



Energy, the U.S. Budget, and Climate Change

Climate Policy Initiative
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CPI Brief

Descriptors

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Executive Summary

The future of the federal government's involvement in the supply and use of energy is now being vigorously debated as a part of a national conversation about government debt and the appropriate role of government. Much of that debate is focused on the Department of Energy's grant and loan programs as well as on tax incentives for energy technologies.

This paper puts these programs in the broader context of energy-related activities in the federal budget and provides a starting point for further discussion and analysis of the federal government's role in energy and climate change. We outline the landscape of federal spending and revenue collection activities that substantially influence energy supply or use in 2010, organized by the type of policy tool or mechanism supported.

Key Findings

1. **We identify three key categories of federal spending related to energy, totaling \$290 billion (low estimate for energy-related security spending) to \$610 billion (high estimate for energy-related security spending):**
 - **Most of federal spending related to energy is for public investment (\$240-560 billion)** in energy-related infrastructure (\$104 billion), energy-related security spending (\$46-368 billion), and energy procured for government activities (\$88 billion). These investments account for a larger fraction of federal discretionary spending (18-43%) than might be expected given the energy intensity of the economy (energy expenditures account for 8% of total GDP in 2010).
 - » **Most energy-related public investment supports petroleum-based transportation.** 70-90% of the investment (\$175-500 billion) supports transportation, such as highway construction and repair, airports, jet fuel for military aircraft, and securing oil supply. This is an outsized fraction of public energy investment – transportation accounted for 48% of energy expenditures in 2010 and 28% of primary energy consumption.
 - » **Very few investments focus on approaches which reduce emissions.** Only 4-9% (\$21 billion) of the energy-related investments – in rail, transit, and federal building efficiency – focuses on technologies or approaches which are likely to reduce emissions of greenhouse gases which contribute to climate change. Of that amount, most of the \$4 billion for federal building efficiency was temporary economic stimulus spending.
 - » **Energy-related security spending is substantial, but the amount is uncertain.** We use a range (\$46-368 billion) of spending to reflect the range of published estimates.
 - **Energy incentives (\$46.7 billion) are much smaller, less than 2% of federal spending.** The bulk of the incentives (\$30.2 billion) are energy tax breaks, which are less transparent and efficient than direct spending, but may be more politically sustainable.
 - » **Few energy incentives support low-emissions technologies.** Just 35% of the incentives (\$16.7 billion) support low-emissions technologies, including \$11.1 billion in renewable energy and efficiency tax breaks and \$5.5 billion in grants and loans for other emissions-reducing technologies.
 - » **Most tax breaks that reduce emissions (\$9 billion) are temporary stimulus measures** associated with the Recovery Act and have expired or will expire by the end of 2012.
 - » **The incentives are a substantial source of global clean energy technology financing,** as climate technology grants and loans are comparable to global technology venture capital

funding in 2010 (\$7.8 billion), while the tax expenditures represent a sizeable fraction of U.S. private investment in renewable projects in 2010 (\$34 billion).

- **Regulation and information collection are even smaller (\$3 billion) but critical**, as the funding supports activities such as implementation and enforcement of EPA regulation of air pollutants.
- 2. **Energy-specific taxes resulted in \$47.6 billion in revenues in 2010, 2% of government receipts.** As these taxes are levied entirely on fossil fuels, these taxes may reduce emissions which contribute to climate change. The tax revenues roughly offset energy incentive spending. Fees collected from the public for energy-related services provided by the government led to an additional \$27 billion in revenues, not even close to enough to offset public energy investments.
- 3. **Spending to reduce emissions which contribute to climate change was \$38 billion, less than 2% of federal spending**, including \$21 billion in public investments and \$17 billion in incentives. Almost \$13 billion of this is temporary spending associated with the Recovery Act.

There are a number of budget items that affect or are affected by energy supply and consumption which we did not estimate, such as the impact of air pollution on Medicare and Medicaid spending, housing subsidies which impact energy supply and use, the cost of bonus depreciation, the budgetary impacts of regulation, and the cost to the government of bearing certain nuclear accident and waste disposal risks. We hope to return to these issues and update these estimates in future work.

Official budget documents do not provide a comprehensive list of energy-related spending and revenues. As a result we had to make some judgments about what to count, how to count it, and how to categorize it; and we have endeavored to be transparent about the decisions we have made. We welcome comments, and hope to improve and extend this analysis in the future to contribute to the broader discussion about federal spending and energy.

THE U.S. FEDERAL BUDGET

Total spending and tax expenditures (\$4,432 billion)



Total revenues (\$2,163 billion)

Discretionary
Security
Spending

Mandatory
Spending

Tax
Expenditures

Individual
Income Taxes

Social Insurance and
Retirement Receipts

Discretionary
Non-security
Spending

Interest
Payments

Other
Receipts

Corporate
Income Taxes

\$289-611 billion
(6.5 - 14% of total spending and tax expenditures)

Energy-related

\$75 billion
(3.5% of total revenues)

\$38 billion
(0.9% of total spending
and tax expenditures)

Mitigation-
related

Introduction

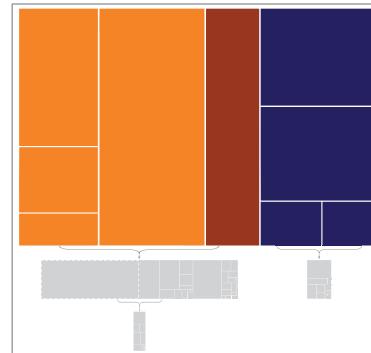
In the absence of comprehensive legislative action on climate and energy issues, the primary policy tools currently available for reducing greenhouse gas emissions at the national level are linked to federal spending and revenue collection. These tools are (at least in part) subject to the annual federal budget process. The future of federal government support of energy and climate mitigation efforts is now being vigorously debated as a part of a broader national conversation about government debt and the appropriate role of government. Much of that debate is focused on the Department of Energy's grant and loan programs as well as on tax incentives for energy technologies.

These two categories of spending represent a small fraction of energy-related federal spending and revenue collections. This paper puts these programs in the context of the broader federal budget and provides a starting point for further discussion and analysis of the federal government's role in energy and climate. We outline the landscape of federal spending and revenue collection activities which substantially influenced energy supply or use in Fiscal Year (FY) 2010.¹ We organize the landscape by the policy tool or mechanism the budget activity is linked to – i.e. infrastructure investment, tax incentive, regulation. We then focus in on the fraction of those activities which are related to climate mitigation. The appendix provides some background information on the annual budget process.

Official budget documents do not provide a comprehensive list of energy-related spending and revenues. As a result we had to make some judgments about what to count, how to count it, and how to categorize it; and we have endeavored to be transparent about the decisions we have made. We welcome comments, and hope to improve and extend this analysis in the future to contribute to the broader discussion about federal spending and energy.

What is in the U.S. Budget?

At the highest level, the budget describes federal spending and revenues – we look at each separately.



