Fiscal Year 2010 Revenue Proposals* 39 (May 2009).

¹⁰ *Id.* at 128, tbl. 1.

¹¹ *See, e.g.*, 43 U.S.C. § 1353.

¹² Onshore leases have benefited less from officially sanctioned relief policies than from poor government management and oversight. *See* U.S. Dep’t of Interior, Office of Inspector General, *Evaluation, Oil and Gas Production on Federal Leases: No Simple Answers* (Feb. 2009). This study does not count losses attributable to poor governance as subsidies.

¹³ *See* Energy Information Admin. (EIA), Office of Oil and Gas, *Overview of the Federal Offshore Royalty Relief Program* (2006) (citing MMS report that royalty relief generated \$2 billion gross in increased bidding).

compares that percentage with other governmental leasing systems around the world.¹⁴ The GAO report summarizes the findings of eight separate studies, conducted by the oil and gas industry, private consulting firms, and the government itself from 1997 to 2006, each of which ranked the federal offshore leasing system near or at the bottom of every list for government take. The GAO has concluded that “the U.S. federal government receives one of the lowest government takes in the world,” and that the Gulf of Mexico, where most U.S. offshore drilling is located, is a particularly “favorable place to invest.”

The study defines the baseline government take rate as the non-weighted average of government take percentages of all systems located in OECD countries included in the 2007 GAO report’s tables. (Non-OECD countries have even higher takes, generally in the 60-80% range, but differing economic conditions make these a poor comparison with the U.S.). Researchers then calculated the U.S. federal offshore take as the average of deepwater and shallow-water takes calculated by the Minerals Management Service (MMS) in a 2006 study.¹⁵ These averages generated percentages of 50.3 and 46.5, respectively, producing a differential of 3.8 points. Because a higher government take on these leases would likely discourage leasing and production activity on them, the study offset the amount of potential revenues that could be gained by the reduction in revenues associated with lower bidding and production volumes. These losses were calculated as approximately 18% of the gain, based on a 2006 MMS estimate that an increase in royalty rates on certain offshore leases by 4.17 percentage points would generate \$4.5 billion in new revenues and cause \$820 million in losses to the government over 20 years ($\$820 / \$4500 = 18\%$). The final figure was calculated by taking 3.8% of total revenues generated by federal offshore leases (as reported by the Minerals Revenue Management Service (MRM) for the study period (FY2002-FY2008)¹⁶), reducing that figure by 18% to account for losses, and then adjusting to present value.

a. Grants and Other Direct Payments (\$18,309)

This section describes selected direct expenditures by the federal government on fossil fuel-specific energy sources. More detail about programmatic spending on fossil fuels by the Department of Energy and Department of Agriculture is included in the Appendix.

LIHEAP (\$6,358)

The Low Income Home Energy Assistance Program (LIHEAP) allocates block grants to states so they can provide low-income households with energy assistance. In a typical year, over half of the funds are used to assist with heating costs, while remaining funds are used to assist with cooling costs, state leveraging and outreach programs, and weatherization efforts. The federal funds are distributed among the states primarily according to the percentage of low-income energy costs

¹⁴ Gov. Accountability Office (GAO), *Oil and Gas Royalties: A Comparison of the Share of Revenue Received from Oil and Gas Production by the Federal Government and other Resource Owners*, GAO-07-676R (May 1, 2007).

¹⁵ A review of EIA data for the Gulf of Mexico indicates a rough parity in production volumes between shallow water and deepwater leases (with natural gas production higher in shallow waters than deep but vice-versa for crude oil), making volumetric adjustment of this average unnecessary. See EIA, Gulf of Mexico Federal Offshore Production, http://tonto.eia.doe.gov/dnav/ng/ng_prod_deep_sl_a.htm (last visited Sept. 17, 2009).

¹⁶ MRM, Total Federal Offshore Reported Royalty Revenue Volumes, <http://www.mrm.mms.gov/MRMWebStats/FedOffReportedRoyaltyRevenues.aspx?yeartype=FY&year=2008&dateType=AY> (last visited Sept. 17, 2009).

found within each state.¹⁷ Historically, this means that the highest level of funding has been allocated to certain Northeastern and Midwestern states, whose residents use more home energy to keep warm during the winter. Preliminary eligibility for state LIHEAP programs is determined by income, with roughly 15% of eligible households ultimately receiving aid. LIHEAP covers less than 10% of the total winter heating costs of all federally eligible households, with an average benefit per recipient household in 2005 of just over \$300.¹⁸ Between FY 2002-2008, total federal LIHEAP appropriations ranged from \$1.8-\$3.1 billion; subtracting the funds allocated for weatherization, leveraging, and Residential Energy Assistance Challenge (REACH) Option programs generates an approximate amount of \$1.6-\$2.1 billion annually, for a starting base of \$12.3 billion during the study period.

The purpose of LIHEAP is to prevent home energy shut-offs, rather than to intervene in energy markets. However, the basic structure of the program is to provide low-income households with the means to make their utility payments, the vast majority of which cover the cost of energy generated by fossil fuels. Under the study methodology, this qualifies as a “cost to government” associated with energy production or use. The EIA report (2007) calculates the lump sum of LIHEAP appropriations, but does not treat these as an electricity- or fuel-specific subsidy, noting that the major forms of energy affected are No. 2 fuel oil, natural gas, coal, and electricity end use.¹⁹ Koplow (2003) categorizes LIHEAP as a consumption intervention, similarly counting all the annual appropriations, with the major beneficiaries identified as mostly oil, gas, electricity, and some demand-side management.²⁰ The rationale for counting LIHEAP as a subsidy is that it provides funds to conventional fuel companies for accounts that would otherwise remain delinquent.

The calculation of what portion of LIHEAP constitutes a subsidy to fossil fuels is derived from the program’s annual appropriations. After summing the regular and supplemental appropriations (excluding funds for state leveraging programs and REACH, which do not go directly to energy use), researchers subtracted the funds used for weatherization. Actual weatherization expenditure data was available for 2002-2005,²¹ while the typical maximum allowable percentage was used as a proxy for the 2006-2008 figures.²²

From this modified appropriations figure, researchers isolated the funds used for home heating, as these are the expenditures that primarily go directly to fossil fuels. The actual percentages

¹⁷ The formula for allocating funds to the states has changed since the inception of the LIHEAP program. For more information, see U.S. Dep’t of Health and Human Services, *Low Income Home Energy Assistance Program, Report to Congress for Fiscal Year 2005*, app. B (April 24, 2008) [hereinafter 2005 LIHEAP Report to Congress].

¹⁸ 2005 LIHEAP Report to Congress, *supra* note 17, tbl. 2.

¹⁹ EIA, *Federal Financial Interventions and Subsidies in Energy Markets 2007*, at 36-38, 167-168 (2007).

²⁰ Memorandum from Doug Koplow, Earthtrack, Inc., to Jason Grumet and Drew Kodjak, National Commission on Energy Policy, *Federal Subsidies to Energy in 2003 - A First Look*, at 5 (July 30, 2004) (hereinafter *Federal Subsidies to Energy in 2003*).

²¹ See 2005 LIHEAP Report to Congress, *supra* note 17, tbl. 2.

