Clean Energy Tax Incentives: What Role Should Government Play?

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Before the
Subcommittee on Energy, Natural Resources and Infrastructure
Committee on Finance
U.S. Senate

Executive Summary

Government Subsidies and Tax Incentives for Clean Energy: The wind, solar power, biofuel and ethanol industries do not meet the standard criteria used to justify taxpayer-funded subsidies for their deployment across the U.S. economy. They are not "infant industries," are not essential for U.S. economic and job growth and they are unlikely to provide benefits commensurate with their costs. Addressing the huge U.S. federal budget deficit requires cutbacks in programs whose costs exceed their benefits.

Renewable Energy Costs are High: Energy use is a key component in U.S. economic recovery, in recent years each 1% increase in GDP in the U.S. has been accompanied by a 0.2% increase in energy use. Data from DOE's EIA show that new electric generating capacity using wind and solar power tends to be considerably more expensive than conventional, available and secure natural gas and coal resources.

Impact of Clean Energy Standard: A national mandate requiring that electricity retailers supply a specified share of their sales from clean energy sources would have adverse economic impacts. A new EIA analysis shows that by 2035, the CES will raise electricity prices by 20% to 27 % and reduce GDP by $124 billion to $214 billion.

Renewable Energy Receives Largest Share of Tax Code Subsidies: In 2010, an estimated 76% of the $19.1 billion in federal tax incentives went to renewables, for energy efficiency, conservation and for alternative technology vehicles while only 13% went to fossil fuels according to the Congressional Research Service (CRS). Some renewable electricity enjoys negative tax rates: solar thermal's effective tax rate is -245 % and wind power's is -164%.

Tax Code Should be Neutral: Accelerated depreciation, Section 199, the foreign tax credit deduction and LIFO are examples of tax code provisions that are available to any industry and are not considered "subsidies."

Fossil Fuels Expansion: Several recent economic analyses suggest that increased access to domestic onshore and offshore oil and gas reserves , including shale gas, could strongly boost U.S. economic recovery, manufacturing and job growth as well as increasing energy security.

Conclusions: Continued high levels of federal support for the deployment of clean energy and alternative fuel vehicles in the U.S. is unlikely to have a significant impact on reducing GHG concentrations in the atmosphere since the real growth in emissions is coming from developing countries. Instead, government funded basic R&D for renewables and conservation may be a better use of taxpayer dollars than the current suite of tax incentives and direct spending programs whose renewal by policymakers is highly uncertain, especially given the critical situation of the U.S. federal budget.

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Introduction

Chairman Bingaman, Ranking Member Cornyn and members of the Subcommittee, my name is Margo Thorning, senior vice president and chief economist, American Council for Capital Formation (ACCF),* Washington, D.C. I am pleased to present this testimony on the impact of incentives for renewable energy on U.S. economic and job growth and the federal budget.

The American Council for Capital Formation represents a broad cross-section of the American business community, including the manufacturing and financial sectors, Fortune 500 companies and smaller firms, investors, and associations from all sectors of the economy. Our distinguished board of directors includes cabinet members of prior Democratic and Republican administrations, former members of Congress, prominent business leaders, and public finance and environmental policy experts. The ACCF is celebrating over 30 years of leadership in advocating tax, regulatory, environmental, and trade policies to increase U.S. economic growth and environmental quality.

The Subcommittee Chairman and Committee members are to be commended for their focus on how the tax incentives and subsidies provided to clean, renewable energy technologies have impacted their deployment as well as U.S. manufacturing and job growth. Given the continuing weakness of the U.S. economic recovery, stubbornly high unemployment rate, sluggish investment spending and a federal budget deficit of 8.5% of GDP, a careful examination of whether the incentives in the tax code and the direct federal expenditures on clean energy are the best and highest use of U.S. taxpayer's dollars is warranted.

Rationale for Subsidies for Industry

As explained in a report by the UN's Food and Agriculture Organization, subsidies can be defined as government policies that aid one or more industries, usually carrying a financial

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benefit to the industry.[1] At the most conventional level, subsidies are government financial transfers to an industry, through payments to workers or to firms. Probably nobody would deny that the government is subsidizing the industry if it is paying part of the wages of workers in the industry or it is granting firms in the industry funds to make capital purchases. This is the narrowest definition of a subsidy.