1. Spending

Federal spending in a given year is usually measured by total federal outlays – the actual disbursement of funds by government in that year. However, as outlays can be the result of spending that may have been authorized long before the year in which money is spent, it is not always reflective of current policy. In particular, outlays in 2010 not only reflect spending authorized by Congress for that year, but also reflect temporary spending authorized in 2009 by the stimulus measure, the Recovery Act. To provide a view of the budget that better reflects the policy decisions made in 2010, we generally use an alternative spending measure in this paper – the new budget authority in a given year (the amount of new authority to enter into obligations to disburse funds made available to the President by congress in

¹ We only attempt to identify, collect, and categorize the relevant budgetary items by the policy tools they represent. In particular, we do not calculate the effective subsidies being provided to the energy industry here, or assess the economic impact of the budgetary items identified. Some notable tools and papers on subsidies: D. Koplow's work, largely accessible through Earth Track - <http://www.earthtrack.net/>, Environmental Law Institute (2009), "Estimating U.S. Government Subsidies to Energy Sources: 2002-2008", EIA (2011), "Direct Financial Interventions and Subsidies in Energy in FY 2010", IEA (2011), "World Energy Outlook 2011", online subsidy database <http://www.iea.org/subsidy/index.html>, Pew Charitable Trusts' Subsidy Scope online database - <http://subsidyscope.org/energy/>, The Institute for Policy Integrity Energy Tax Breaks Wiki - http://energylaw.org/wiki/Main_Page, OECD (2011), "Inventory of estimated budgetary support and tax expenditures for fossil fuels"

that year). However, note that our estimates of tax expenditures (foregone revenue associated with tax breaks) and mandatory spending (which does not require annual authorization from Congress) are not free from Recovery Act impacts. We note any specific influences from the Recovery Act as they arise in the text.

Federal government spending can be split into three major categories:

- **Mandatory Spending (\$1.954 trillion of outlays)** – spending controlled by previous legislation; can be disbursed without the need for annual approval through appropriations bills.
 - » Social Security (\$701 billion)
 - » Medicare (\$446 billion)
 - » Medicaid (\$273 billion)
 - » Other (\$534 billion)
- **Discretionary Spending (\$1.309 trillion in outlays, \$1.258 trillion in new budget authority)** – spending which requires annual congressional authorization through appropriations bills.
 - » Security (\$815 billion in outlays, \$850 billion in new budget authority)
 - » Non-Security (\$491 billion in outlays, \$408 billion in new budget authority)
- **Tax Expenditures (\$1.025 trillion)** – “spending in the tax code,” or how much less the government collects in revenues because of tax breaks (such as the tax credit for wind energy generation) provided by Congress over the years. While changes in the tax code are generally proposed in the President’s annual budget submission to Congress, tax expenditures do not necessarily require annual legislative action to continue to remain in effect – but most climate-related tax expenditures do require such action.

The sum of the first two categories (in addition to interest on the Federal debt - \$196 billion in FY 2010) gives us total government outlays of **\$3.46 trillion in FY 2010** (compared to US GDP of \$14.7 trillion and state and local government spending of roughly \$2 trillion in 2010). However, tax expenditures – which are more than double the non-security discretionary spending – are critical to understand the influence of government on the economy. Adding them to the outlays gives us an estimate of the influence of government spending as closer to **\$4.48 trillion in FY 2010**.

2. Revenues

On the revenue side, receipts for FY 2010 can be organized into three major categories:

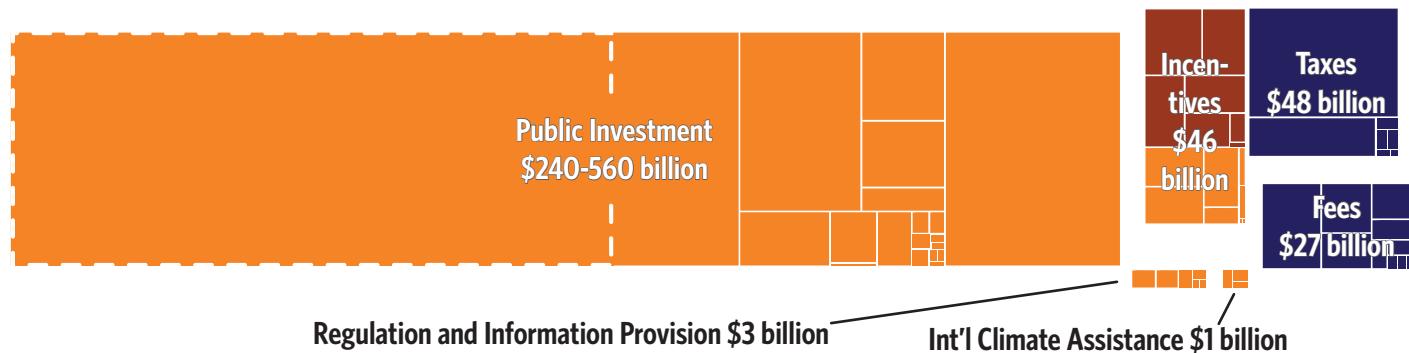
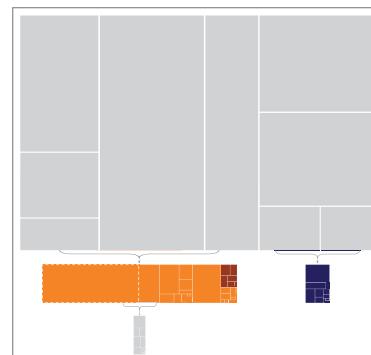
- **Individual Income Taxes (\$899 billion)**
- **Corporate Income Taxes (\$191 billion)**
- **Social Insurance and Retirement Receipts (\$865 billion)**
 - » Social Security Payroll Taxes (\$632 billion)
 - » Medicare Payroll Taxes (\$180 billion)
 - » Unemployment Insurance and other retirement (\$53 billion)
- **Other Taxes, Duties, and Receipts (\$208 billion)**

This leads to a total of **\$2.16 trillion in receipts in FY 2010**, and a deficit of \$1.3 trillion. Note that tax expenditures are almost equal in size to receipts from all income taxes. So roughly half of potential income tax revenue is lost to tax breaks, and what is collected is not even enough to pay for all discretionary spending.

How much of the U.S. budget substantially impacts energy supply and use?

The budget is a reflection of national policy and priorities. Here, we outline the landscape of federal spending and revenues that can significantly influence the production and use of energy (and the greenhouse gas emissions associated with these activities) split into four categories of policy tools:

- **Public Investment and Offsetting Collections (\$240-560 billion in investments, \$27 billion in fees collected):** Activities such as government procurement, investment in government-owned transportation assets or electric utility assets, and defense spending related to energy security can directly impact energy supply and use. Some of the spending is offset by fees collected for services rendered.
- **Incentives and Taxes (\$30 billion in tax breaks and \$16 billion in grants and loans, \$48 billion in energy-specific taxes):** Government spending or tax provisions specifically focused on energy supply and consumption activities – such as vehicle fuel taxes, research and development grants, and renewable energy tax credits – can influence private sector energy supply or use.
- **Regulation and Information Provision (\$3 billion):** The budget provides the resources necessary for regulatory or information collection agencies to carry out their missions, such as regulation of power plant emissions or collection of energy information.
- **International Climate and Energy Assistance (\$1 billion):** Several U.S. agencies provide financing and development assistance focused on energy and climate issues, including the State Department, USAID, and the Department of Treasury.



In total, the budget includes a total of between \$290-610 billion in federal government spending that substantially influenced the production and use of energy in 2010.² This can be compared to roughly \$75 billion in revenue collections from energy-specific taxes and fees.