²² States may allocate 15% of their LIHEAP block grant funds to weatherization activities, and up to 25% if they meet certain criteria and obtain a waiver. See Libby Perl, Congressional Research Service (CRS), *The Low-Income Home Energy Assistance Program (LIHEAP): Program and Funding*, CRS Code RL 31865 (Oct. 21, 2008). As a general matter, only a few states obtain such waivers, while a similar number do not expend any portion of their funds on weatherization. Personal communication with LIHEAP Clearinghouse personnel (April 17, 2009). Therefore, the study assumes that the numbers approximately offset each other, and uses 15% as a proxy for 2006-2008 expenditures.

spent on heating were available for 2002-2005,²³ and the average percentage was used as a proxy for 2006-2008 expenditures.²⁴ The final step was to extract the portion of these funds that went to fossil fuel payments, as opposed to general electricity payments. The U.S. Department of Health and Human Services had tabulated the percentage of households using fossil versus non-fossil heating fuels in 2001, and ELI used the percentage as a proxy for fossil versus non-fossil expenditures for 2002-2008.²⁵

Strategic Petroleum Reserve (\$6,183)

The Strategic Petroleum Reserve (SPR) was created in 1975 after multiple oil crises, in order to protect the American economy from severe oil supply disruptions. The SPR is funded through annual appropriations to the Department of Energy with special appropriations for oil purchases. Oil is also obtained through a “royalty-in-kind” program with the Minerals Management Service.²⁶ The Strategic Petroleum Reserve (SPR) provides a taxpayer-funded service to oil consumers and refiners.²⁷ The SPR may provide a significant economic benefit in the event of a severe supply disruption, but it has seen limited use. According to the Congressional Research Service, drawdowns in the run-up to the Persian Gulf War and in response to Hurricane Katrina only had a marginal impact on oil prices.²⁸ In recent years, the SPR has functioned primarily as an “oil bank” that lends oil to individual petroleum firms to help them through minor supply disruptions.²⁹

Even if the SPR were used for its nominal purpose, its beneficiaries would be oil consumers, with costs borne by taxpayers. The study therefore considers it a subsidy to the petroleum sector, although researchers did not include the cost of oil acquisition in the calculations because this represents a capital asset that may prove profitable to the government in the future.³⁰ ELI calculates the cost to government of the SPR as the lifetime costs of financing for SPR facilities, maintenance, and operation since 1976 that are attributable to the study period. The study offsets the cost to government by revenues from commercial leasing of SPR facilities, which has generated several million dollars in recent years.³¹

²³ See 2005 LIHEAP Report to Congress, *supra* note 17, tbl. 2.

²⁴ The average percentage of funds spent on home heating between 2002 and 2005 was 54.6% (range = 53.8-55.4%).

²⁵ U.S. Dep’t of Health and Human Services, LIHEAP Home Energy Notebook for Fiscal Year 2003, at tbl. A-3 (Mar. 2005). In 2001, 75% of LIHEAP recipient households across the U.S. used fossil heating fuels (natural gas, fuel oil, kerosene, and liquefied petroleum gas).

²⁶ See GAO, *Strategic Petroleum Reserve: Increasing the Cost-Effectiveness of Filling the Reserve*, GAO-08-726T (Apr. 24, 2008).

²⁷ Doug Koplou & Aaron Martin, *Fueling Global Warming: Federal Subsidies to Oil in the United States* 4-17 (1998).

²⁸ See Robert Bamberger, CRS, *The Strategic Petroleum Reserve: History, Perspectives, and Issues*, CRS Code RL 33341 (updated Sept. 11, 2008).

²⁹ DOE, Releasing Crude Oil from the Strategic Petroleum Reserve, <http://fossil.energy.gov/programs/reserves/spr/spr-drawdown.html> (last visited Sept. 17, 2009).

³⁰ The GAO reports, however, that there are significant inefficiencies in current methods of oil acquisition. See GAO, *supra* note 26.

³¹ Historical expenditures and SPR budget information were obtained from DOE, *Strategic Petroleum Reserve Annual Report* (2007).

Black Lung Disability Trust Fund (\$1,035)

The Black Lung Disability Trust Fund (BLDTF) pays health benefits to coal miners afflicted with pneumoconiosis or “black lung disease.”³² Created in 1978, it is funded through an excise tax of \$1.10/ton on underground coal and \$.55/ton on surface coal, exempting lignite coal, imports, and exports.³³ As with other excise taxes (for example, those on crude petroleum or transportation fuels), these levies support a trust fund that accrues to the benefit of the fuel market itself (i.e., coal), by covering health costs incurred in the production of that fuel. Thus, the cost and benefit of the tax to the fuel should theoretically net to zero. However, as the excise tax payments did not sufficiently cover early benefits payments, the BLDTF was given “indefinite authority to borrow” from the U.S. General Fund.³⁴

The Office of Inspector General (OIG) at the Department of Labor (DOL) reports that it first alerted Congress and the public to the enormous debt liabilities of the BLDTF to the Treasury in its Semiannual OIG Report to Congress in March 1997. At that time, the OIG reported that the debt stood at \$5 billion.³⁵ By the end of FY 2008, the BLDTF had accrued nearly \$13 billion in principal debt and accrued interest to the Treasury.³⁶ To fix the problem, Congress partially refinanced and partially “bailed out” the BLDTF in the Emergency Economic Stabilization Act at the end of FY 2008.³⁷ Under this plan, half of the debt was refinanced with zero-coupon bonds, while the \$6.498 billion of remaining debt was handled through a one-time appropriation by Congress to the BLDTF, which then immediately paid this sum back to the U.S. Treasury. The study treats the one-time appropriation (but not the bonds) as a subsidy to coal, representing a cost to taxpayers of thirty-three years of advances from the General Fund that were never paid back, and which otherwise would have been borne by the coal sector through an excise tax set at a level that would fully cover the needs of the coal miners who contracted black lung disease.

The amount of the subsidy is calculated as the percentage of the one-time appropriation of \$6.498 billion attributable to the amount of debt (principal plus interest) accrued during the study period of FY2002 – FY2008. While the full amount of the appropriation is properly viewed as a coal subsidy, only 13.47% of that amount is attributable to debt incurred during the study period, or, adjusted for inflation, about \$1.035 billion.

Highway Trust Fund (\$500)

The Highway Trust Fund supports highway, road, and other transportation projects throughout the country. It is funded largely by the Transportation Fuel Excise Tax on road fuels (set at 18.4 cents per gallon of gasoline during the study period).³⁸ Several energy subsidy reports offset tax subsidies to the transportation fuel market with the Transportation Fuel Excise Tax on the

³² Salvatore Lazzari, CRS, *The Black Lung Excise Tax on Coal*, CRS Code RS21935 (Sept. 15, 2004).

³³ See IRC § 4121.

³⁴ U.S. Department of Labor (DOL), *Annual Report FY2008: Performance and Accountability Report*, available at <http://www.dol.gov/sec/media/reports/annual2008/PFS.htm>.

³⁵ DOL, Inspector General’s Semiannual Report to Congress 56 (April 1997).

³⁶ DOL, *supra* note 34.

³⁷ Pub. L. 110-343. See also DOL, *Fiscal Year 2009 Budget in Brief*, available at <http://www.dol.gov/sec/budget2009/bib.htm#esa3>.

³⁸ See GAO, *Improved Solvency Mechanisms and Communication Necessary to Help Avoid Shortfalls in the Highway Account*, GAO-09-316, at 3-4 (2009).

theory that this is a special tax imposed over the generally applicable tax rate (e.g., EIA 1992).³⁹ The study generally does not treat the transportation fuel excise tax as a fuel-specific subsidy or offset, because the excise tax on gasoline and other road fuels goes to fund highway construction, road repairs, and the Leaking Underground Storage Tank (LUST) Fund⁴⁰ – services that benefit users of transportation fuels.⁴¹ Thus, the excise tax is properly characterized as a “user fee” for those traveling the nation’s highways rather than a special tax.⁴² The additional burden this tax imposes on the motor fuels market, and the benefit the market derives from that burden, theoretically net to zero.

While surplus revenues generated by the transportation fuel excise tax have at times gone into the General Fund, this has not been the case at any point during the study period. If it were, this additional tax burden would have to be applied to offset special tax advantages given to transportation fuels. In actuality, the Highway Trust Fund required a special infusion of \$8 billion from the General Fund in October 2008 (\$500 million of which was then distributed to states prior to the end of FY 2008⁴³) to keep it solvent.⁴⁴ It is likely the Highway Fund will again run out of money before the end of FY 2009 and further infusions will prove necessary.⁴⁵ Relying on the CBO scoring of this provision, the study treats the \$500 million disbursement from the General Fund in FY 2008 as a subsidy from the taxpaying public to consumers of transportation fuels.

