TESTIMONY

Statement of
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Technology Neutrality in Energy Tax: Issues and Options

before the
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Chairman Baucus, Senator Grassley, and Members of the Committee, thank you for the invitation to testify this morning on the issue of technology neutrality in the treatment of energy in the tax system. I make the following points in my testimony today.

- Energy policy is shaped in important ways by the federal tax system. While taxes are one instrument of tax policy, subsidies in the form of accelerated depreciation, percentage depletion, production tax credits and investment tax credits are more commonly used instruments in the tax code.
- Technology neutrality can be defined in a variety of ways. It can be defined in terms of the effective tax rate on new investments in the sector, in terms of the levelized cost of power from new investments or in terms of specific policy goals that motivate energy tax incentives.
- Efficiency is best achieved by setting taxes on energy sources that have negative externalities associated with their production or consumption. Similarly technological neutrality is most easily achieved through the use of taxes.
- A second-best technological neutrality can be achieved through the use of subsidies but it is more difficult to do so. In particular it is very difficult to level the playing field across different non-polluting energy sources through the use of subsidies.

I. Background

Federal taxes specifically related to energy production or consumption are dominated by the federal motor fuels excise tax for the Highway Trust Fund. This 18.3¢ per gallon tax collected just under $40 billion in Fiscal Year 2006. In contrast taxes on coal to fund the Black Lung Disability Trust Fund collected $639 million in FY 2006 and the Leaking Underground Storage Tank tax collected $226 million in that year.[1]

The tax code has become an important instrument for energy policy over the past decade. Tax provisions for accelerated depreciation, percentage depletion, deductions and tax credits are different tools for reducing the cost of producing energy. The Energy Information Administration recently released a report detailing federal financial interventions in energy markets and notes that expenditures through the tax system account for nearly two-thirds of all federal support (see Table 1 below).[2]

Subsidies through the tax code play an especially important role in supporting fossil fuel and renewable energy production. They play a smaller role in supporting nuclear power production though this could change over the next decade. Production tax credits for new nuclear power production put in place in the Energy Policy Act of 2005 could significantly increase federal tax expenditures for this source of electricity.

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1 Statistics taken from the Budget of the United States (2009), Historical Tables, Table 2.4. See Metcalf, Gilbert E. 2007. Federal Tax Policy towards Energy. *Tax Policy and the Economy* 21:145-184 for further discussion of the federal taxes on energy along with a comparison and contrast with other countries.

2 Energy Information Administration. 2008. *Federal Financial Interventions and Subsidies in Energy Markets 2007*. Washington, DC: EIA SR/CNEAF/2008-01.

Table 1. Federal Support for Energy: FY 2007 ($ Millions)			
Fuel	Tax Expenditures	Total	Share of Total
Coal*	2,660	3,302	81%
Natural Gas and Petroleum Liquids	2,090	2,149	97%
Nuclear	199	1,267	16%
Renewable Energy	3,970	4,875	81%
Electricity (not fuel specific)	735	1,235	60%
End Use and Conservation	790	3,754	21%
Total	10,444	16,582	63%

Source: Table ES-1, Energy Information Administration. 2008. *Federal Financial Interventions and Subsidies in Energy Markets 2007*. Washington, DC: EIA SR/CNEAF/2008-01.

* - The 2007 tax expenditure for coal includes the credit for producing fuels from a non-conventional source in the amount of $2,370 million. Subsequent legislation has eliminated this tax expenditure for coal.

The role of tax policy has increased significantly over the past decade. EIA documents that total federal subsidies and support for energy have roughly doubled between 1999 and 2007 (in year 2007 dollars). Over this period, tax expenditures have more than tripled from $3.2 billion in real terms to $10.4 billion.

As of 2007, EIA documented thirty seven tax expenditures related to energy production and consumption. The number of incentives in the tax code makes it difficult to assess their relative effectiveness and the extent to which they favor certain types of fuels over other fuels. I turn to this issue next.