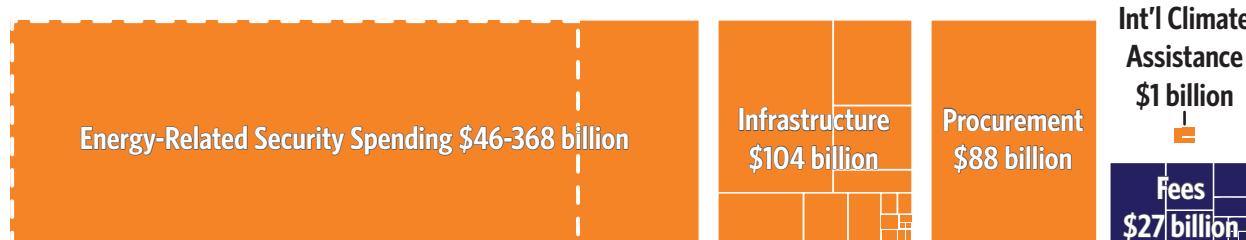
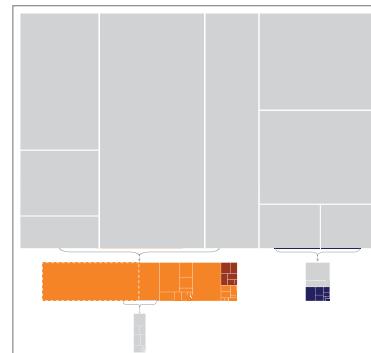
As discussed in the previous section, all discretionary spending below represents new budget authority provided by Congress in 2010 rather than actual government expenditures or outlays, so as to exclude the temporary Recovery Act funds (unless otherwise noted).

² The budget data presented are, unless otherwise noted, taken from FY 2010 actual budget authority (for spending), receipts and collections (for revenues), and estimated tax expenditures (for tax incentives) provided in the President's FY 2012 budget submissions to Congress, specifically the [Analytical Perspectives](#) and [Appendix](#) volumes as well as the agency-specific congressional budget justifications. The primary exceptions are some estimates of tax expenditures which are only available from the [Joint Committee on Taxation's](#) reports, and certain specific estimates taken from outside sources referenced in the text.

1. Public investment and offsetting collections

Most federal spending related to energy is for public investment (\$240-560 billion), which includes:

- \$104 billion in energy-related infrastructure investment,
- \$88 billion in direct and indirect spending on energy associated with government procurement,³
- Between \$46-368 billion in estimated energy-related security spending,⁴ and
- \$1 billion in international climate assistance.



These investments are comparable in size to global private investment in fossil-fuel electric power (\$233 billion), upstream oil and gas (\$470 billion), and all energy (\$1.2 trillion) in 2010.⁵ Key findings from the landscape of public investments are:

- **Most of federal spending related to energy is for public investment (\$240-560 billion) in energy-related infrastructure (\$104 billion), energy-related security spending (\$46-368 billion), and energy procured for government activities (\$88 billion).** These investments account for a larger fraction of federal discretionary spending (between 18-43%) than might be expected given the energy intensity of the economy (energy expenditures account for 8% of total GDP in 2010). Fees for services rendered to the public through these investments – such as payments for electricity services provided by government electric utility assets and rents or royalties for the use of public lands for energy production – only offset a small fraction of this spending (\$27 billion).
- **Most energy-related public investment supports petroleum-based transportation. 70-90% of the investment (\$175-500 billion) supports transportation, such as highway construction and repair, airports, jet fuel for military aircraft, and securing oil supply.** This is an outsized fraction of public energy investment – transportation accounted for 48% of energy expenditures in 2010 and 28% of primary energy consumption.
- **Very few investments focus on approaches that reduce emissions.** Only 4-9% (\$21 billion) of the energy-related investments – in rail, transit, and federal building efficiency – likely reduces emissions of greenhouse gases which contribute to climate change. Of that amount, most of the \$4 billion for federal building efficiency was temporary economic stimulus spending.

³ Note also that energy use associated with procurement for all direct government activities would be included in these estimates, thereby leading to potential double counting of the activities included in many other budget items. We deal with this by subtracting off all energy procurement costs associated with other spending which we include elsewhere in the landscape, with the exception of the energy security spending.

⁴ We provide a range of costs to reflect variation in the methodology used in published literature to attribute defense spending to energy security purposes. Further, we exclude energy procurement costs from this amount.

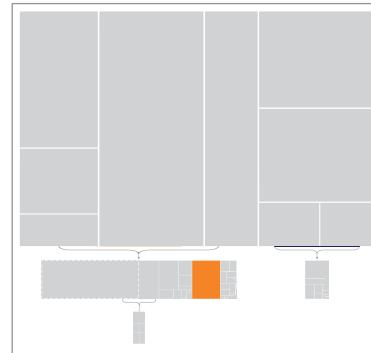
⁵ Taken from a calculation based on IEA and EIA data in UNEP (2011), "Global Trends in Renewable Energy Investment 2011", http://www.unep.org/Renewable_Energy_Investment/

- **Energy-related security spending is substantial, but the amount is uncertain.** We use a range (\$46-368 billion) of spending to reflect the range of published estimates.

1.1 GOVERNMENT PROCUREMENT

Americans spent nearly \$1.18 trillion for the energy they consumed in 2010⁶, equivalent to roughly 8.1% of the U.S. gross domestic product (GDP) that year (\$14.5 trillion). Direct federal government procurement of energy accounted for nearly \$20 billion of that total in 2010⁷, or about 1.6% of total national energy consumption. Of that amount, over \$15 billion⁸ was for Department of Defense (DOD) activities, and much of that for jet fuel procurement.

However, these figures understate the energy impact of federal government procurement as they do not include energy consumed to provide non-energy goods and services to the federal government (for example, associated with employee travel, the activities of government contractors, or the energy used to manufacture goods purchased by the government). We are not aware of a systematic assessment of the magnitude of this impact, but we can make a very rough estimate of its size. Federal government consumption of goods and services and government investment contributed \$1.22 trillion to the U.S. GDP in 2010, or 8.4%.⁹ Assuming that the energy intensity of goods and services procured for federal and non-federal activities are roughly similar, federal procurement (largely funded through the annual budget process) may significantly influence on the order of \$100 billion annually in energy spending. Reducing this to account for procurement activities already accounted for in non-security energy-related federal government activities listed elsewhere in this paper, we arrive at roughly \$88 billion in energy spending.