But as the UN report notes, there is little difference from the standpoint of the industry between a government transferring funds to it, on one hand, and waiving transfer payments, i.e. taxes, that the firm would normally make to the government. The tax code provisions and direct federal grants made available to clean energy industries meet the criteria of subsidies described in the FAO report. The key question is: are the benefits of the taxpayer funded incentives worth the cost?

When economists justify subsidies, they usually do so in one of three ways. First, there is the "infant industry" argument. An industry, for instance, may be dominated by foreign (non-domestic) (e.g. textile manufacture by England during the early days of the United States) and for reasons of social policy, the government may want to develop an indigenous industry. Insufficient private capital may be available to permit the private sector, on its own, to accumulate sufficient capital to make the indigenous industry commercially competitive. The government then could subsidize the industry through grants, loans, equity infusions, tariff protection or tax incentives. When the industry has been built up to the point where it is self-sufficient, the subsidies would be removed.

The logic of the argument is appealing, and the approach to economic development might work, but there is a tendency once the subsidy has been implemented to continue it long after it is necessary or long after it should have been necessary, the FAO report notes. The ultimate result can be that the industry, originally stimulated by the subsidy, becomes dependent upon the subsidy and fails to improve its productivity along with the rest of the world. One is then left with an inefficient industry that cannot compete in the marketplace. The justification for subsidies then switches to the protection of employment which would fall if the government were willing to let the industry fail. Thus, subsidies which were intended to help the industry get started become "necessary" to keep an inefficient industry afloat. The subsidy then becomes permanent until the government finally decides that it can no longer maintain the industry and the industry shrinks as government subsidies shrink with all the economic and social dislocation that entails. Alternatively, the subsidy may be introduced to help the infant industry, the industry may then become self-sustaining, but it may be difficult to wean the industry off the subsidy.

The second argument in favor of subsidization is that a large, critical industry may run into serious temporary difficulties and be in danger of ceasing operations. The government, in such a situation, would have at least three options: it can play no role and let the full market effects be felt; or it can directly subsidize the endangered firms with cash or equity infusions, loans or loan guarantees; or it can let the firms go bankrupt but intervene through the monetary system to prevent the bankruptcy of the firms from affecting other, healthy, part of the economy. A third argument in favor of subsidization is tied to current interests in environmental protection.

[1] http://www.fao.org/DOCREP/006/Y4647E/y4647e05.htm

Subsidies can be used to encourage firms and industries to behave in environmentally friendly ways.[2]

Are Continued Subsidies for Clean Energy Deployment Justified?

- **Infant industries**

Are clean, renewable energies truly "infant industries" and deserving of continued taxpayer support through provisions in the tax code or direct federal expenditures? A look back at history will help put the question in perspective. Regarding solar power, an EIA report notes that solar technology is not new, it dates from the 7th century BC when magnifying glass was used to concentrate the sun's ray to make fire and passive solar to heat rooms was used in Roman bathhouses in the 1st century AD. Almost 3000 years after the use of solar power began; it has many applications but is still not cost-competitive with conventional energy sources in many cases.[3] Similarly, wind power has a long history; the Persians constructed the earliest known windmills in the 6th century AD to grind grain.[4] By 1300 AD windmills were in wide use in Europe for a variety of industrial uses. Though some 1400 years have passed since windmill began to be used for industrial purposes, they are still only an intermittent source of power generation. Finally, batteries have been in use since the early 1800's and the first electric car was invented in Scotland in 1832 by Robert Anderson.[5] Though the plug-in electric vehicle was fairly popular in New York City in the early 1900's, it was quickly supplanted by gasoline powered vehicles with their greater driving range, quick refueling and lower cost. Thus, looking back at the length of time that renewable energy and alternative fuel vehicles have been in use, it seems questionable that these industries (which receive most federal support) meet the criteria of being "infant industries."