But before doing so I wish to discuss *why* the federal tax system should intervene in energy markets through either taxes or subsidies. Economic theory provides clear prescriptions for situations where interventions through the tax code can improve social welfare. Externalities provide the most relevant rationale for the energy sector. If the production or consumption of energy has as a by-product the creation of an externality (e.g. pollution) then social welfare can be improved through government intervention. One way to do this is by taxing the externality. Thus a tax on the sulfur content of fossil fuels, for example, would be an efficient response to acid rain damages arising from fossil fuel consumption for electricity generation. This is an example of a Pigouvian tax.[3] It "internalizes the externality" by forcing firms to take into account the social costs of pollution by raising their private costs by the amount of the social damages that are

[3] Named for the economist Arthur C. Pigou, an early proponent of this policy instrument in Pigou, Arthur C. 1938. *The Economics of Welfare*. London: Weidenfeld and Nicolson. A comparable approach – and the one taken to address acid rain – is to create a cap-and-trade system for SO_2. Either approach puts a price on emissions of SO_2 and provides the appropriate price signal to electric utilities to reduce emissions.

generated by the pollutant. This approach implicitly makes clear that pollution generating activities have social benefits as well as costs. Optimal policy must balance those costs against the benefits; the tax is an efficient means of effecting that balance.

Rather than taxing activities that create negative externalities, we can provide subsidies to activities that are substitutes for externality generating activities. Put simply, if fuel X generates pollution damages while fuel Y does not, we can raise the price of fuel X relative to fuel Y to reflect the social damages from burning fuel X or we can reduce the price of fuel Y. Either approach encourages firms to use less of fuel X and more of fuel Y. This is the essential approach taken through federal energy tax policy. In large measure, we subsidize energy activities that we would like to encourage rather than tax activities that we would like to discourage.

What are the externalities that are of significant concern that drive federal tax policy towards energy? I would argue that two dominate the agenda. First is the concern with global climate change arising from increasing concentrations of greenhouse gases in the atmosphere. Fossil fuel combustion in the United States was responsible for eighty percent of domestic greenhouse gas emissions in 2007.[4] Any policy to reduce U.S. greenhouse gas emissions must have as a key element incentives to shift from fossil to renewable fuels consumption.

A second concern is our heavy reliance on petroleum products and the dominance of this fuel in the transportation sector. In 2007 seventy percent of petroleum products were used by the transportation sector. Conversely, petroleum accounted for over 95 percent of the fuel used in this sector. Our reliance on petroleum makes us vulnerable to economic dislocations from sharply rising oil prices or supply disruptions. Table 2 illustrates our increasing reliance on oil over the past few decades. Oil imports have risen from just over 40 percent of total US supply to nearly 60 percent in 2007. The EIA Annual Energy Outlook does not project any significant decline in this share over the next few decades under current policy. Many have argued that our heavy reliance on oil constrains our foreign policy, drives up our military costs, and makes us vulnerable to macroeconomic shocks when oil prices rise as they did over the past few years.[5]

Energy production and consumption are associated with negative externalities in addition to climate change and oil dependence. I do not focus on those here because many of these negative externalities are currently addressed through regulatory means. For example, the Acid Rain Program run by the Environmental Protection Agency has been a highly cost-effective response to the damages from releasing sulfur dioxide in fossil fuel electric generation units. Moreover the current set of energy subsidies is arguably focused to a large extent on reducing greenhouse gas emissions and reducing

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[4] See Environmental Protection Agency. 2009. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2007*. Washington, DC: Environmental Protection Agency, EPA 430-R-09-004.