While a number of legislative mandates and executive orders have been put in place which can influence the greenhouse gas emissions associated with direct government procurement of energy, the indirect emissions associated with government procurement have largely not been addressed.¹⁰

6 Energy Information Administration, Annual Energy Outlook 2011 estimates for energy expenditures in 2010: <http://www.eia.gov/oaia/aeo/tablebrowser/#release=AEO2011&subject=0-AEO2011&table=3-AEO2011®ion=1-0&cases=ref2011-d02091a>

7 A rough estimate for 2010 costs taken from OMB presentation at GovEnergy 2011: http://www.govenergy.com/2011/Files/1Presentations/Policy%20Planning%20and%20Leadership/Session7_CVallina.pdf

8 Department of Defense Annual Energy Management Report for 2010 - [http://www.acq.osd.mil/ie/energy/DoD_AEMR_FY2010_July_2011\[1\].pdf](http://www.acq.osd.mil/ie/energy/DoD_AEMR_FY2010_July_2011[1].pdf)

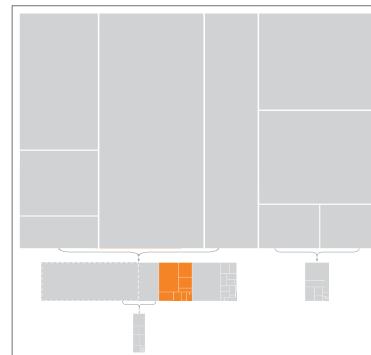
9 Bureau of Economic Analysis, National Data, National Income and Product Accounts Tables, Table 1.1.5 - <http://www.bea.gov/iTable/iTable.cfm?ReqID=9&step=1>

10 Executive Order 13514 mandated agencies to set targets for reductions in all GHG emissions from non-mission critical activities (i.e. excluding jet fuel for military operations). These resulted in a government-wide aggregate target of a roughly 28% reduction in direct GHG emissions from a 2008 baseline by 2020. Similar targets for a small subset of indirect emissions have also been set, but at much lower levels (13%) and covering only a fraction of such emissions – such as from federal employee commuting and travel. For details, see <http://www.whitehouse.gov/administration/eop/ceq/initiatives/sustainability>.

1.2 INFRASTRUCTURE

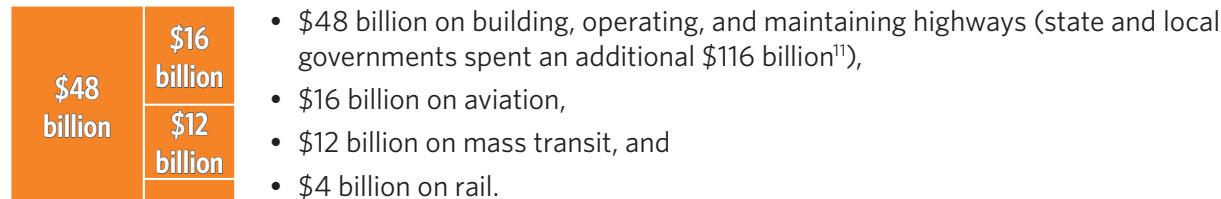
Federal government investments related to infrastructure provision and maintenance which substantially influence energy production and use, totaled over \$100 billion in 2010, including:

- \$80 billion on transportation infrastructure,
- \$16 billion on expenses associated with providing electricity services from federally owned electric utility assets,
- \$4 billion on energy efficiency improvements in federal buildings and facilities,
- \$2.5 billion on fossil energy-related environmental management, and
- \$1.1 billion on nuclear energy-related environmental management.



1.2.1 Transportation

In 2010, over \$80 billion in spending on transportation infrastructure by the U.S. Department of Transportation was authorized, including:



- \$48 billion on building, operating, and maintaining highways (state and local governments spent an additional \$116 billion¹¹),
- \$16 billion on aviation,
- \$12 billion on mass transit, and
- \$4 billion on rail.

A substantial fraction of highway (roughly \$32 billion in 2010) and mass transit (about \$5 billion) spending was funded through a dedicated source of revenue, the Highway Trust Fund. The trust fund is supported by revenues collected annually through motor vehicles fuel and other taxes (see revenue collections below).

1.2.2 Electricity services from federally owned assets

In 2010, federal government entities invested \$16 billion in capital, operating, and marketing expenses associated with providing electricity services from federally owned electric utility assets.

- \$10.7 billion in spending¹² by the Tennessee Valley Authority (TVA), a federally owned corporation that owns, operates, and sells power from a fleet of primarily coal (46% of generation), nuclear (32% of generation), and hydropower facilities (8% of generation).¹³



¹¹ Congressional Budget Office Testimony before the Committee on Finance, US Senate, May 17, 2011 - <http://www.cbo.gov/ftpdocs/121xx/doc12173/05-17-HighwayFunding.pdf>

¹² TVA is funded through power and transmission sales revenue and not subject to annual appropriations

¹³ TVA was originally an economic development-focused organization, initially tasked in 1933 with development of a river basin common to seven states to provide power to those who did not previously have access to power.

- \$5.1 billion in spending by federal Power Marketing Administrations (PMAs)
¹⁴ within the DOE which market the power from hydroelectric facilities owned by federal agencies (just over half of the 96 GW of installed U.S. hydroelectric capacity) to local utilities.
- An estimated \$220 million to support construction as well as operations and maintenance on the over 20 GW of Army Corps of Engineers hydropower facilities.¹⁵
- An estimated \$52 million to support hydropower facility upkeep at nearly 15 GW of Bureau of Reclamation hydropower facilities.¹⁶

This spending is substantially funded through offsetting collections described in greater detail below.

1.2.3 Energy-efficiency investments in government buildings and facilities

In 2010, the federal government invested over \$4 billion in energy efficiency improvements in government buildings and facilities, more than double the investment made in 2009.¹⁷ However, this investment was made largely using Recovery Act funding, and therefore may not represent likely future levels of investment in this area.

1.2.4 Environmental and health impacts of fossil energy

Federal spending related to addressing the environmental or health impacts of fossil energy totaled \$2.5 billion in 2010, including:

- \$839 million for oil pollution prevention and cleanup activities from the Oil Spill Liability Trust Fund,
- \$691 million for sport fish restoration and boating safety from the Aquatic Resources Trust Fund,
- \$596 million for compensation, medical, and survivor benefits to coal miners and survivors from the Black Lung Disability Trust Fund,
- \$242 million for reclamation of abandoned mines from the Abandoned Mine Reclamation Fund,
- \$104 million for land preservation and restoration from the Leaking Underground Storage Tank Trust Fund, and
- \$87 million for advancing safe and secure transportation through pipelines from the Pipeline Safety Fund.

This spending is funded through offsetting collections deposited in the dedicated funds noted above.

¹⁴ The largest PMA, the Bonneville Power Administration (BPA), also provides transmission services across the Northwest for non-federal generators with administrative expenses in FY 2010 of just under \$3.7 billion. BPA has self-financing authority and is not subject to annual appropriations through its power and transmission service sales and its authority to borrow from the Treasury. The remaining PMAs had a combined budget for administration of nearly \$1.4 billion, also funded in part through sales. However, the use of any proceeds from sales by these PMAs is subject to annual discretionary appropriations.

¹⁵ Actual budget authority provided for hydropower in 2010 is not specified in the FY 2012 budget – the reported amount is an estimate based on the requested spending in 2010 for hydropower (\$230 million) and the roughly 5% lower actual spending authorized by Congress in 2010 for all Army Corps construction and O&M.

¹⁶ An estimate based on actual obligations in 2010 by the Bureau of Reclamation in its FY 2012 budget request which contributed to the Bureau's progress towards its goal to "Secure America's Energy Resources."

¹⁷ This estimate, taken from an OMB presentation at GovEnergy 2011 cited in 7 above, represents obligations of funds rather than new budget authority, and therefore includes the impacts of Recovery Act funding.