Northeast Home Heating Oil Reserve (\$50)

The Northeast Home Heating Oil Reserve is intended to compensate for supply interruptions to home heating oil supplies, without distorting heating oil prices enough to alter consumer behavior.⁴⁶ The Reserve is predominantly self-funded, as barrels of oil from the Strategic Petroleum Reserve were traded for the original stock of heating oil, and the Reserve solicited donated storage equipment. Annual appropriations from the DOE budget for facilities maintenance and operations are counted, however, as a subsidy to heating oil for the same reasons as those given for the Strategic Petroleum Reserve.

³⁹ A. Andersen, G. Lagace, J. Rasmussen, & A. Rypinski, EIA, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, EIA Rep. SR/EMEU/92-02 (1992).

⁴⁰ See Pamela J. Jackson, CRS, *The Federal Excise Tax on Gasoline and the Highway Trust Fund: A Short History*, CRS Code RL30304 (2006), available at <http://www.cnie.org/NLE/CRSreports/06May/RL30304.pdf>. At times, the excise tax has been used to fund reductions in the federal deficit, but this has not been the case during the study period.

⁴¹ Note, however, that fossil-based alternative fuels, ethanol, and biodiesel fuels receive a credit equal to the general Transportation Fuel Excise Tax. IRC § 6426. This is clearly a subsidy to these fuel sources. In fact, the Volumetric Ethanol Excise Tax Credit (VEETC) constitutes the largest single subsidy the federal government offers to any renewable energy source. The amounts of these subsidies are scored by the JCT, and they are included in the data table.

⁴² This treatment is consistent with the reasoning in Doug Koplow & John Dernbach, *Federal Fossil Fuel Subsidies and Greenhouse Gas Emissions: A Case Study of Increasing Transparency for Fiscal Policy*, 26 ANNU. REV. ENERGY ENV'T. 361 (2001).

⁴³ See CBO, *Cost Estimate for H.R. 6532* (Sept. 19, 2008).

⁴⁴ Pub. L. 110-318.

⁴⁵ GAO, *Improved Solvency Mechanisms and Communication Necessary to Help Avoid Shortfalls in the Highway Account*, GAO-09-316, at 17 (2009).

⁴⁶ See generally DOE, *Northeast Home Heating Oil Reserve – Profile*, <http://fossil.energy.gov/programs/reserves/heatingoil/> (last visited Sept. 17, 2009).

Naval Petroleum and Oil Shale Reserves (§28)

The Naval Petroleum and Oil Shale Reserves once functioned as a Navy counterpart to the Strategic Petroleum Reserve. Today, however, only one reserve remains in operation. Some of the resources extracted from the reserve are sold to generate revenue, while some are used to test oil production techniques. This use benefits oil as a fuel source. The number used in this study represents the difference between the costs of operating the reserve and the revenue generated by it, using figures obtained from the DOE congressional budget justifications.

During the study period, payments were also made to the Elk Hills School Lands Fund. This fund is an account used to make annual payments related to a sale of one of the prior Naval Petroleum and Oil Shale Reserves. The Department of Energy sold the Elk Hills field in 1996 to Occidental Petroleum Corporation for \$3.65 billion, pursuant to authority granted by the National Defense Authorization Act of 1996. The Act also required the Department of Energy to make an offer to settle a dispute with the California State Teachers' Retirement System over two parcels of land. The resulting agreement granted California 9% of the sale proceeds, to be paid out in annual installments over the next seven years.⁴⁷ As the payments do not benefit a fuel source, but rather were used to settle a dispute, they do not constitute a subsidy to fossil fuels.

c. Items Not Counted as Subsidies

This section discusses specific government programs or expenditures that researchers determined were not directed at fossil fuel-specific energy sources. These items were not included in the study. Separately, Part III of this paper discusses categories of government actions or policies (not specific to fossil fuels) that were also not counted as subsidies.

Oil Spill Liability Trust Fund, Leaking Underground Storage Tank Fund, and Abandoned Mine Land Reclamation Fund

The Oil Spill Liability Trust (OSLT) Fund was created in 1986 and is funded through an excise tax on crude oil that began in 1990. In 2008, Congress extended the tax to 2017.⁴⁸ The excise tax supports several oil spill prevention and remediation programs.⁴⁹ The OSLT Fund is part of a dual-insurance system, set up by the Oil Pollution Act (OPA), that requires oil shippers to carry private insurance up to a statutorily defined amount (variable by vessel size and type). The OSLT Fund covers damages that exceed that amount, capped at \$1 billion per incident, of which no more than \$500 million can be spent on natural resources remediation.⁵⁰ Although no event since the enactment of OPA has been so catastrophic as to liquidate the entire fund, this remains a possibility.

⁴⁷ See Robert Bamberger, CRS, *The Naval Petroleum Reserves: Proposed Sale and Issues*, CRS Code 95-293 (1996); California State Teachers' Retirement System, *Overview of the California State Teachers' Retirement System and Related Issues* 50 (2009); DOE, Naval Petroleum Reserves – Profile, <http://fossil.energy.gov/programs/reserves/npr/> (last visited Sept. 11, 2009).

⁴⁸ Pub. L. 110-343, 122 Stat. 3860, Division B, § 405 (amending 26 U.S.C. § 4611).

⁴⁹ U.S. Coast Guard, National Pollution Funds Center, The Oil Spill Liability Trust Fund, http://www.uscg.mil/npfc/About_NPFC/osltf.asp (last visited Sept. 17, 2009).

⁵⁰ 26 U.S.C. § 9509.

CRS reports that the OSLT Fund's current balances would be insufficient to cover a spill on the order of the Exxon/Valdez, which caused over \$3 billion in damage.⁵¹

The Leaking Underground Storage Tank (LUST) Fund was established in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The Fund is administered by EPA through cooperative agreements with states for clean up of LUST sites where no responsible party can be located.⁵² It is funded through a fuel excise tax.⁵³ The GAO reports that by the end of FY 2005, the Fund had a balance of \$2.5 billion.⁵⁴ Recent appropriations levels have averaged around \$70 million a year, while the balance has grown at an average rate of \$129 million per year. Although the unobligated Fund balance is quite large at over \$2.5 billion, the 54,000 outstanding orphaned LUSTs reported by the states will cost around \$12 billion in future remediation efforts.⁵⁵

The Abandoned Mine Land Reclamation (AMLR) Fund was established in 1977 and is supported by a fee on coal production. Through FY 2005, the Fund had a balance of \$1.8 billion.⁵⁶ The fund collects interest, which since 1992 has gone to support retired miners' health care. In the FY 2008 Budget, DOI estimated expenses of \$147 million for land reclamation and \$113 for health care expenses, for a total of \$260 million. The Office of Surface Mining (OSM) estimated in 2005 that remaining clean-ups will cost \$3 billion and other associated health and environmental impacts from coal mining would cost an additional \$3.6 billion.⁵⁷

EIA (2007) notes that "[i]n the case of trust funds and insurance programs the funds needed to cover the liability may be collected through a levy on the industry. If the present value of the cost of the liability assumed by the government exceeds the present value of the levy on the industry, it is considered to be an indirect subsidy."⁵⁸ The study does not count the OSLT Fund, the LUST Fund, or the AMLR Fund as subsidies or as offsets against other subsidies benefiting petroleum or coal. There have been no disbursements into or from the General Fund into or from the OSLT Fund, LUST Fund, or AMLR Fund. Therefore, researchers do not believe there is a subsidizing impact defined in terms of losses to the U.S. General Fund during the study period. Although the costs of unremediated sites or future oil spills may far exceed projected balances in these funds, these are treated as externalities. They are not costs borne by the government during the study period and thus fall outside the scope of this study.