[5] On the first point, see Deutch, John, and James Schlesinger. 2006. National Security Consequences of U.S. Oil Dependency Washington, DC: Council on Foreign Relations Task Force Report No. 58. On the macroeconomic impact of oil shocks, see – among other sources – Hamilton, James. 2009. Causes and Consequences of the Oil Shock of 2007-2008. Washington, DC: Brookings Institution.

our consumption of oil. For the purposes of this testimony I will take as given that going forward tax policy will be predominantly concerned with these two issues and that any assessment of energy tax policy must consider, among other things, the degree to which policy reduces greenhouse gas emissions or our reliance on petroleum products.

Table 2. US Oil Dependence

	1990	2000	2007	2030
Net oil imports as percent of total US Supply	42.2	52.9	58.2	55.5
World Oil Price (2007 $/BBL)	38	35	72	60
World Crude Production (million BBD)	65.5	74.9	81.5	102.9
OPEC Share (percent)	38.3	42.9	43.2	46.4
US Petroleum Consumption (million BBD)	17	19.7	20.7	22.8
US Share of World Production (percent)	26.0	26.3	25.4	22.2
Oil Intensity (1,000 BTUs/GDP) $2000	4.7	3.9	3.4	2.2
Oil Intensity (Value of oil as a percent of GDP)	2.6	2.0	3.6	1.9

Source: BP Statistical Review of World Energy (2008), EIA Annual Energy Review (2008), EIA Annual Energy Outlook (2008), EIA International Energy Outlook (2008)

II. What Does Technology Neutrality Mean?

This hearing is concerned with technology neutrality in energy production. Before assessing this concept we need to define it. In a general sense technology neutrality means that our tax code does not favor one fuel over another. With this as our definition our tax code is not technology neutral nor should it be. To the extent that certain energy sources create negative externalities we want to ensure that the tax code (or federal policy more generally) takes into account the pollution arising from energy production or consumption. We can modify the definition to mean that the tax code should not favor one fuel over another after taking into account any positive or negative externalities arising from the production or consumption of energy.

While conceptually straightforward, it is more difficult in practice to identify whether certain energy technologies are advantaged or disadvantaged by the tax code. We cannot observe what the mix of energy technologies and fuels would be in the absence of a technology neutral tax system. Moreover efforts to measure the impact of changes in the tax code on energy production and consumption are made more difficult by the fact that changes in energy tax provisions often occur at the same time as (or soon after) significant changes in energy prices or supply.

One approach to quantify the impact of the tax system on energy investment is the construction of *effective tax rates*. An effective tax rate is a summary measure of the various provisions in the tax code that affect investment in new capital. Specifically, it compares the before-tax return to the difference between the before- and after-tax return. The before-tax return is the return an investment must earn in order to cover its cost, pay the required return to investors, and pay taxes on the project. The after-tax return is the return that savers (the source of funds for investment) expect to receive after taxes are paid on marginal investments. Thus, if savers are prepared to accept seven percent on an investment after tax and the project must earn ten percent in order to cover depreciation, taxes, and required payments to investors, the effective tax rate is 30 percent $\left(\frac{10-7}{10}\right)$.

Effective tax rates focus on the marginal cost of funding investments rather than on project cost. In particular, they focus on the cost of a break-even investment. Because they summarize the many provisions of the tax code that affect the returns on capital investment, effective tax rates are frequently used to consider how the tax system affects capital investment. This is a particularly salient issue given the capital investment needs of energy infrastructure in the United States.

Table 3 reports estimates of effective tax rates on new energy investment assuming the tax rules in place in 2007.[6]

Table 3. Effective Tax Rates on New Energy Investment

	Current Law	No Tax Credits	Economic Depreciation
	(1)	(2)	(3)
I. Electric Utilities			
Generation			
Nuclear	-99.5%	32.4%	-49.4%
Coal (PC)	38.9%	38.9%	39.3%
Coal (IGCC)	-11.6%	38.9%	-10.3%
Gas	34.4%	34.4%	39.3%
Wind	-163.8%	12.8%	-13.7%
Solar Thermal	-244.7%	12.8%	-26.5%
2. Petroleum			
Oil Drilling (non-integrated firms)	-13.5%	-13.5%	39.3%
Oil Drilling (integrated firms)	15.2%	15.2%	39.3%
Refining	19.1%	19.1%	39.3%
3. Natural Gas			
Gathering Pipelines	15.4%	15.4%	39.3%
Other Pipelines	27.0%	27.0%	39.3%