1.2.5 Environmental and health impacts of nuclear energy

Federal spending related to the environmental or health impacts of nuclear energy totaled nearly \$1.1 billion in 2010, including:

- \$574 million for uranium enrichment decontamination and decommissioning,
- \$245 million for environmental clean-up of non-defense related government nuclear energy R&D and production facilities,
- \$138 million for the Federal Emergency Management Agency's Radiological Emergency Preparedness Program, and
- \$131 million for long-term nuclear waste disposal.¹⁸

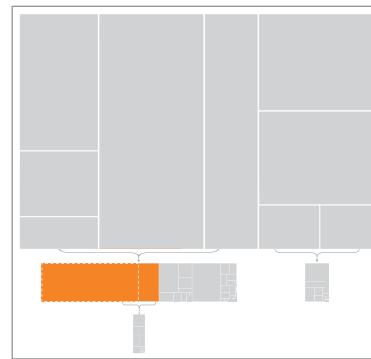
Some of this spending is funded through offsetting collections described below.

1.3 ENERGY-RELATED SECURITY SPENDING

The costs to government associated with securing energy supplies, primarily supply and transport of oil products from the Persian Gulf, are substantial but difficult to estimate. A significant challenge for making such an estimate is determining the attribution of defense costs to energy security rather than other defense purposes. The defense budget does not attempt such attribution, nor provide regional and mission-specific costs which would allow for such attribution to be carried out easily.

Here, we quote a range of costs based on two recent peer-reviewed estimates. The lower end – roughly \$50-100 billion annually in 2004

– is taken from an analysis by DeLucchi and Murphy (2008) which attempted to assess the potential future defense savings which would reasonably realized by Congress from a hypothetical withdrawal from the Persian Gulf.¹⁹ The higher end – over \$400 billion in 2007 – is taken from Stern (2010)²⁰, and uses a novel quantitative method which ties cost attribution to the geographical and temporal distribution of naval carriers.²¹



Note that these estimates reflect the largest component of federal energy-related security spending. Additional contributions include:

- At least \$50 million in funding (out of the roughly \$2 billion annually for non-proliferation programs in the National Nuclear Security Agency of the DOE) used for nuclear energy oversight

¹⁸ As a result of the Nuclear Waste Policy Act of 1982, the federal government has assumed the responsibilities and risks associated with the provision of long-term waste management – in return for a \$0.001 / kWh charge on nuclear electricity generation (which has accumulated a significant surplus, as discussed in the next section).

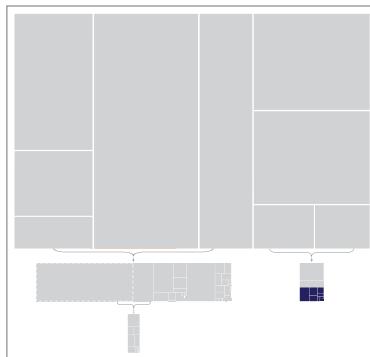
¹⁹ DeLucchi and Murphy (2008), "US military expenditures to protect the use of Persian Gulf oil for motor vehicles", Energy Policy 36 (2008), 2253-2264. Note that their estimate relies primarily on modest inflation (1-2% annually) of previous attempts at comprehensive analysis of the DoD budget by mission and region which dated from 1990. Given the substantial re-alignment of the armed forces after the cold war which had only just begun and the emerging importance of the Persian Gulf in the intervening two decades, it is very likely that this approach is extremely conservative.

²⁰ Stern (2010), "The United States cost of military force projection in the Persian Gulf, 1976-2007", Energy Policy 38 (2010), 2816-2825.

²¹ Historically, carriers have been prerequisites for the use of any force at any location and time and thus proxies for regional orientation of all U.S. military forces – and the fleet of carriers has, since 1990, been largely deployed in the Persian Gulf. One criticism of this approach is that it is largely predicated on the proposition that the bulk of U.S. defense spending is variable rather than fixed costs in the long term – and thereby may not appropriately account for defense spending associated with readiness for unanticipated future threats.

through the International Atomic Energy Agency can be considered a nuclear energy security-related cost,

- \$240 million to maintain the Strategic Petroleum Reserve,
- Other security and follow-on spending in Homeland Security, the State Department, National Security Agency, Central Intelligence Agency and Veterans Affairs which reflect the fully loaded costs of energy security-related engagements (not estimated here).²²



1.4 OFFSETTING COLLECTIONS AND FEES FROM ENERGY SUPPLY AND CONSUMPTION ACTIVITIES

Some of the public investments outlined above (as well as some regulatory activities discussed below) result in the provision of services to specific individuals or entities, such as generation and transmission of electricity from federally owned hydropower facilities. These investments were often offset (at least in part) by collections of fees or charges levied on those individuals in return for the services rendered. The offsetting collections from the public in return for government provision of goods or services related to energy supply and consumption activities totaled roughly \$27 billion in 2010, including:

- \$10.9 billion from sales of energy and transmission services rendered by TVA,
- \$5.3 billion in royalties, bonuses, and rents from offshore energy-related activities,
- \$3.8 billion in royalties, bonuses, and rents from onshore energy-related activities,
- \$3 billion from sales of energy and transmission services rendered by BPA,
- \$1.8 billion in revenue from electricity and transmission services rendered by other PMAs,
- \$910 million on fees collected from nuclear power facilities by the Nuclear Regulatory Commission (NRC),
- \$754 million in collections from a \$0.001 / kWh charge (and \$1.1 billion in accrued interest on nearly \$24 billion in accumulated trust fund balances) on nuclear electricity generation for the Nuclear Waste Disposal Fund for federal government provision of long term nuclear waste disposal services,
- \$298 million in fees collected by the Federal Electricity Regulatory Commission (FERC),
- \$252 million in reclamation fees (and \$55 million in accrued interest) to support the Abandoned Mine Reclamation Fund, and
- \$100 million in fees collected by the North American Electric Reliability Corporation (NERC).

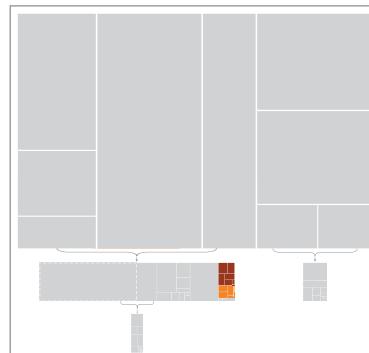


²² See Bilmes and Stiglitz (2006), "The Economic Cost of the Iraq War" for an attempt at quantifying some of these associated costs.

2. Energy incentives and taxes

Energy-related incentives (\$46.7 billion) are an order of magnitude smaller than public investments. Energy-related taxes collected by the government (\$47.6 billion) are also just a fraction of investment spending. However, they are central to the public debate on the role of government, as the corresponding revenue collection and spending measures are often designed to influence energy production and use by the private sector. The incentives consist of:

- \$30.2 billion in tax expenditures – tax breaks or special tax provisions which substantially incentivize certain energy-related activities, and
- \$16.5 billion in energy-related grant and loan programs.



Key lessons from the landscape of incentives and taxes are:

- **Few energy incentives support low-emissions technologies.** Just 35% of the incentives (\$16.7 billion) support low-emissions technologies, including \$11.1 billion in renewable energy and efficiency tax breaks and \$5.5 billion in grants and loans for emissions-reducing technologies.
- **Most tax breaks that reduce emissions (\$9 billion) are temporary stimulus measures** associated with the Recovery Act and have expired or will expire by the end of 2012.
- **The incentives are a substantial source of global clean energy technology financing,** as climate technology grants and loans are comparable to global technology venture capital funding in 2010 (\$7.8 billion), while the tax expenditures represent a sizeable fraction of U.S. private investment in renewable projects in 2010 (\$34 billion).
- **Energy-specific taxes resulted in \$47.6 billion in revenues in 2010, 2% of government receipts.** As these taxes are levied entirely on fossil fuels, these taxes likely reduce emissions which contribute to climate change. The tax revenues roughly offset energy incentive spending.