- **Economic impact of phasing out subsidies for renewable technology deployment**

Another key question is whether the phase out of tax incentives for clean energy deployment will have an adverse impact on U.S. economic recovery and job growth. As noted in a 2010 report by Department of Commerce, "Measuring the Green Economy," green products and services comprised only 1 to 2 percent of the total private business economy in 2007. The number of green jobs ranged from 1.8 to as many as 2.4 million when products and services that some might argue were not "green' were included in the total. These jobs constituted between 1.5 and 2.0 percent of total employment in 2007.[6] The Commerce Department report concludes that the relatively small size of the green economy suggests that the majority of jobs created during the economic recovery are likely to come from the production of products and services outside the green economy. Thus, phasing out of incentives in the tax code for clean energy is not likely to have a material impact on U.S. economic growth and such savings could help reduce the federal

[2] Ibid.
[3] http://www1.eere.energy.gov/solar/pdfs/solar_timeline.pdf
[4] http://www.utexas.edu/gtc/assets/pdfs/windmills_world.pdf
[5] http://www.npr.org/2011/11/21/142365346/timeline-the-100-year-history-of-the-electric-car
[6] http://www.esa.doc.gov/sites/default/files/reports/documents/greeneconomyreport_0.pdf

budget deficit, especially if declining government subsidies leads to increased efficiency in the subsidized firms rather than their demise.

In addition, renewable energy industries are now globally deployed. As a result, it will be very difficult if not impossible to ensure that the benefits of U.S taxpayer funded subsidies will result in the creation of new investment, jobs, new patents, etc. here in the U.S. On the other hand, it is also true that the U.S. has benefited indirectly from the vast spending on renewables in Europe and lately in China, which have brought down costs for everyone. In this respect it might be argued that the fact that others are subsidizing such technologies is an argument for the U.S. doing less, not more.

- **Environmental impacts of renewable energy**

While fossil fuels have their share of negative environmental and social impacts such as GHG and other emissions, coal ash, mining subsidence and oil spills, for example, the use of renewable energy also carries risks. Wind and solar power have the advantage of not directly producing GHGs or other emissions but there are negative environmental impacts associated with them and as well as other renewable energy including corn-based ethanol. As policymakers decide how much taxpayer support for clean energy industries is warranted, they need to consider their overall impact on the environment and on society in addition to their impact on GHG emission and reducing oil imports.

For example, a recent article "Wildlife Slows Wind Power" notes a series of incidents, including the death of an endangered bat at a wind farm in Pennsylvania have "caught the attention of regulators and conservation minded scientists who worry that large number of bats, bald eagles and other birds are being killed by the wind turbines spinning blades." As World Bank ecologist George Ledec notes, "Low carbon does not mean low overall environmental or social impacts".[7]

Biofuels such as corn-based ethanol also have negative social and environmental impacts. A 2009 report by the Congressional Budget Office concludes that the increased use of ethanol accounted for about 10 percent to 15 percent of the rise in food prices between April 2007 and April 2008; impacting both consumer spending and government outlays for food assistance.[8] CBO also notes that if increases in the production of ethanol lead to large amounts of forests or grasslands being converted into new cropland, those changes in land use could more than offset any reduction in greenhouse-gas emissions from the use of ethanol compared to gasoline.

Large scale solar power is not without potential negative environmental impacts as well. As noted in a recent article by Ned Haluzan, "large solar power plants require large amounts of land so if we were to massively build them this could significantly shrink the habitats of many plants and animals. The current solar technologies require approximately one square kilometer for every 30-60 megawatts of generated solar energy so really large solar energy projects require lot

[7] http://online.wsj.com/article/SB10001424052970203501304577088593307132850.html
[8] http://www.cbo.gov/ftpdocs/100xx/doc10057/04-08-Ethanol.pdf

of available land." Haluzan also points out that some solar power plants require lot of water for cooling purposes, so this could lead to water shortage problem in certain areas".[9]

The most cost-effective way to promote environmental goals is likely to come through federal research and development. As noted by Professors Nemet and Baker in a 2009 Energy Journal article on the development of low-carbon technologies, "While both subsidies and successful R&D programs reduce costs, the effect of successful R&D on cost in 2050 is an order of magnitude larger than the effect of subsidies."[10] If clean, renewable technologies that have been in development for centuries and are still not competitive with conventional energy, other approaches may be needed to maximize the benefits from the use of taxpayer dollars for clean energy. It may be time to direct more federal support on basic research and development and less support for promoting and deploying existing technology.

Cost of Renewable Energy

Energy use is a key component in U.S. economic recovery, in recent years each 1% increase in GDP in the U.S. has been accompanied by a 0.2% increase in energy use. Higher energy prices tend to slow economic growth and reduce the competitiveness of the U.S. manufacturing sector. As policymakers confront the slow U.S. economic recovery and slow job growth, they need to consider the impact of tax, budget and regulatory decisions that promote the use of renewable energy compared to the expansion of conventional fossil fuels or nuclear power electricity generation and for transportation.