Source: Table 2, Metcalf, Gilbert E. 2009. Taxing Energy in the United States: Which Fuels Does the Tax Code Favor? New York: The Manhattan Institute. PC stand for pulverized coal and IGCC for integrated gasification combined cycle.

Table 3 illustrates that new energy capital investments for many fuels can have large and negative effective tax rates. An effective tax rate of -100 percent, for example, means that the return an investment must earn prior to paying taxes need only be half as large as the return investors require since the tax code will provide sufficiently generous tax treatment that the project return increases to the investor's required return. The table

[6] This analysis comes from Metcalf, Gilbert E. 2009. *Taxing Energy in the United States: Which Fuels Does the Tax Code Favor?* New York: The Manhattan Institute.

also illustrates that tax credits for certain new electricity generating units are the predominant source of the tax benefits for these technologies.[7]

Another way to report subsidies in the tax code is the subsides per BTU of energy or MWh of electricity generation. Table 4 reports data from the EIA study discussed above.

<table>
<tr><th colspan="3">Table 4. Subsidies per Unit of
Energy Production in 2007</th></tr>
<tr><td></td><td>Energy</td><td>Electricity</td></tr>
<tr><td></td><td>$/billion BTUs</td><td>$/MWh</td></tr>
<tr><td>Coal</td><td rowspan="2">113</td><td>0.14</td></tr>
<tr><td>Refined Coal*</td><td>29.94</td></tr>
<tr><td>Natural Gas and Petroleum Liquids</td><td>63</td><td>0.22</td></tr>
<tr><td>Nuclear</td><td>24</td><td>0.25</td></tr>
<tr><td>Renewable Energy</td><td>584</td><td>2.01</td></tr>
<tr><td colspan="3">Source: Energy Information Administration. 2008. Federal Financial Interventions and Subsidies in Energy Markets 2007. Washington, DC: EIA SR/CNEAF/2008-01.

* - The 2007 tax expenditure for coal includes the credit for producing fuels from a non-conventional source in the amount of $2,370 million. Subsequent legislation has eliminated this tax expenditure for coal.</td></tr>
</table>

The first column reports the total tax subsidy for energy per billion BTUs of production. I have combined refined coal and coal here given data availability. The subsidy for coal is roughly double that of natural gas and petroleum liquids and roughly five times that of the subsidy for nuclear power.[8] In contrast, the subsidy per billion BTUs of renewable energy is nearly $600. The second column restricts attention to subsidies for fuels used in the production of electricity. Here I've broken out refined coal given data on electricity generation with refined coal. The subsidy per megawatt hour of electricity production is highest for refined coal and lowest for other coal.

Measuring subsidies per dollar of production is problematic for a number of reasons. Table 4 measures the average subsidy but provides no information about the subsidy's effect on the use of this fuel. It may be that production of a particular form of energy would occur in the absence of any subsidy directed at that fuel source. Second, the subsidy doesn't take into account differences in the quality of fuels. On an energy

[7] A similar approach that focuses on the cost of producing electricity is to report the levelized cost of a project. This is the constant revenue per kWh of electricity generation that a project must earn over its life to cover its costs. One can compare levelized cost measures with under different tax assumptions to see how the tax code affects the cost of a project. This is the approach taken in Metcalf, Gilbert E. 2007. Federal Tax Policy towards Energy. *Tax Policy and the Economy* 21:145-184

[8] Note that no developer has yet made use of the production tax credits for new nuclear power plants.

content basis, natural gas is nearly five times the cost of coal. Thus while the subsidy to regular coal used in the production of electricity is roughly two-thirds that of natural gas on a MWh basis, the coal subsidy is more beneficial per dollar of spending on coal. Third, the subsidy is not related to any externality that may be driving energy policy. Whether the subsidy for renewable energy is high or low depends on the benefits that come about from the reduction in our use of that fuel. We cannot say anything about that by focusing on a subsidy per unit of energy.