2.1 TAX EXPENDITURES

Energy tax expenditures – estimates of the cost to government in foregone revenues associated with various tax breaks – totaled \$30.2 billion in 2010, including:

- \$8.5 billion from tax provisions and preferences which substantially impact fossil fuel producers and generating facilities, such as the impact of a deduction for domestic oil and gas production and refining, and the use of last-in-first-out accounting.
- \$6.4 billion from renewable tax provisions, primarily tax credits and grants in lieu of those tax credits for investment in renewable electricity generation,²³
- \$6.3 billion from biofuels tax credits, primarily from reduced excise taxes for alcohol fuels,
- \$4.8 billion from tax credits for energy efficiency improvements in buildings, transport, and industry,



²³ CPI's recent [case study analysis of policy impacts on renewable finance](#) provides a more detailed view of the impact of these tax expenditures and other government subsidies on the economics of individual renewable electricity generation projects, showing that they cover roughly 40-45% of project costs. CPI's ongoing work on renewable energy financing is focused on addressing the extent to which this support is effectively and efficiently leveraging private sector funds to fuel growth in low-carbon energy use.

- \$3.3 billion from transportation tax benefits such as subsidies for employee parking,
- \$908 million from tax benefits to the nuclear industry, primarily a reduced tax rate on funds set aside for nuclear decommissioning, and
- \$98 million from other transmission and energy-related tax provisions.



2.2 ENERGY-RELATED GRANT AND LOAN PROGRAMS

Grant and loan programs largely focused on research, development, demonstration, or deployment relevant to energy supply or conservation accounted for roughly \$16.5 billion in spending in 2010.

- \$5.1 billion in grants to states and tribes to aid low-income households with high energy costs through the Health and Human Services Department's Low Income Home Energy Assistance Program,
- \$4.9 billion for energy technology grant and loan programs (including magnetic and inertial confinement nuclear fusion R&D programs) in the Department of Energy (DOE),
- \$4.5 billion for the DOE's basic science programs (excluding fusion energy)²⁴,
- \$1.2 billion for the Department of Defense's clean energy technology R&D programs,
- \$453 million in grant and loan programs at the Department of Agriculture to support rural energy deployment, biofuels, and related opportunities.²⁵ Of this amount, \$267 million was provided to cover the costs to government to support roughly \$850 million in loans for rural energy. In addition to these programs, the USDA also had the authority to provide \$7.1 billion in direct loans in FY 2010 to rural electric cooperatives to support upgrades and additions to their generation, transmission and distribution assets. These loans were expected to have no net budgetary impact and did not require a set aside of budgetary authority in 2010 to cover costs,
- \$133 million for the Environmental Protection Agency's clean energy technology programs,²³
- \$124 million for NASA's programs focused on clean energy technology,²³
- \$125 million for the Department of Transportation's clean transportation programs,²³
- \$26 million for NSF clean energy technology related R&D programs,²³ and
- \$18 million for NIST's clean energy innovation programs.²³

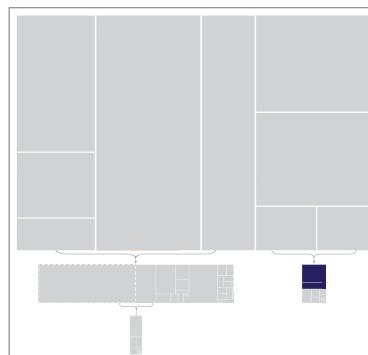


²⁴ Note that DOE's basic science efforts include significant funding for activities which may not be driven by any near-to-mid-term - or even foreseeable long-term - application to energy supply or use, but may nevertheless be enabled by the Department of Energy's national laboratories or facilities.

²⁵ Taken from the FY 2011 Federal Climate Change Expenditures Report to Congress, reflecting agency reported FY 2010 budget authority for climate change technology programs.

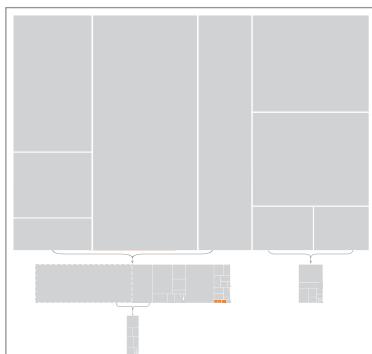
2.3 GOVERNMENT RECEIPTS FROM TAXES ON ENERGY SUPPLY AND CONSUMPTION ACTIVITIES

The federal government collected approximately \$48 billion in revenues from taxes or other collections that involve the exercise of the federal government's sovereign power and are targeted at energy supply and consumption activities. This excludes revenues from broadly applicable taxes such as the general corporate or individual income tax, but includes the following:



- \$35 billion in receipts from motor vehicle fuels and related taxes (mostly from an \$0.183 / gallon tax on gasoline and a \$0.243 / gallon tax on diesel) deposited in the Transportation Trust Fund to cover (a fraction of) federal expenses related to highway and transit infrastructure,
 - \$10.6 billion in receipts for airport and air travel taxes deposited in the Airport and Airway Trust Fund to support commercial aviation activities and regulation,
 - \$650 million in collections from motor boat fuel and other taxes for the Aquatic Resources Trust Fund for sport fish restoration and boating safety.
 - \$596 million in collections from a coal excise tax (\$1.10 per ton on under-ground-mined coal, \$0.55 per ton on surface-mined coal) deposited in a Black Lung Disability Trust Fund to cover miner health expenses,
 - \$495 million in excise taxes on oil (\$0.08 / barrel) and fines to support the Oil Spill Liability Trust Fund to cover claims from injured parties resulting from oil spills,
 - \$169 million from a \$0.001 / gallon tax on motor fuels (and \$134 million in accrued interest) to support the Leaking Underground Storage Tank Trust Fund for preventing and responding to releases from the underground stor-age tanks, and
 - \$90 million from user fees assessed to pipeline and LNG storage facility operators for the Pipeline Safety Fund.

3. Regulation and information provision



Federal government support of regulation and information collection makes up a tiny fraction of the budget. The funding supports activities such as the Environmental Protection Agency's (EPA) regulation of air pollutants that cannot be implemented or enforced in the absence of the resources provided. The Federal government spent roughly \$3 billion in 2010 on federal regulatory and information collection and dissemination activities related to the supply and consumption of energy, including:

- \$1 billion for the EPA's regulatory activities in support of their goal to take action on climate change and improve air quality (excluding clean energy technology spending),
 - \$910 million for oversight of the safety and security of nuclear power facilities by the Nuclear Regulatory Commission (NRC),

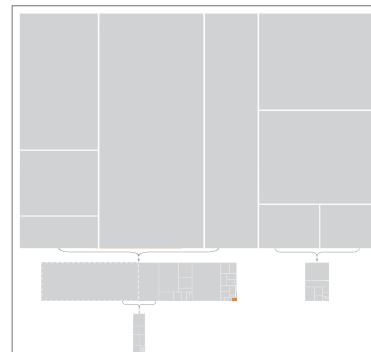
- \$579 million for regulatory activities surrounding energy production on federal lands and oceans by the Department of the Interior's Energy programs,
- \$298 million for federal regulation of electricity markets by the Federal Energy Regulatory Commission (FERC),
- \$100 million for electricity reliability coordination and oversight by the North American Electric Reliability Corporation (NERC), and
- \$111 million for federal energy information collection by the DOE's independent statistical agency, the Energy Information Administration (EIA).