Mass Transit Account

A small portion (2.86 cents) out of the generally applicable fuel excise tax (set at 18.4 cents per gallon during the study period) funds the Mass Transit Account. This account, from which Congress appropriated approximately \$46 billion over the study period, funds a variety of grants, research, and construction projects related to mass transit systems. Mass transit and school bus fleets

⁵¹ Jonathan L. Ramseur, CRS, *Oil Spills in U.S. Coastal Waters: Background, Governance, and Issues for Congress*, CRS Code RL 33705, at 22-23 (2008).

⁵² See Mary Tiemann, CRS, *Leaking Underground Storage Tank Cleanup Issues*, CRS Code 97-471 (1999).

⁵³ 26 U.S.C. § 9508.

⁵⁴ GAO, *Leaking Underground Storage Tanks: EPA Should Take Steps to Better Ensure the Effective Use of Public Funding for Cleanups*, 07-152, at 35 (2007).

⁵⁵ *Id.* at 4.

⁵⁶ Nonna A. Noto, CRS, *Abandoned Mine Reclamation Fee on Coal*, CRS Code RL 32993, at 3 (2006).

⁵⁷ Office of Surface Mining, *Annual Report 2005: Abandoned Mine Land Reclamation*.

⁵⁸ EIA, *supra* note 19, at 3.

are excluded from the gas excise tax, as are certain fuel types (ethanol, LPG, etc.).⁵⁹ To the extent mass transit systems rely on the same fuel sources that are subject to the fuel excise tax, the benefit and burden would net to zero just as with the Highway Trust Fund generally. To the extent the Account benefits transportation options that rely on non-taxed fuels (alternative fuels, biofuels, and electricity), it may be considered a subsidy, but this benefit is not fuel-specific, and the link between transit infrastructure and the fuels they rely on is too attenuated for inclusion in this study. Like the Highway Trust Fund generally, the study treats this Account as neither a subsidy nor an offset to a subsidy.

Commuter Benefits Exclusion from Income

IRC Section 132 excludes from gross income payments for qualified expenses incurred by employees in commuting to work. During the study's time period, those qualified expenses were defined as transit passes, parking costs, and use of high-occupancy vehicles (HOV). The JCT scores this provision as a tax expenditure that costs the government approximately \$3 to \$4 billion per year. This provision indirectly provides a relatively large benefit to conventional fuels. Calculations based on U.S. Treasury "Analytical Perspectives" reports (accompanying the President's annual budget) suggest that for the applicable time period, on average, 14% of this expenditure is attributable to mass transit, while 86% can be attributed to parking expenses. A *de minimis* amount goes to HOVs. Koplow (2004) used Treasury figures to estimate the impact of the expenditure on commuter fuels, claiming that about 82% of the amount could be attributable to fossil fuels in 2003.⁶⁰

The study does not include the cost of this tax expenditure because it is not a fuel-specific subsidy, although it is possible to estimate the value of this expenditure to fossil fuels, ethanol, and other renewable fuels (solar, wind, and hydropower) through prorating. Using data on U.S. commuting patterns over FY2002-FY2008, ELI researchers conclude that about \$1 billion of the cost of this provision benefited renewables (mostly ethanol), while \$27 billion benefited fossil fuels. The unintended subsidizing effect of this provision should be of interest to policymakers, but again, these numbers are not included in the study.

Water Infrastructure

Ports, harbors, and waterways are dredged primarily to accommodate large oil tankers. Maintenance of these areas, including dredging conducted by the U.S. Army Corps of Engineers, is generally funded by the Harbor Maintenance Tax (HMT), a 0.125% tax on all incoming commercial cargo. According to a GAO report on federal user fees, approximately \$1.4 billion is credited to the HMT annually, but only about \$900 million is spent; the USACE expects the balance to reach \$8 billion by FY2011.⁶¹

Despite the fact that additional costs are incurred specifically to accommodate oil tankers, which are generally the largest ships, this expense is being borne by all commercial cargo importers, not the federal government. Although MISI (2008) counted this additional cost as a subsidy to the oil industry, by estimating the expenditures for federal navigation programs and allocating the costs

⁵⁹ 26 U.S.C. §6427.

⁶⁰ Federal Subsidies to Energy in 2003, *supra* note 20, at 8.

⁶¹ GAO, *Federal User Fees: Substantive Review Needed to Align Port-Related Fees with the Programs they Support*, GAO-08-321, at 26–27 (2008).

according to the ratio of petroleum/petroleum-based products carried to all waterborne trade,⁶² this methodology does not appear to consider the fact that such efforts are funded by a commercial cargo tax, especially since the oil industry is assuming its share of that tax. Thus, the study does not count HMT expenditures as a subsidy to oil.

LNG Terminals

As of November 2008, there were ten LNG terminals in North America, eight of which are located in the U.S. (five in Texas and Louisiana, one in Georgia, and two in New England). If federal infrastructure has been developed to facilitate liquefied natural gas (LNG) imports and exports, such efforts would constitute a subsidy to the natural gas industry. However, LNG terminals have been private endeavors to date. An international treaty to which the U.S. is *not* a party makes insurance compulsory for LNG transporters and sets liability limits – in the event of an accident, the ship owner is liable for up to 100 million SDR (US \$128 million), after which a fund, comprised of payments from all contracting parties, will cover damages up to 250 million SDR (US \$320 million). State and local governments in the U.S. do provide some incentives for LNG terminals through such things as tax-exempt industrial revenue bonds.⁶³ These amounts have not been included because the federal tax exemption for government-issued bonds is not fuel-specific.

II. Renewable Energy (\$28,943)

This section lists and describes the items that researchers counted as subsidies to renewable energy fuels. As with the fossil fuel section, it is broken down into two main components: a) tax expenditures and other foregone revenues, and b) direct expenditures. The individual provisions are presented in order of magnitude, followed by more detailed explanations of certain expenditures and programs whose quantification required additional steps. The paper also lists specific items that were not counted as subsidies to renewable fuels.

The numbers are presented in millions of dollars, spanning the entire study period (FY 2002-08).

a. Tax Expenditures and Other Foregone Revenues (\$17,940)

“Tax expenditures,” also known as tax breaks, are provisions in the Internal Revenue Code (IRC) that Congress has enacted to benefit a specific sector or segment of society. Because tax expenditures represent foregone government revenues, they are counted as a cost to government. Both the Joint Committee on Taxation (JCT) of Congress and the Office of Management and Budget (OMB) provide annual estimates of lost government revenue due to tax expenditures. The study relied primarily on these sources for the numbers presented below.

Alcohol Credit for Fuel Excise Tax (\$11,577) - IRC Section 6426(b). This credit, popularly known as the Volumetric Ethanol Excise Tax Credit (VEETC), is available at a rate per gallon of

⁶² Management Information Services, Inc., *Analysis of Federal Expenditures for Energy Development* 15 (September 2008).

⁶³ See *Texas Putting Out Welcome Mat for LNG Projects*, LNG EXPRESS, at 12 (Feb. 1, 2005), available at http://www.calhounlng.com/PDF/LNG_Express01.pdf (last visited Sept. 17, 2009).

alcohol fuel produced by a taxpayer for use or sale. It operates as an exclusion from the generally applicable fuel excise tax imposed by IRC Section 4081.

Renewable Electricity Production Credit (\$5,224) - IRC Section 45. This credit is available per kilowatt/hour (Kwh) for production from wind, solar, biomass, geothermal, irrigation, hydro, municipal waste, poultry waste, refined and Indian coal. The amount going to coal production is *de minimis* and therefore not prorated out.

Renewable Energy Investment Credit (\$259)– Internal Revenue Code (IRC; Title 26 of the U.S. Code) Section 48. This credit is available for the following types of energy generation facilities: solar (electric, lighting, and heating/cooling), geothermal, fuel cells, and microturbines.