A final way to measure subsidies is per ton of carbon dioxide emissions that is not emitted or barrel of oil that is not consumed. The benefit of this approach is that it calibrates the measure of the tax code's impact to the policy goals we care about (reducing greenhouse gas emissions and oil consumption). If the tax subsidy per ton of avoided greenhouse gas emissions from technology X is twice that of reducing emissions from technology Y then we can say that our tax policy favors technology X over Y on this dimension.

This definition of technology neutrality is not the same as efficiency in abatement of pollution. The latter requires that the marginal cost of pollution abatement be equalized across energy sources. Unless subsidies are designed in terms of a payment per unit of pollution reduced it is difficult if not impossible to achieve economic efficiency across fuel types. Moreover, as I discuss below, even if subsidies are constructed in this fashion, it is difficult to disentangle true emission reductions from reductions that would have taken place in the absence of the tax subsidy.

III. Achieving Technology Neutrality Through a Subsidy Based Policy

Using subsidies within the tax system to achieve energy policy goals has been a time honored custom throughout the history of the U.S. income tax. It is important, however, to recognize the limitations of subsidies in achieving efficient outcomes. Congress may decide that the political benefit of a subsidy based approach outweighs the efficiency costs but it should be aware of the drawbacks of this approach so as to use the instrument as efficiently as possible.

First note that a subsidy based approach achieves the important goal of adjusting relative prices of polluting and non-polluting energy sources in the right direction. If fuel source X causes pollution that is equal to 10 percent of its cost then we can provide the right incentive to fuel users choosing between fuel sources X and Y by raising the price of X by 10 percent or by lowering the cost of fuel source Y by 1/(1.10) or 9.1 percent. Either way the relative cost of fuel source X to Y is now ten percent higher than it was prior to the implementation of new energy policy. Either a tax or a subsidy can be effective on the margin of choosing among fuel sources where some sources cause pollution.

This creates a problem, however, on a different margin. Efficiency requires that consumers make decisions taking into account the full cost of using commodities – including the pollution costs associated with using energy. Raising the cost of the polluting fuel source X raises the overall cost of energy use and encourages a reduction in energy consumption. More precisely, consumers shift away from consuming energy to consuming other goods. This substitution is driven by the higher overall cost of energy. Subsidizing the clean substitute undermines this consumer substitution effect as it leads to a lower cost of energy overall. Consumers do not reduce energy consumption as much as they would under a cost-raising policy.

Second, subsidies that appear to be technologically neutral may not be neutral at all in the sense of equalizing the subsidy cost per unit of activity that Congress is trying to discourage. Consider the tax credit for hybrid vehicles put in place in the Energy Policy Act of 2005. The credit ranges from zero to $3,000 per vehicle depending on whether the vehicle meets the specific hybrid criteria and on how many vehicles have been sold. The credit phases out as the vehicle hits certain sales targets over time. Table 5 shows the subsidy cost per gallon of gasoline saved through this credit for a number of vehicles. The tax credit is for model 2009 vehicles. I measure the savings relative to a vehicle that gets 20 miles per gallon assuming the vehicle is driven the average number of miles currently driven by private vehicles in the United States.