The activities of FERC, NERC, and NRC are supported through user fees, though the use of those fees to cover their expenses is subject to annual congressional authorization through the appropriations process.

4. International climate and energy assistance programs

Federal investments in international climate and energy assistance programs total \$1 billion and include:

- • \$421 million for international climate assistance in the Department of Treasury,²⁶
- • \$383 million for U.S. Agency for International Development programs focused on climate,²⁶ and
- • \$199 million for State Department climate assistance activities.²⁶



What have we missed?

The following budget items may have significant impacts on patterns of energy supply and use but were more difficult to estimate and omitted from this document:

PUBLIC INVESTMENTS

- **Medicare and Medicaid Spending Tied to Energy Pollution Health Impacts:** Pollution largely from fossil fuel use – such as the emissions of SO_x, NO_x, and particulate matter – have been associated with significant negative health effects. These effects, in turn, can impact government spending on health-related programs such as Medicare and Medicaid. One recent study²⁷ estimated that these programs are likely to bear the bulk of the health care costs associated with these emissions, as they are responsible for providing insurance to the most vulnerable populations. While the study estimated that emissions reductions from the Clean Air Act had reduced federal spending by more than \$12 billion annually in 2010, no estimate of the costs associated with the remaining emissions from energy use was made.
- **Nuclear Accident Risk Coverage:** The Price-Anderson Nuclear Industries Indemnity Act of 1957 provides a government-run insurance fund to partially indemnify the nuclear industry against liability claims in the event of a nuclear accident. Each nuclear facility is required to obtain the maximum amount of private liability coverage (presently, roughly \$400 million),

²⁶ Taken from the FY 2011 Federal Climate Change Expenditures Report to Congress, reflecting agency reported FY 2010 budget authority for international climate assistance.

²⁷ Gardiner (2011) "Saving Lives and Reducing Health Care Costs: How Clean Air Act Rules Benefit the Nation" used the results of EPA's prospective analysis of the future benefits of the Clean Air Act to estimate the annual savings from reduced emissions to the federal government.

but the government will cover all liabilities in excess of this amount, up to a total of \$12 billion, through a retroactive charge on all firms owning commercial nuclear reactors.²⁸

INCENTIVES

- **HUD Energy Efficiency Grants and Loans:** The Department of Housing and Urban Development Agency promotes energy efficiency through upgrades in the stock of public housing as well as through its authorities to provide financing and other assistance to homeowners. We have not estimated the budgetary impacts of these efforts.
- **Accelerated Depreciation:** Provisions of the tax code that allow accelerated depreciation schedules for capital assets for tax purposes (faster than their economic depreciation) which are not necessarily energy-industry specific resulted in nearly \$30 billion in net tax expenditures in 2010. In particular, economic stimulus measures allowed companies to take 50% or 100% bonus depreciation for a significant fraction of the capital assets they placed into service since 2008. This provided substantial tax benefits to the capital intensive industries largely responsible for the nation's energy supply and use. However, as we were not able to find industry specific assessments of these impacts, we have not been able to estimate the fraction of the corresponding tax expenditures which can be substantially attributed to energy supply and use.
- **Housing Tax Breaks:** Housing-related tax breaks (a total of nearly \$190 billion in tax expenditures in 2010) may substantially impact energy use and emissions – for example, if they drive new housing development (thereby increasing energy use) or increase the relative proportion of owned vs. rented properties (possibly reducing the impact of market failures associated with efficiency improvements on rental properties). However, we do not include these provisions as we are not aware of work that establishes the size and sign of these energy impacts.
- **Foreign Tax Credit:** A change in the rules for a tax credit currently available to oil and gas companies for the foreign taxes they pay has been included by the current administration in its proposals to remove tax preferences for fossil fuels. However, as the impact of this rule has not been tracked as a tax expenditure by the federal government, no estimate of its cost in 2010 is available. However, the American Petroleum Institute estimates that this change in rules would cost the industry \$10.7 billion from 2012-2021 – consistent with the administration's estimates of annual savings of approximately \$1 billion annually.
- **Research and experimentation tax credits:** The election to expense research and experimentation costs, as well as a tax credit available to firms that increase their investment in research activities from previous years, provide tax benefits to firms which engage in R&D. We have not been able to estimate the fraction of these tax expenditures that reflect tax benefits for energy-related R&D.

REGULATION AND INFORMATION COLLECTION

- **Budget Impact of Regulation:** Regulation of energy activities impacts private-sector activities and can ultimately have an impact on private-sector income as well as demand for government-provided services (such as health and unemployment insurance). If the regulation has substantial economic impacts, these may lead to significant impacts on tax revenues as well as government spending. We have not attempted to assess these impacts.

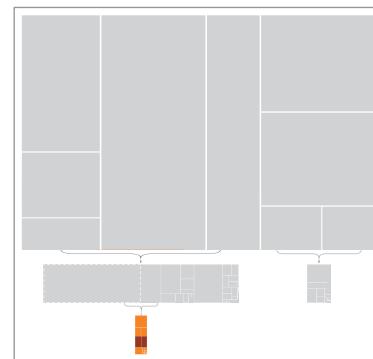
28 See Koplow (2011), "Nuclear Power: Still Not Viable Without Subsidies" for a review of attempts to quantify the cost to government of providing accident liability coverage.

INTERNATIONAL CLIMATE AND ENERGY ASSISTANCE

- **OPIC and EXIM:** The Overseas Private Investment Corporation (OPIC) and the Export-Import Bank (EXIM) provide financial assistance in the form of direct loans, guarantees, and other financial and insurance products to U.S. and international private sector actors for overseas activities including those focused on energy. OPIC provided \$642 million in loans and risk insurance to 19 renewable energy projects in emerging economies over from 2008-2010. In 2011, it roughly tripled its commitment rate, providing \$1.1 billion in financing for renewable projects.²⁹ EXIM authorized \$332 million in financing for renewable projects in FY 2010, representing a small fraction of EXIM's \$5.5 billion in loan and guarantee transactions supporting energy-related exports in FY 2010.³⁰ The operations of EXIM and OPIC are self-financed, but we have not estimated the fraction of their collections that can be attributed to their energy-related financing activities.

How much does the federal government spend on climate change mitigation?