Five-Year Modified Accelerated Cost Recovery System (MACRS) Period for Solar, Wind, Biomass, and Ocean Thermal (\$200)- IRC Section 168(e)(3)(B). This provision defines qualifying property by reference to IRC Section 48 (above).

Alcohol Fuel Blender Credit (\$198)- IRC Section 40. This credit is available at a dollar-rate per gallon of alcohol fuel produced for use or sale and can be taken in lieu of the VEETC. Small producers or cellulosic producers qualify for additional benefits.

Biodiesel Blenders Credit and Biodiesel Excise Credit (Combined) (\$182)- IRC Sections 40A, 6426(c), and 6427(e). This combined credit is available at a dollar-rate per gallon of biodiesel produced for use or sale, or as a credit equal to the generally applicable fuel excise tax under IRC Section 4081. (It operates identically to the VEETC above.)

Deduction for Clean Fuel Vehicles and Refueling Property–Biofuels (\$165)- IRC Section 179A. This deduction is available for the cost of the property with certain limitations. Qualifying Fuels include natural gas (NG), liquefied natural gas (LNG), liquefied petroleum gas (LPG), hydrogen, electric, 85-percent ethanol (E85), methanol, and other alcohol fuels. Amounts were prorated between fossil fuels (see Section I, above) and renewables.

Credit for CREBs Holders (\$85) The tax credit for Clean Renewable Energy Bonds (CREBs) was created by the Energy Policy Act of 2005 (codified at IRC Section 54). This credit is available to CREBs holders in lieu of interest payments from the bond issuer. Qualified facilities include wind, solar, geothermal, closed- and open-loop biomass, and other facilities defined in IRC Section 45(d).

Credit for Residential Solar Electric, Heating, and Fuel Cell Property (\$39)- IRC Section 25D. This credit is available for up to 30 percent of individuals' expenditures on residential scale renewable energy facilities such as solar electric, solar water heating, and fuel cells.

Credit for Clean Fuel Vehicles and Refueling Property–Biofuels (\$10) - IRC Section 30C. This credit is available for up to 30 percent of the cost of the property. Qualifying fuels: E85, NG, LNG, compressed NG (CNG), LPG, hydrogen, or 20-percent biodiesel. Amounts were prorated between fossil fuels and biofuels.

Special Depreciation for Cellulosic Plant Property (\$1) - IRC Section 168(l). This provision includes within the depreciation deduction under IRC Section 167 an allowance equal to 50 percent of the adjusted basis for qualified property.

b. Grants and Other Direct Payments (\$11,003)

This section describes selected direct expenditures by the federal government on renewable fuel-specific energy sources. More detail about programmatic spending on renewable energy by the Department of Energy and Department of Agriculture is included in the Appendix.

Corn-Based Ethanol (\$5,007)

A substantial portion of USDA's corn production subsidy payments are received by farmers who use their corn to produce ethanol. Even though these subsidies are not directed at corn growers specifically for the purpose of producing ethanol, they represent a government expenditure that benefits energy and that supports a specific fuel (and Congress has not acted to restrict the use of these subsidies in order to prevent them from supporting corn ethanol production). In addition, Congress enacted in 2005 a national ethanol mandate that stimulates demand. In light of these facts, researchers concluded that the proportion of total USDA corn subsidies going to ethanol production is a subsidy to corn ethanol.

The subsidy is not a price support, but rather consists of a fixed per-unit payment and a price floor – a framework that has subjected the program to criticism. The 2002 Farm Bill set the direct payment rate at \$0.28 per bushel, and the price floor at \$2.60 per bushel. Between 2002 and 2008, the percentage of corn used for fuel alcohol increased from 11.1% to 29.7%. Aside from ethanol-oriented taxes and credits, the amount of subsidies provided to corn producers generally rose from \$1.98 billion in 2002 to \$4.92 billion in 2006; in 2007 and 2008 the subsidies stayed relatively constant at \$2.06-\$2.07 billion. By proportion, this means that from 2002 to 2008, \$4.45 billion went to subsidize corn ethanol.⁶⁴ Although these ethanol-specific programs have increased the price of corn generally, and may be responsible for pushing the price of corn above the statutory price floor, the ethanol percentage was not prorated further because of the additional per-unit direct payment.

Power Marketing Administrations (-\$294)

There are five federal Power Marketing Administrations (PMAs) that distribute electricity generated from federally owned and operated facilities. The vast majority (on the order of 92%) of the energy distributed by the PMAs comes from federally-owned hydroelectric facilities, which suggests they should be counted as a hydropower subsidy. Though many of the facilities were originally constructed to provide flood control and recreational benefits in addition to power generation, the study considers all government expenditures on the PMAs as subsidies to the associated fuel sources. As discussed in EIA (2007),⁶⁵ the principal financial benefit the PMAs receive from the federal government is indirect, in the form of reduced interest rates on debt issued by the PMAs. Despite explicit statements to the contrary, capital markets treat PMA debt issues as though they were at least partially backed by the federal government, resulting in a lower cost of

⁶⁴ Corn subsidy totals for 2002-2006 were available from the Environmental Working Group, www.ewg.org/farm (last visited Sept. 17, 2009). In 2007 and 2008 the price floor was not exceeded, so the subsidy was only comprised of the direct payments. Direct payment expenditure figures were obtained directly from the U.S. Department of Agriculture staff and used to represent total corn subsidies for 2007 and 2008. This methodology was generally adopted from Doug Koplow, Federal Subsidies to Energy in 2003, *supra* note 20, at 2; Doug Koplow, *Biofuels – At What Cost? Government support for ethanol and biodiesel in the United States* tbl. 4.4 (2006).

⁶⁵ EIA, *supra* note 19, at 74-80.

capital. As discussed above, the study does not treat federal loan guarantees as a subsidy unless payments are actually made from the government as a result. In this case, not only do the benefits take the form of loan guarantees, those guarantees are inferred by the markets despite that fact that the PMAs clearly state that there is no explicit guarantee of the debt.

Subsidies to the PMAs come in two forms: loans from the federal government at rates lower than the Treasury rate of similar maturity, and annual appropriations from the federal government to be repaid annually at rates that differ from the Treasury rate. The largest PMA, the Tennessee Valley Authority (TVA), receives neither type of direct benefit, while only the Bonneville Power Authority (BPA) received annual appropriations over the study period.

PMAs are allowed to borrow money over the long term from the federal government, often at rates below the government's cost of capital. In these cases, the government is effectively forced to borrow money from the capital markets at the Treasury rate, while it simultaneously loans money to the PMAs at a different rate. In addition, PMAs are allowed to repay the highest interest debt first, a benefit unavailable to the federal government. Researchers calculated the effective rate on outstanding debt to the federal government and compared it to the Treasury rate for debt issues of equal or similar maturity. When the Treasury rate is higher than the rate to the PMAs, this results in a net loss to the government and a subsidy to the borrowing PMA. The difference in capital costs is counted as the subsidy. If the Treasury rate is lower, the federal government is effectively earning a profit from the transaction. In these cases, the study calculates the difference as a benefit to the government which is used to offset subsidies to the associated fuels.

The Bonneville Power Administration, the second-largest of the PMAs, receives direct appropriations from Congress, which it has to repay at the end of each year, with interest. The interest rate on outstanding appropriations is typically different than the interest rate on 1-year Treasury issues. The study calculates the net subsidy in the same way described above. Over the course of the study period, the 1-year rate paid by BPA on its outstanding appropriations was higher than the Treasury rate in every year.

Interestingly, while the three smallest PMAs – the Southeastern Power Administration (SEPA), Southwestern Power Administration (SWPA), and Western Power Administration (WAPA) – all receive subsidies from the federal government in the form of below-market long term loans, BPA paid higher-than-Treasury rates on both its annual appropriations and its long term debt for every year covered by the study. The profit made by the federal government from both of these income streams from BPA more than offsets the subsidies to the smaller PMAs. The net effect is a profit to the federal government of \$294 million on an inflation-adjusted basis.

c. Items Not Counted as Subsidies

This section discusses specific government programs or expenditures that researchers determined were not directed at renewable energy sources. These items were not included in the study. Separately, Part III of this paper discusses categories of government actions or policies (not specific to renewable fuels) that were also not counted as subsidies.