Table 5. Hybrid Vehicle Tax Credit
Model 2009 Values

Vehicle	MPG	Hybrid Vehicle Tax Credit	Annualized Value of Credit	Annual Gasoline Savings (Gallons)	Tax Credit per Gallon of Gasoline Saved
Chrysler Aspen Hybrid	21	$2,200	$347	30	$11.68
Ford Escape Hybrid (2WD)	32	$3,000	$474	234	$2.02
Mazda Tribute Hybrid (2WD)	32	$3,000	$474	234	$2.02
Nissan Altima Hybrid	34	$2,350	$371	257	$1.44
Toyota Corolla	31	$0	$0	222	$0
Toyota Prius	46	$0	$0	353	$0

Source: Author's calculations of savings relative to a vehicle that gets 20 miles per gallon and is driven 12,485 miles per year. Vehicles are assumed to be driven for ten years and savings are annualized with a ten percent discount rate.

The table illustrates several points. First, the tax credit per gallon of gasoline saved varies from zero to over $11 per gallon. Second, certain hybrid vehicles that get high mileage are excluded from the credit because they have been successful in the market place. Third, certain high mileage vehicles are excluded from the subsidy because they do not use specified technology. Note that the Corolla gets nearly the same mileage as the Tribute Hybrid. This is the most egregious violation of technology neutrality. The tax credit provides no incentive to tinker with the internal combustion engine to achieve increases in vehicle efficiency despite the many opportunities that exist to make the internal combustion engine more efficient. Our tax policy should provide the same incentives to improve mileage regardless of the technology put in place. Only in this way is true technology neutrality achieved.

The hybrid vehicle tax credit is a clear example of inefficient allocation of resources across fuel saving capital investments. It is not the only example, however. Inefficient allocations can occur even when policies appear to be technology neutral. Consider the production tax credit for electricity generated from renewable sources. Currently the tax credit is worth 2.1¢ per kWh for electricity over the first ten years of the plant's life.[9] This policy appears to be technology neutral (assuming all renewable technologies are made eligible for the credit). Renewable in this context means carbon-free. But consider Table 6 which compares the production tax credit for wind with that for geothermal energy.

Table 6. Production Tax Credit

Renewable Source	PTC	Capacity Factor	Subsidy per ton CO_2
Geothermal	$ 0.021	73%	$ 7.74
Wind	$ 0.021	27%	$ 12.28

Source: Author's calculations. Capacity factor based on electricity generation in 2006. CO_2 emissions avoided assume geothermal replaces coal fired base load capacity while wind replaces natural gas shoulder or peaking capacity. Coal and natural gas emissions based on EIA estimates

The subsidy per ton of carbon dioxide avoided critically depends on which power source is displaced by the new renewable capacity addition. Geothermal power, for example, has a capacity factor of over 70 percent – meaning that it is producing power on average for 70 percent of the year – while wind's capacity factor is less than 30 percent.[10] Geothermal power is more likely to displace base load coal units than natural gas while the opposite is true for wind. Under the assumption that geothermal displaces coal and wind displaces natural gas, the subsidy for the former is $7.74 per ton of carbon dioxide avoided while the subsidy for wind is $12.28 per ton. The difference arises because coal emits on average one ton of CO_2 per MWh of electricity generation while natural gas emits on average roughly two-thirds of a ton of CO_2 per MWh.

The point here is not whether geothermal displaces coal and wind natural gas (or even whether the displaced fuel is constant over time). Rather the point is that a technology neutral policy focused on reducing greenhouse gas emissions should favor technologies that are more likely to displace coal than natural gas. The current new technology credits do not take this into account.

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[9] Certain sources (e.g. municipal solid waste and open loop biomass) are eligible for a tax credit at half this rate.

[10] The capacity factor for wind depends importantly on location and turbine design. Capacity factors as high as 40 percent are not out of the question. But even at higher capacity factors the point of this example is unaffected.

In summary, the current set of subsidies to encourage reductions in petroleum consumption and greenhouse gas emissions have two drawbacks. First, they generate a distortion on the margin between energy consumption and consumption of other non-energy commodities. Second, they generate distortions among the externality-reducing technologies in a way that raises the cost of achieving our policy goals.