Climate change mitigation is funded by the federal government through discretionary spending and tax expenditures (see Appendix A for a summary of the major categories of federal spending, or [here for a more detailed discussion](#)). The vast majority of that spending must be re-authorized by Congress either annually or every few years. The Climate Change Expenditure Report for FY 2011 submitted by the President to Congress (which was requested in the Interior appropriations bill for 2010) provides estimates for federal spending related to climate change mitigation in certain specific categories – primarily incentives and international assistance:



- **Discretionary Budget Authority (roughly \$7 billion)**
 - » Climate Change Technology Programs (\$5.5 billion – primarily Department of Energy (DOE) applied energy technology research, development, and demonstration spending)
 - » International Assistance (\$1 billion – primarily State Department, but not all mitigation)
 - » Loan Programs (no new authority in 2010 – primarily DOE Advanced Technology Vehicle Manufacturing Loans and Innovative Technology Loan Guarantees)
 - » Administration of Regulations / Information Provision (EPA, DOE, Department of the Interior (DOI) – fraction relevant to climate mitigation not estimated)
 - » Mitigation of Emissions from Federal Government Activities (Defense, General Services Administration (GSA) – fraction relevant to climate mitigation not estimated)
- **Tax Expenditures (roughly \$11 billion)**
 - » Energy tax credits and grants for renewable electricity investment or generation, building energy efficiency improvements, plug-in hybrid or other advanced, efficient vehicles, energy efficient appliances, etc. (\$11 billion – updated with FY 2012 budget information for actual 2010 tax expenditures). All of these provisions have expiration dates in the next five years – any extension will require budgetary resources which are subject to the annual budget process.
 - » Bonus Depreciation (impact specifically for climate mitigation not estimated)
 - » Research and Experimentation tax credit – a tax credit available to firms that increase their

29 OPIC Press release, <http://www.opic.gov/news/press-releases/2009/pr120211> and [FY 2010 Annual Report](#)

30 [EXIM FY 2010 Annual Report](#)

investment in research activities from previous years (fraction for climate mitigation technologies not estimated).

So, the total level of expenditures authorized in FY 2010 for climate mitigation activities totals around **\$18 billion**, or about a half a percent of federal expenditures. These categories neither cover all mitigation spending nor provide an easy break-out of mitigation efforts. We add to this mitigation activities identified in our survey of energy-related public investments, totaling roughly **\$20 billion**:

- \$12 billion for mass transit,
- \$4 billion for rail, and
- \$4 billion for energy efficiency upgrades to Federal buildings and facilities

This leads to a total of roughly \$38 billion for climate mitigation activities in FY 2010. However, roughly \$13 billion of this (most of \$4 billion for energy efficiency upgrades, and nearly \$9 billion in tax incentives) represents temporary spending associated with the Recovery Act.

The U.S. supports clean energy and energy efficiency deployment in large part through tax policies. Tax policies have significant drawbacks relative to incentives through direct spending -- they are less transparent and more susceptible to gaming, and they often require net income or profits in order to benefit from them, making them less efficient as a policy tool. However, they have the advantage of being less politically vulnerable than direct spending in the U.S. budget process.

Federal government support is a substantial and significant driver of the clean energy sector, particularly in innovative clean energy technologies. The budget authority provided for climate change technology programs (which are largely cost-shared R&D grants) in FY 2010 - \$5.5 billion - can be compared to the level of global venture capital investments in clean energy in 2010 as estimated by the Cleantech Group - roughly \$7.8 billion (\$5.3 billion in North America). The total value of the tax expenditures - \$11 billion - can be compared with the total level of investment in clean technologies reported by Bloomberg New Energy Finance for the U.S. in 2010, \$34 billion.

Appendix A. How does the budget process (not) work?

In theory, the process that determines the new budget authority available for obligation and expenditure by agencies of the Federal government for fiscal year 2013 (which runs from October 1st, 2012 to September 30th, 2013) would proceed as follows:

1. **Formulation of the President's Budget** – In principle, the President's budget reflects the policy priorities of the President and includes proposed discretionary spending levels, estimated mandatory spending levels and tax expenditures, as well as proposals for any policy changes that may impact expenditures or revenues.
 - *Agency Budget Formulation (summer of 2011)* – each government agency formulates its request for discretionary budget authority (as well as estimates for mandatory spending and any policy proposals with budgetary impacts) through an internal budget process.
 - *Agency Request to OMB (September 2011)* – after reaching internal agreement, a budget request is sent to the White House Office of Management and Budget (OMB), which is responsible for reconciling these requests, estimates, and policy proposals with the President's priorities and assembling the President's overall request.
 - *President's Request to Congress (February 2012)* – the budget is published by OMB and delivered to Congress.
2. **Action by Congress (in both House and Senate)** – Congress is given the power of the purse by the Constitution so that Federal expenditures proposed by the President on the basis of national policy goals are reconciled with varied interests at the state (the Senate) and local (House of Representatives) levels. Continuing operations of much of the Federal government (in particular, activities supported by discretionary spending) require that Congress enact appropriation laws each year funding its activities.
 - *Budget Committees in the House and Senate – Budget Resolution (April 2012)* – the budget committees in the house and senate review the President's budget proposal and determine the overall level of expenditures and revenues for the government as a whole, as well as the allocation of expenditures among appropriations committees. Budget resolutions are not signed into law by the President, and may not even be reconciled between the House and Senate.
 - *Appropriations (and possibly Finance or Ways and Means) Committees – Appropriations (and/or Tax) Bills (summer 2012)* – Appropriations committees then have the responsibility of drafting bills deciding the detailed allocation of funds among the agencies in their jurisdiction, while any proposed changes to revenues or many mandatory programs are handled by the Finance or Ways and Means Committees.
 - » The balance of local and national policy interests needed to pass these bills every year has historically been the primary task of Appropriations Committees.
 - » The committees do this by focusing on congressionally directed spending, or "earmarks," to negotiate passage of these bills, often with large bipartisan majorities, but leaving largely intact the majority of the President's request.
 - » For example, the Energy and Water appropriations committees have jurisdiction over the Department of Energy's programs as well as water infrastructure related activities undertaken by the Army Corps of Engineers and the Bureau of Reclamation. The insertion of an earmark for water infrastructure projects in coal country in the bill can help convince their representatives to vote for a bill with significant funds for renewable electricity which they may otherwise oppose.

- *Appropriations Bills Passed (September 2012)* - After the Senate and House versions of each appropriation bill are reconciled in a Conference, they are passed and signed into law by the President prior to the end of the fiscal year.

While the formulation of the budget actually does proceed largely on schedule each year, action by Congress on appropriations bills have been completed on time only three times in the last 30 years. In recent years, few appropriations bills have been passed prior to the start of the fiscal year. So, the Federal government operates for much of the year by virtue of short-term stop-gap measures known as “continuing resolutions” which authorize continued spending at levels based upon the previous fiscal years’ appropriations (with some modifications). When (or if) a deal is reached between the leadership in the House, Senate, and the White House, all remaining unfinished appropriations bills are combined into a single bill (an “omnibus”) which is pushed through by leadership.

In the most recent congress, a ban on “earmarks” has been instituted. While this ban has the significant potential benefit of eliminating federal spending that is directed to a specific local purpose or project rather than for programs which are intended to promote the greater national good, it also creates some challenges:

- Without the flexibility to use earmarks to trade off local concerns in support of national policy interests, more of the policy substance of appropriations bills will be subject to partisan and politically driven negotiation.
- Reaching agreement on spending for purposes that have been politicized, such as renewable energy innovation, will be more challenging. The earmark ban effectively provides a procedural obstacle to continued or expanded spending in controversial areas.
- Without the transparency that had been imposed on the earmark process, any steps that are taken to address parochial interests in appropriations behind closed doors are now likely to be less, rather than more, visible to the public.