Energy Efficiency and Weatherization Assistance

The federal government provides financial assistance for efforts, such as advanced lighting and building technologies, to improve energy efficiency and decrease the energy demands of buildings. While improvements in energy efficiency may lead to significant reductions in greenhouse gas emissions, the reduction of energy use does not constitute a subsidy to a particular fuel. As a result, these types of expenditures are not viewed as subsidies and are not included in the data.

III. Excluded From the Study

This section describes specific categories of government actions or policies that do not fall under the study's definition of a subsidy, even though they may have a financial impact on specific energy sources.

Standards

Energy procurement standards require particular sectors or entities to ensure that a fixed percentage of their energy comes from a particular source. Examples include renewable energy standards (RES) and fleet purchasing requirements. Other standards, like the Corporate Average Fuel Economy (CAFE) standards, are used to set fuel economy requirements for passenger cars and light trucks.

Unlike subsidies, which provide a financial incentive, standards⁶⁶ constitute a regulatory requirement and thus are excluded from the scope of this study. While standards may affect markets for particular fuel sources, and can be viewed as imposing costs on – or conferring benefits to – particular industries, they do not constitute a cost to the government. Moreover, it is difficult to translate precisely the effect of a standard into an equivalent subsidy. Finally, for this study, there is no federal RPS to consider, and federal government procurement standards that mandate the purchase of a certain percentage of fuel-efficient vehicles for the federal fleet are both small and not fuel-specific.

Regulatory interventions

The study does not examine the impact of regulation (or a lack of regulation) on energy markets. For example, the Clean Air Act imposes costs on the fossil fuel industry by imposing emission control standards, but it is not currently used to regulate greenhouse gas emissions, despite a 2007 ruling from the Supreme Court overturning the Environmental Protection Agency's prior position that it lacked authority to regulate greenhouse gases as air pollutants under the Clean Air Act. The decision not to regulate greenhouse gases under the Clean Air Act benefits coal and other energy sectors, but it does not constitute a subsidy under the study's "cost-to-government" definition.

⁶⁶ For more information, see Richard G. Newell, Resources for the Future (RFF), *Climate Technology Deployment Policy*, Issue Brief 10, at 140-41, which discusses the distinction between standards and subsidies.

Non-fuel-specific subsidies to electricity transmission, distribution, and generation

The electricity transmitted across the U.S. power grid is indistinguishable by fuel source – once energy enters the grid, it cannot be traced back to its origin. As a result, any improvements made to electricity transmission or distribution infrastructure (whether to benefit fossil or renewable fuels) cannot be allocated by fuel source.

For this reason, the study excludes general subsidies to electricity transmission, distribution, or end use, as well as programs or expenditures that rely on electricity as their end-use energy source. Similarly, the subsidy calculations (for eligible categories) exclude any portion of those funds that go to general electricity. For example, the study's calculation of the amount provided by the government to the LIHEAP program leaves out the small percentage (less than one-fourth) of the program's heating energy that derives from electricity, although the remaining amount that is tied to fossil fuels is counted as a subsidy.

Non-specific taxes and other subsidies

The study excludes taxes and other expenditures associated with general energy consumption (such as accelerated depreciation provisions and tax-exempt debt), even if they disproportionately benefit certain energy sources, on the basis that they are made equally available to both fossil fuel and renewable energy, as well as other industries. A variation on this rule is the Foreign Tax Credit, which, while not aimed at energy sectors specifically, contains certain provisions that apply solely to fossil fuels. The study counts these provisions as a subsidy, as explained under the section on fossil fuel expenditures, above.

Liability limits

Liability limits for particular fuels allow those sectors to escape higher insurance premiums while avoiding the costs of catastrophic events that exceed the liability limit. While these limits clearly provide financial benefits to the private fuel sector, their cost to government (and taxpayers) is less discernable. Liability limits essentially reallocate risk – a liability limit in the absence of another method of compensation allocates risks to potentially injured parties who would otherwise receive some form of compensation. In addition, because reducing the risk exposure of an enterprise also reduces its incentive to avoid accidents, the victims of such accidents will bear added risk for losses that cannot be compensated, such as loss of life. Although a liability limit in such cases is inequitable, it is not counted as a subsidy because it does not impose a direct cost to government.

In all cases identified by this study, however, the government would provide the financial backstop (i.e., by bearing the reallocated risk), and if an accident did exceed liability limits, the government would compensate the victims, in which case the expenditure would come from the taxpayers. It is the taxpayers, rather than the potentially injured parties, who are taking on the risk. At the same time, until an accident happens, the cost to the taxpayers is not realized and does not impact the federal budget.

While this risk can correctly be viewed as a subsidy with a cost to taxpayers, quantifying that cost is difficult. To the extent the cost is borne by the taxpayers rather than injured or responsible parties, the annual expected cost of the subsidy is: (a) the chance that an accident with losses

exceeding the liability limit would take place, multiplied by (b) the expected loss were an accident of such magnitude to occur, less the liability limit that the enterprise would have to pay.

The most widely known liability limit in the energy sector is the nuclear accident liability limit (now set at \$10 billion) under the Price-Anderson Act.⁶⁷ Nuclear fuels are excluded from this study. Other liability limits are provided in the Oil Pollution Act⁶⁸ and the Trans-Alaska Pipeline Authorization Act. As discussed above in the section on trust funds, the OPA reallocates risk between responsible parties and the OSLTF (funded through an excise tax on petroleum), rather than taxpayers.⁶⁹ While there has been debate over the equitable allocation of risk between these two entities, because the OSLTF is supported by a levy on industry, the study assumes that this results in a net \$0 subsidizing impact on the petroleum sector. The Trans-Alaska Pipeline liability limit is set at \$350 million per incident.⁷⁰ Although there have been a series of oil spills from the Pipeline as a result of leakage, accidents, and at least one act of terrorism,⁷¹ none apparently caused damage in excess of the liability limit. Finally, while liability limits have been proposed for carbon capture and storage activities, such a policy has yet to be implemented.⁷² Depending on how such a policy is structured, liability limits could have a subsidizing impact on the coal sector.

Although it is clear that taxpayers have borne heightened risks associated with fuel types as a result of these limits on responsible-party liability (including during the study period), the exact dollar value of those risks is too attenuated from federal fiscal policy to quantify in this study as a cost to taxpayers.

IV. Conclusion

Against a backdrop of growing energy and climate concerns, this study seeks to paint a comprehensive and visual picture of federal subsidies to fossil fuels and renewable energy over the last seven years. The study, which focuses on the graphic depiction of federal energy subsidies, confirms that despite the national dialogue on energy use and climate change, the U.S. government has continued to subsidize greenhouse-gas emitting fossil fuels to a significant degree, while directing substantially less support to renewable energy sources. As the study reveals, a large portion of the \$72 billion in fossil fuel subsidies derives from just a few provisions in the U.S. Tax Code, including a provision (the Foreign Tax Credit) whose operation does not appear to be widely understood by policymakers or the public. On the renewable side, over half of the \$29 billion subsidy amount supports corn ethanol, a fuel whose production and use raises serious questions

⁶⁷ 42 U.S.C. § 2210. Koplow lists the Price-Anderson Act as the third largest distortion in energy markets (behind the failure to internalize costs of GHG emissions and military expenditures to defend oil supplies). Doug Koplow, *Ten Most Distortionary Energy Subsidies* 3 (January 2007), available at www.earthtrack.net (last visited Sept. 17, 2009). The Renewable Energy Policy Project asserts that Price-Anderson single-handedly created the nuclear industry, as no investors would take on the financial risks of a nuclear incident without such a limit. Renewable Energy Policy Project, *Federal Energy Subsidies: Not all Technologies are Created Equal*, Report No. 11, at 14 (July 2000).