IV. Design Issues

In addition to the pricing issues discussed above, the current set of energy tax initiatives have other issues that could fruitfully be addressed by lawmakers. The first issue is that of stability and clarity in the policy. The historic pattern of two-year authorization cycles for production tax credits has created great uncertainty in the wind industry and led to boom and bust cycles that raise the cost of renewable energy investment.[11] Greater certainty over the production tax credit would smooth out investment and reduce bottlenecks in turbine manufacture that delay projects and raise costs. A related issue is the ability to use tax benefits. One casualty of the current financial crisis is the reduced tax appetite of firms that historically have invested in wind and other renewable projects. The provision of a rebate option in the American Recovery and Reinvestment Act of 2009 addresses this concern.

A second key design issue is that of additionality. Does the policy lead to incremental reductions in pollution or simply subsidies for emission reducing activities that would have occurred in the absence of the policy? A good example of this is the $.50 per gallon alternative fuels mixture credit. This credit is intended to encourage the addition of biodiesel and other biomass based fuels to petroleum to reduce petroleum use. Recently it has emerged that many paper firms are taking the credit for mixing diesel fuel with black liquor, a biomass by-product of paper making that historically has been used by the industry as a fuel source for their boilers. Controversy has arisen over whether paper firms are adding diesel fuel to black liquor purely for the purpose of claiming the tax credit biodiesel mixture tax credit.[12] This is troubling on two levels. First, it may be highly inefficient if credits are being provided for inframarginal activities. This is a common problem with any subsidy. We want to provide the incentive to firms that would not have undertaken the desirable activity in the absence of the subsidy. But we don't want to provide the subsidy to firms that would have undertaken the activity regardless of the subsidy. But the example from the paper industry is troubling beyond the inframarginal nature of the subsidy. If the tax credit is raising the demand for diesel fuel in order to make the biofuel eligible for the credit, then it is having the perverse effect of raising rather than lowering demand for petroleum products.[13]

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[11] The American Recovery and Reinvestment Act of 2009 extends the production tax credit (PTC) for wind through 2012 and allows PTC qualified facilities to opt for a 30 percent investment tax credit or a cash rebate. These options are described in greater detail in Bolinger, Mark, Ryan Wiser, Karlynn Cory, and Ted James. 2009. *PTC, ITC, or Cash Grant?* Berkeley: Lawrence Berkeley National Laboratory LBNL-1642E.

[12] See Mouawad, Jad, and Clifford Krauss. 2009. Lawmakers May Limit Paper Mills' Windfall. *New York Times*, April 18, 2009.

[13] The perverse impact of policy is not limited to the biodiesel mixing tax credit. Research by Holland, Hughes, and Knittel suggest that low carbon fuel standards may have the perverse effect of increasing net

A third important design issue is the interaction between tax policy and other policies. A simple example here is the interaction of the hybrid vehicle tax credit and the Corporate Average Fuel Economy (CAFE) standards. Allowing tax credits for hybrids encourages the production and purchase of high mileage vehicles. But CAFE sets minimum fleet mileage standards for automakers. Producing more hybrid vehicles relaxes the CAFE mileage constraint for automakers and allows them to sell more low mileage vehicles.[14] One possible policy response to this would be to exclude credit receiving hybrids from the fleet for purposes of meeting CAFE standards. Alternatively one could eliminate the credit and simply let CAFE be the driving incentive for hybrid production.

V. A Better Approach

I have identified a number of problems with the current approach. Energy related tax subsidies lower rather than raise the cost of consuming energy. Much of the subsidy may be inframarginal. And the policy can be undermined through interaction with other energy policies. Here I wish to briefly mention policies that avoid most if not all of these pitfalls.