Federal policies that promote the use of more expensive renewable energy to replace cheaper and already environmentally sound and compliant conventional energy sources have the effect of increasing federal spending, reducing tax receipts and raising the price of energy. According to recent EIA data, new electric generating capacity using wind and solar power tends to be considerably more expensive than conventional natural gas and coal. As shown in Table 1, the total cost of offshore wind, at $244 dollars per mega watt hour (MWH) is almost 300% higher than for advanced combined cycle natural gas–fired plants which cost only $62 per MWH. The cost of solar thermal, at $312 MWH, is over 400% higher than natural gas-fired electricity production. Similarly, advanced nuclear costs an estimated $114 per MWH and advanced coal costs only $110 MWH.[11]

A federal mandate for increased use of renewable energy has been proposed by Chairman Bingaman. The Clean Energy Standard (CES) would require that covered electricity retailers supply a specified share of their electricity sales from clean energy sources. Under a CES, electric generators would be granted credits for every megawatthour (MWh) of electricity they produce using qualifying clean energy sources. The credits could be bought and sold, companies without enough clean energy credits could buy them from other generators.

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[9] http://www.renewables-info.com/interesting_energy_articles/solar_energy_environmental_impact.html
[10] http://www.ecs.umass.edu/mie/faculty/baker/DemandSubsidies.pdf
[11] http://www.eia.gov/forecasts/aeo/electricity_generation.cfm

A new EIA analysis of the CES shows how the implementation of the CES impacts energy prices and overall U.S. economic growth.[12] By 2035, relative to the reference case, average electricity prices rise by 20% under the Bingaman base case (BCES) and by 27% under the "All Clean" and "Standards plus Codes" cases.[13] All the CES cases evaluated by EIA cause reductions in Gross Domestic Product. Relative to the base case, by 2035 GDP declines by $124 billion (in constant 2005 dollars) under the BCES case to as much as $214 billion under the Standards and Codes case (see Figure 1).

In addition, current data on electricity prices in states with renewable portfolio standards (RPS) show that they experience higher costs for electricity those without an RPS mandate. In 2011, the 29 states with an RPS mandate faced residential electricity prices that were 27% higher than those without a mandate and industrial electricity prices were 23% higher (see Figure 2).

What Role Can Energy Play in the U.S. Economic Recovery and Job Growth?

- **Renewable energy development**

As noted above, renewable energy tends to be more expensive in many cases than conventional fossil fuels and nuclear power. In addition, the Department of Commerce research cited above and recent experience with DOE- funded clean energy start-ups suggests that taxpayers will not see much job growth or productive new enterprises from approximately $90 billion allocated for clean energy in the American Recovery and Reinvestment Act of 2009. For example, a recent article on California's green jobs initiative notes that "Job training programs intended for the clean economy have also failed to generate big numbers. The Economic Development Department in California reports that $59 million in state, federal and private money dedicated to green jobs training and apprenticeship has led to only 719 job placements — the equivalent of an $82,000 subsidy for each one."[14] While the renewable energy industry has a role to play as the U.S. tries to reduce emissions of all types and become less dependent on imported oil, policymakers should evaluate the cost-effectiveness of federal tax and budget outlays subsidizing these industries.

- **Fossil fuel expansion**

In contrast to the disappointing results from many expensive green energy initiatives funded by the U.S. taxpayer, several recent economic analyses suggest that increased access to domestic onshore and offshore oil and gas reserves (including shale gas) could strongly boost U.S. economic recovery, manufacturing and job growth. Fossil fuels, which provide 78% of U.S. primary energy production, can have a positive impact in restoring strong economic growth. A new Global Insight/CERA analysis, "Restarting the Engine-Securing American Jobs, Investment and Energy Security" finds that allowing exploration and development in the Gulf of Mexico in

12 http://www.eia.gov/analysis/requests/ces_bingaman/pdf/ces_bingaman.pdf

13 See table 3 and table 5 at http://www.eia.gov/analysis/requests/ces_bingaman/pdf/ces_bingaman.pdf

14 http://www.nytimes.com/2011/08/19/us/19bcgreen.html?_r=3

2012 could create more 230,000 jobs, a $44 billion increase in GDP and $12 billion in additional tax receipts to federal and state treasuries.[15]

Another new report by Wood Mackenzie, "U.S. Supply Forecast and Potential Jobs and Economic Impacts (2012-2030)" finds that policies that encourage the development of new and existing resources could by 2015 increase production by over 1 million barrels of oil equivalent per day (mboed), create almost 670,000 jobs and provide an additional $10 billion in federal and state tax receipts compared to the base case.[16] By 2030, production would rise by over 10 mboed, employment would be over 1.4 million higher and tax receipts would be $99 billion higher.