⁶⁸ 33 U.S.C. § 2704.

⁶⁹ See discussion of Oil Spill Liability Trust Fund, Section I(c).

⁷⁰ 43 U.S.C. § 1653.

⁷¹ See Arctic Refuge Action, <http://www.arcticrefugeaction.org/newsroom/alaskaoilspill.html> (last visited Sept. 17, 2009).

⁷² CCSReg Project, *Carbon Capture and Sequestration: Framing the Issues for Regulation* (2008).

about effects on climate. These figures raise the pressing question of whether scarce government funds might be better allocated to move the United States towards a low-carbon economy.

APPENDIX: Sources of Data

This section explains the data sources used to quantify the subsidies included in this study. As explained earlier, the subsidies examined include: (1) foregone revenues, mostly in the form of tax expenditures, and including reported lost government take from offshore leasing; and (2) direct spending, in the form of direct expenditures, research and development programs, and related spending.

(1) Tax Expenditure Data

In general, the numbers presented come directly from one of the sources listed below, with limited exceptions. All sources provide future projections based on economic modeling and thus are only estimates – the federal government does not make exact, fuel-specific historical tax expenditure data available to the public. For each year of the study period, researchers took data from tax expenditure reports issued closest in time to that year. This means that for Fiscal Year 2002, researchers relied on the Joint Committee on Taxation’s (JCT) *Estimates of Federal Tax Expenditures for Fiscal Years 2001-2005* (JCS 1-01), because no JCT tax expenditure report was issued for the time period FY 2002-2006. Where researchers relied on data from the Office of Management and Budget (OMB) (published in the President’s annual “Analytical Perspectives” section of the Budget) in a given year, the study uses the Budget corresponding to two fiscal years after that year. This is because OMB provides seven-year projections beginning two years before the year of the report. For example, the Fiscal Year 2004 Budget provides tax expenditure data from 2002 to 2009. The study uses that year’s Budget only for the earliest year’s data, i.e., 2002 data. FY 2003 data comes from the 2005 Budget, and so forth.

For several provisions, researchers were required to make calculations from the data because there was not a one-to-one correspondence between the scored tax expenditure and the fuel-specific subsidy. These include:

- (1) 5-year rolling averages derived from JCT 5-year estimates, where annual numbers for a particular provision are not available because they are *de minimis*;⁷³
- (2) the clean fuels credit and deduction in IRC Sections 30C & 179A, which were prorated because they target both alternative fossil fuels and renewable fuels;
- (3) the special deductions for mining reclamation reserves under the Surface Mining Control and Reclamation Act (SMCRA) (IRC Section 468), which are also available for clean-up costs at solid waste management sites. Researchers counted half of the 5-year rolling average for this provision as a subsidy to coal, believed to be a conservative estimate given the respective tax liabilities associated with coal-mine versus solid-waste sites;⁷⁴ and

⁷³ *De minimis* as defined by the JCT means less than \$50 million per year, an amount that the study does not treat as *de minimis* for this report. Rolling averages provide the most accurate method of obtaining annual numbers based on available data.

⁷⁴ Many solid waste management sites (i.e., landfills) are owned by municipalities or other government units that already receive preferential tax treatment.

(4) the Foreign Tax Credit (IRC Section 901), which, while generally available to all U.S. taxpayers, has been construed to disproportionately benefit the oil industry.

The data for tax expenditures come from three governmental sources, listed in order of preference:

(i) Joint Committee on Taxation (JCT) Tax Expenditure Reports.⁷⁵ These are published each year, with the report numbers identified in the far left-hand column of the table along with the fiscal year to which they correspond.⁷⁶ The reports provide 5-year projections from the year of publication. As numbers are rounded to the nearest \$100 million, several significant energy tax expenditures either do not show up in these tables, or are footnoted as being less than \$50 million per year. In addition to year-by-year estimates for corporations and individuals (which have been combined), these reports provide a total 5-year estimate. Often a specific number is given for the 5-year total of a particular provision, even though the annual impact of that provision is marked as “less than \$50 million.” In such cases, the 5-year totals from all JCT Annual Reports over a given period can be taken to produce a 5-year rolling average.

(ii) JCT Estimated Revenue Effects, also called Estimated Budget Effects.⁷⁷ These are published alongside a specific piece of legislation to show how that legislation changes federal revenue from the baseline over a 10-year period projected forward (the baseline assumes that the current law remains in effect over the entire period). They are most helpful for provisions created within the last 10 years, for which it is possible to track the budget impact of all modifications, amendments, and extensions of a provision by adding together the Revenue Estimates for each legislative change. For tax provisions enacted more than 10 years prior to FY 2008, the baseline is lost for at least some portion of the study period; in other words, data are not available on the fiscal impact wrought by the enactment itself as well as any other amendments made 10 years prior to 2008.⁷⁸

(iii) Office of Management and Budget, Budget of the United States, *Analytical Perspectives*, published each Fiscal Year with the President’s Budget.⁷⁹ Researchers generally refrained from using these numbers unless JCT has not scored a particular provision, and the provision was considered to be a fuel-specific subsidy that should be included. This was the case for three tax provisions.⁸⁰ Note that OMB rounds its numbers to the nearest \$10 million.

⁷⁵ The JCT Reports are available at <http://www.jct.gov/publications.html?func=select&id=5> (last visited Sept. 17, 2009).

⁷⁶ The latest Tax Expenditure Report for the study period, JCS 2-08, for FY 2008-2012, was published on Oct. 31, 2008 and reflects changes in law brought by the 2008 Emergency Economic Stabilization Act, Pub. L. 110-343 (Divisions B and C).

⁷⁷ These can be accessed in chronological order at <http://www.jct.gov/publications.html?func=select&id=6> (last visited Sept. 17, 2009).

⁷⁸ For a compilation of the revenue estimates of all changes in the tax code by session of Congress, see JCT, *General Explanation of Tax Legislation in the XXXth Congress*, available at <http://www.jct.gov/publications.html?func=select&id=5>. For laws passed in the 110th Congress, researchers used legislation-specific documents (i.e., those corresponding to Pub. L. 110-140, Pub. L. 110-246 and Pub. L. 110-343).

⁷⁹ Comprehensive budget documents are available through the Government Printing Office (GPO) website, at <http://www.gpoaccess.gov/usbudget/> (last visited Sept. 17, 2009).

⁸⁰ Although researchers used JCT numbers for the Section 132 exclusion of commuting expenses, OMB but not JCT broke down the amounts that went to parking expenses and transit expenses respectively. This breakdown was

Methodologically, then, where both JCT and OMB provide estimates of a tax expenditure, the study used the JCT numbers. Where only OMB has scored a provision, the study used that number. There is almost certainly not a one-to-one correspondence between these estimates due to the different assumptions and economic models used by OMB and JCT to calculate them, but by combining these two sources of information in the accompanying graphic, the study presents the most accurate picture of the data currently available.

(2) Direct Spending Data

Most direct spending programs are housed within the Department of Energy (DOE) and the Department of Agriculture (USDA).

Department of Energy

Researchers analyzed individual programs within DOE's offices and divisions to determine whether these programs constituted subsidies to either renewable or fossil fuel energy, relying on three primary data sources to assess the goals, primary activities, and focus of each program:

- (1) the joint appropriations committee conference reports for each Fiscal Year (e.g. the Energy and Water, Interior and Environment, and/or Consolidated Act reports), which contain narrative descriptions of the annual funding allocations;
- (2) the office, division, or program website, which provides current and historical budget information and research priorities; and
- (3) each agency's annual congressional budget justifications, which delineate the specific aims and methods of each division program for the subsequent fiscal year.