Assuming our concern is with climate change and oil consumption, optimal policies will raise the cost of emitting greenhouse gases and oil consumption.[15] One approach to discourage greenhouse gas emissions is through a carbon pricing mechanism.[16] One approach is through a carbon fee. Elsewhere I describe a proposal to price carbon emissions in a way that meets targets for emission caps over a control period (say from 2012 through 2050) to ensure that environmental goals are met while achieving price stability.[17]

A simple and efficient way to reduce oil consumption is to implement an oil consumption tax. Because of the volatility of oil prices and occasional spikes as we saw last year, I proposed (along with a colleague) a variable oil consumption tax that phases

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carbon emissions. See Holland, Stephen P., Jonathan E. Hughes, and Christopher R. Knittel. 2009. Greenhouse Gas Reductions under Low Carbon Fuel Standards? *The American Economic Journal: Economic Policy* 1 (1):106-146.

[14] Alternatively and equivalently, it leads to the substitution of hybrid vehicles for other high mileage vehicles that in the absence of hybrids the automakers market primarily to meet CAFE fleet standards.

[15] Clearly there is overlap between policies that discourage oil consumption and greenhouse gas emissions. But policies can also work at cross purposes. A desire to reduce oil consumption could lead to increased coal consumption (and greenhouse gas emissions) if plug-in cars are a key part of the strategy to reduce oil consumption. Hence it is desirable to have multiple policy instruments in the face of multiple policy goals.

[16] I use the term carbon price as this is the common terminology despite the fact that the price can extend to gases beyond carbon dioxide.

[17] See Metcalf, Gilbert E. *Reacting to Greenhouse Gas Emissions: A Carbon Tax to Meet Emission Targets*, Tufts Department of Economics Working Paper 2009-03. For a detailed description on how to implement a carbon fee see Metcalf, Gilbert E., and David Weisbach. forthcoming. The Design of a Carbon Tax. *Harvard Environmental Law Review*.

out as oil prices rise.[18] An oil consumption tax is preferable to an increase in the gasoline tax since it targets all oil consumption rather than the portion targeted to motor vehicles. But an increase in the gasoline tax in lieu of an oil consumption tax would go a long way towards improving efficiency.[19]

Both of these approaches address the problems addressed above. They ensure that energy consumption internalizes the costs of externalities associated with its production or consumption and achieves the socially efficient mix of energy and non-energy consumption. Second, they avoid problems of inframarginal subsidies or perverse incentives. Third, they complement rather than work at cross purposes with other federal energy policies.

VI. Conclusion

Current energy tax policy can perhaps be best viewed as a transitional policy until policies such as carbon pricing (whether through a carbon fee or a cap-and-trade system) are put in place along with consideration of an oil consumption tax or increase in the gas tax. In the meantime, Congress should consider how they might best modify the existing subsidies in the tax system to achieve true technology neutrality.

True technology neutrality requires measuring the subsidy cost of reducing the externality in question. Here I have focused on reducing greenhouse gas emissions and oil consumption. Policies should provide a level playing field in the sense that the subsidy per unit of externality avoided should be comparable across technologies. They should also consider the extent to which true reductions in the externality occur and avoid unintended consequences. This is all very easy to say but difficult to do. But so long as our energy policy is built around providing subsidies for activities we wish to support as opposed to taxing those activities we wish to discourage, we will always face difficult design problems that complicate our efforts to achieve efficient and cost effective outcomes.

Thank you for the opportunity to testify today.

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[18] See Bordoff, Jason and Gilbert E. Metcalf, *Breaking The Boom-Bust Oil Cycle*, The New Republic Blog (The Vine), Jan. 6, 2009. Available at http://blogs.tnr.com/tnr/blogs/environmentandenergy/archive/2009/01/06/breaking-the-boom-bust-oil-cycle.aspx.

[19] Research finds that the optimal tax on gasoline in the United States falls far short of the unpriced social cost of its use. See Parry, Ian, and Kenneth A. Small. 2005. Does Britain or the United States Have the Right Gasoline Tax? *American Economic Review* 95:1276-1289.

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