In fact, domestic access to shale gas and development of that abundant resource has the ability to reduce operating and feedstock costs for manufacturing and chemicals industries, respectively, in ways that can be transformative for those industries and job growth. In another recent analysis, "The Economic and Employment Contributions of Shale Gas in the United States" the consulting firm Global Insight documents the significant contributions that shale gas is making to the U.S. economy.[17] The report finds that in 2010, the industry supported 600,000 jobs and contributed more than $76 billion to GDP. Capital expenditures were $33 billion in 2010 and will grow to $48 billion in 2015. The current low and stable gas prices will contribute to a 10 % reduction in electricity prices in the near term and to a 1.1% increase in the level of GDP by 2013. All sectors of manufacturing benefit, especially those that use natural gas as a feedstock or energy source. In the long run, there will be improvements in the competitiveness of domestic manufacturers due to lower natural gas and electricity costs. As a result, industrial production will be 4.7% higher in 2035, the Global Insight report concludes.

The Federal Tax Code and Incentives for Energy Investment

Most federal support for energy production and investment is for renewable energy. As CRS analyst Molly Sherlock notes in a recent report, in 2010, an estimated 76% of the $19.1 billion in federal tax incentives went to renewables, for energy efficiency, conservation and for alternative technology vehicles while only 13% went to fossil fuels (see Table 2). [18] Given that non-hydro renewables provided only 7% of primary energy production and plug–in electric vehicles like the Chevy Volt and Nissan Leaf will sell fewer than 15,000 cars in 2011, a legitimate question arises about whether the costs of these taxpayer funded subsidies to deploy these technologies exceed the benefits of these programs.

The degree of federal subsidies for alternative energy sources can also be measured by the effective tax rate. A negative tax rate indicates that the tax code is subsidizing the investment since the investor is willing to accept a before-tax rate of return that is less than the after- tax rate of return. According to the CRS report cited above, the tax code in 2007 created strong incentives for renewable energy investments. For example, a 30% investment tax credit

[15] http://www.gulfeconomicsurvival.org/phx-content/assets/files/GoM_Restarting_the_Engine.pdf
[16] http://www.api.org/policy/americatowork/upload/API-US_Supply_Economic_Forecast.pdf
[17] http://www.ihs.com/images/Shale-Gas-Economic-Impact-Dec-2011.pdf
[18] http://www.nationalaglawcenter.org/assets/crs/R41953.pdf

combined with 5 year accelerated depreciation gave solar thermal investments an effective tax rate of -244.7%.[19] Wind power had a -168.8 % rate. Sherlock notes that overall effective tax rates for renewables and nuclear are substantially lower than the effective rates on gas, integrated oil drilling, refining and coal (see Table 3).

Another issue worth raising is the question of the effectiveness of renewable energy tax incentives and spending programs which are dependent on a financially strapped federal government and are therefore uncertain and possibly non-sustainable. The almost constant uncertainty about whether a tax code provision or direct spending program will still exist by the time the investment is deployed raises the hurdle rate and increases the cost of capital for investment. In the face of the federal government's huge budget deficits and the perceived need to close the budget gap, many potential investors in renewable energy projects may think the risks are too great. Given this uncertainty, current federal programs to significantly increase the use of renewable energy and promote energy efficiency may simply be ineffective.

How Should the Tax Code Treat Energy and other Investments?

Many public finance experts suggest that the tax code should provide the same incentives for all types of industries and activities so as to avoid advantaging one industry over another. For example, accelerated depreciation, in which the write-off period may be shorter that the actual economic life of an asset is generally provided to all taxpayers regardless of their industry or type of investment in plant or equipment. Section 199 was established to help support U.S. manufacturing of all types. The foreign tax credit deduction is designed to prevent the double taxation of income earned abroad by U.S. multinationals. Similarly, LIFO is an accounting method in use for more than 70 years to protect companies from inflation or rising prices over the course of their operations. All of the above mentioned tax code provisions are available to any industry and are not considered "subsidies."