After determining which DOE programs constitute direct subsidies to either fossil or renewable fuels, researchers collected annual expenditure data. Most of this data was derived from DOE's annual Statistical Table by Appropriation, which includes the yearly line-item appropriations to various agency offices and divisions. The Statistical Table displays the requested appropriation for that fiscal year alongside comparable appropriations from the preceding two fiscal years. As it typically takes the government two years to determine actual expenditure figures, in order to gather data for a particular fiscal year researchers used the Statistical Table for two years after that (e.g., to get FY 2003 data, researchers consulted the relevant data column from the 2005 Statistical Table). The only exception was for FY 2008, when the only Statistical Table available was for FY 2009.

If there was insufficient data in the Statistical Table, researchers consulted the same sources that were used to make the initial determinations about which programs constituted energy subsidies. In some instances, the joint appropriations committee conference reports contained additional details about how the funds were allocated. In others, the agency office website provided supplementary budget framework and/or outlay information. Finally, the congressional budget justifications sometimes contained more detailed information about internal allocations of agency

used to calculate fuels' pro rata share of the tax benefit found in the Section 132 Worksheet, but ultimate numbers are derived from JCT expenditure data.

funds. As with the Statistical Tables, any expenditure data for a particular fiscal year was obtained from the congressional budget justification for two years after that.

Programs within DOE's Office of Science

The Office of Science includes a Biological and Environmental Research division. Within this division is the Genomics to Life (GTL) program, which conducts foundational research for biofuels; a small part of the program is also dedicated to genome sequencing. The funds appropriated for the GTL program were tallied as a subsidy to renewable energy.

Within the Research division of the Office of Science is the Chemical sciences, Geosciences, and Energy biosciences program. The Energy biosciences portion of the program conducts two activities primarily focused on solar research: Photochemistry and Radiation Research, which in 2007 became known as Solar Photochemistry; and Molecular Mechanisms of Natural Solar Energy Conversion, which in 2007 became known as Photosynthetic Systems. Although the Photochemistry and Radiation Research includes some research on radiation that is not geared towards enhancing photovoltaic capabilities, it was not possible to separate the monetary expenditures on each activity. Thus, the study counted the total amount expended on this research as a direct subsidy to photovoltaic energy.

As the Statistical Tables do not give sufficient detail to determine expenditures on either the GTL or Energy biosciences programs, the figures were obtained from the annual DOE congressional budget justifications.

Programs within DOE's Office of Energy Supply and Conservation

The Energy Efficiency and Renewable Energy division within the Office of Energy Supply and Conservation includes several programs that act as subsidies to renewable energy. These include the Biomass and Biorefinery Systems Research and Development, Solar Energy, Wind Energy, Geothermal Technology, and Hydropower programs. The line-item appropriations to these programs were counted as direct subsidies to renewable energy.

The Vehicle Technologies, Building Technologies, and Industrial Technologies programs are primarily focused on increasing energy efficiency. Similarly, the Hydrogen Technology program focuses on hydrogen technology and fuel cells, which are inherently designed to increase energy efficiency. As explained previously, energy efficiency measures are not fuel-specific and thus were excluded from the scope of this study. Therefore, these programs were not counted as direct subsidies.

The objective of the Distributed Energy and Electricity Reliability program is to improve electricity transmission. Because electricity is not a fuel-specific energy, the program was not counted as a subsidy.

The Weatherization and Intergovernmental program promotes the use of energy efficiency and renewable technologies both domestically and internationally. The subprograms that target renewable energy were counted as direct subsidies, while the subprograms aimed at energy efficiency were excluded. The Weatherization Assistance and the Training and Technical Assistance subprograms fell into the latter category and were not counted. Because the State Energy Program

Grants and the State Energy Activities subprograms target both energy efficiency and renewable energy, researchers counted half the appropriated funds as a subsidy to renewable energy and did not count the other half. The Renewable Energy Production Incentive, the International Renewable Energy Program, and the Tribal Energy Activities subprogram all focus on promoting renewable energy generation and use, and thus were tallied as subsidies to renewable energy.

Energy Information Administration

The Energy Information Administration (EIA) provides research and reports on all energy sectors, and is an important resource for both the energy industry and the public. EIA's research is not meant to supplant private data, and although its research contains discrete information about different fuel sources, the information as a whole is not aimed at benefitting a particular fuel source. Therefore, none of the funds appropriated to EIA were counted as a subsidy to any fuel source.

Programs within DOE's Office of Fossil Energy Research and Development

Among others, the following programs are housed within the Office of Fossil Energy Research and Development: the Clean Coal Power Initiative, FutureGen, Fuels and Power Systems, Natural Gas Technologies, Petroleum – Oil Technologies, Fossil Energy Environmental Restoration, and Cooperative Research and Development. All of these programs target the production, use, or mitigation of the impacts of fossil fuels, and all were counted as direct subsidies to fossil fuels. The programs that were not counted, because they do not specifically address fossil fuels, are the Import/Export Authorization, Advanced Metallurgical Research, and Special Recruitment programs. Because the vast majority of the office's activities were deemed subsidies to fossil fuels, the full amount appropriated for Plant and Capital Equipment was also counted as a subsidy.

Program support and direction

In the offices that had an appropriations line-item for program support, program direction, and/or facility construction and capital equipment, researchers prorated the funds that were considered to be used for subsidy provisions. This was done by tallying the total subsidy appropriations of the office and calculating what percentage they represented of total office appropriations. This percentage of the program support and/or direction appropriations was then counted as a subsidy. In other words, the following calculation was performed:

$$\begin{array}{l} \text{(Cost of office programs that act as subsidies/Overall cost of office)} \\ \times \\ \text{(Program direction, support, and/or facility construction and capital equipment costs)} \end{array}$$

If a single office contained subsidies to both fossil fuels and renewable energy, researchers conducted separate calculations to apportion the support and/or direction funds.

Department of Agriculture

USDA runs two programs that act as energy subsidies. First, USDA oversees grants, loans, loan guarantees, research, and assistance for biobased products and bioenergy/renewable energy-related programs. Each year, USDA tallies its total expenditures on these programs. Because the overall figures include some energy efficiency and conservation measures, researchers subtracted the

efficiency and conservation line from the total. The remainder was considered an approximation of the annual funds expended by USDA on renewable energy efforts, and counted as a direct subsidy to renewable energy.

Second, as discussed above, researchers have determined that USDA's corn production payments constitute a subsidy to ethanol. Information on the proportion of corn used to produce fuel alcohol came from the USDA Feed Grains Database: Yearbook Tables. The total amount of corn subsidies paid out in each year was obtained from the Environmental Working Group Farm Subsidy Database (2002-2006) and USDA's Direct Payment records (2007-2008, when the price floor was not triggered). Although ethanol has increased the price of corn generally and may be responsible for pushing the price of corn above the statutory price floor, the ethanol percentage was not prorated further because of the additional per-unit direct payment.

The overall figures for USDA's programs were obtained from two sources. The numbers for FY 2006-2008 were taken from 2006 and 2009 crosscuts⁸¹ of biobased products and bioenergy/renewable energy related programs, which were provided by staff at the USDA Office of Budget and Program Analysis. However, crosscuts were not directly available for FY 2002-2005. Instead, ELI relied on a summary of USDA's discretionary authority for biobased products and bioenergy/renewable energy-related programs contained in a presentation given by the Associate Director of the USDA Office of Energy Policy and New Uses, Office of the Chief Economist, in February 2009.⁸² USDA could not confirm the official figures because they are pending release in a forthcoming GAO report.

⁸¹ Crosscuts are budgets that "cut across" different offices within an agency.

⁸² Presentation by Harry Baumes, Associate Director, USDA Office of Energy Policy and New Uses, to the Southern Association of Agricultural Scientists' 2009 Annual Meeting (Feb. 1, 2009), *available at* <http://www.saasinc.org/2009-Atlanta/Presentations/Baumes-SAAS-2-1-09.ppt>.