As Gary Hufbauer, a member of the ACCF's Center for Policy Research Board of Scholars, noted in a recent article, it is important not to confuse "subsidies" with legitimate tax deductions available to all industries.[20] Dr. Hufbauer states that "The semantically accurate way to describe legislation that would eliminate the manufacturing deduction or curtail the foreign tax credit for oil and gas companies is straightforward: the imposition of tax discrimination, not the removal of federal subsidies. Because most Americans agree that tax discrimination is bad policy - Uncle Sam shouldn't be picking winners and losers through the tax code - accurate language would diminish enthusiasm for these proposals."[21]

By the same token, the current policy of providing subsidies and negative tax rates for renewable energy, energy efficiency and alternative fuel vehicles should be reexamined with an eye toward balancing costs and benefits.

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[19] http://www.nationalaglawcenter.org/assets/crs/R41953.pdf

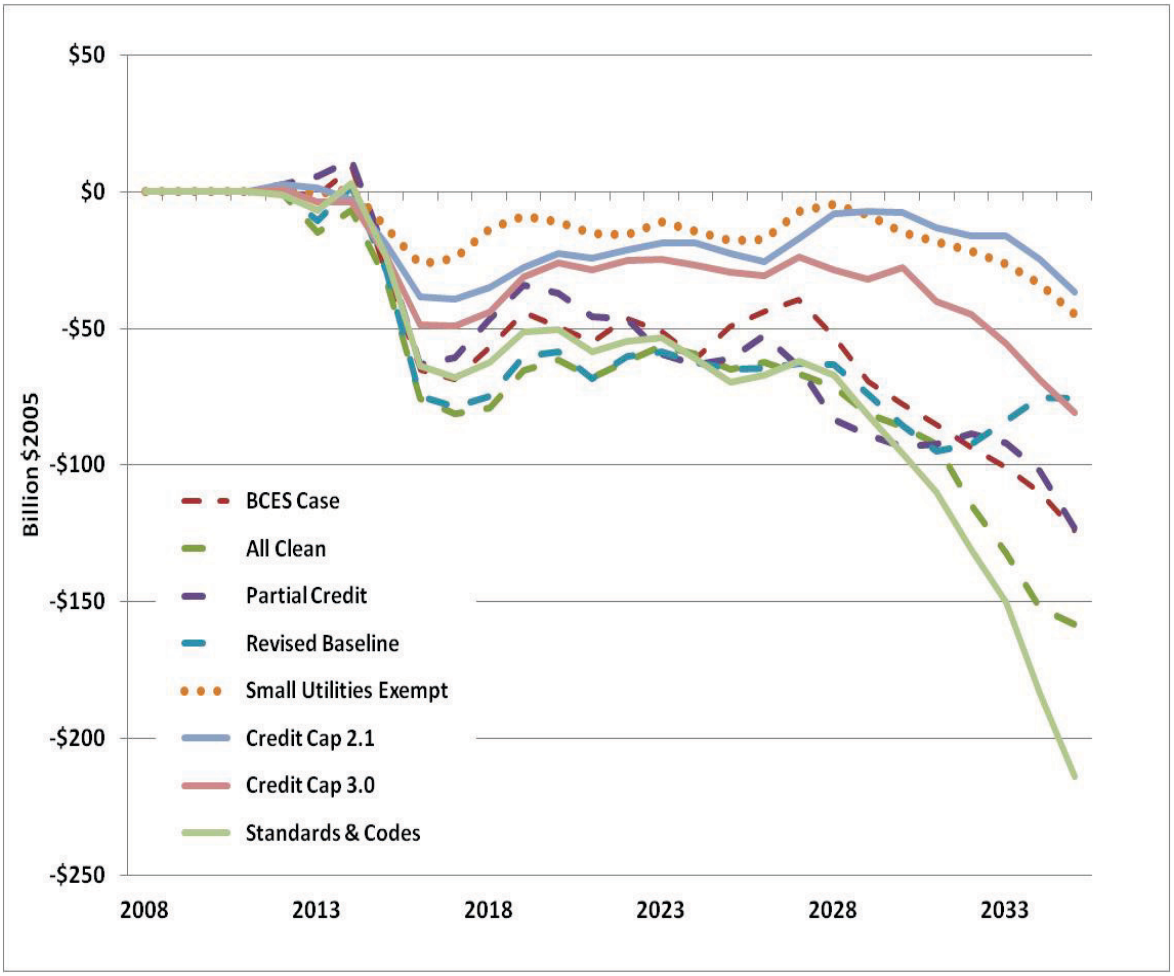
[20] http://www.washingtontimes.com/news/2011/dec/7/debunking-the-big-oil-subsidy-myth/

[21] Ibid

Conclusions

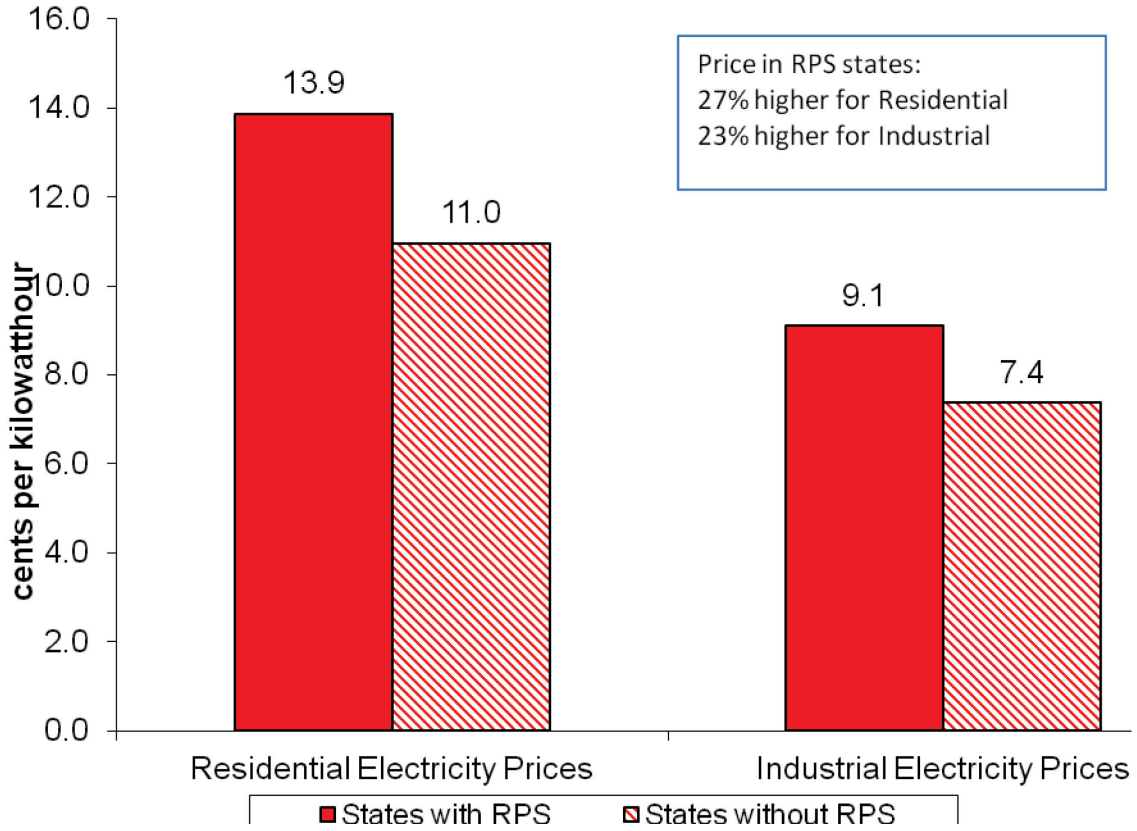
Continued high levels of federal support for the deployment of clean energy and alternative fuel vehicles in the U.S. is unlikely to have a significant impact on reducing GHG concentrations in the atmosphere since the real growth in emissions is coming from developing countries (see Figure 3). In addition, as described above, renewable energy is not without its own negative environmental and social impacts. By encouraging the deployment of energy technologies that are more expensive than conventional energy, consumers and industry are forced to spend more on energy and have less for other purchases or for productive investment. As a result, GDP and job growth will be lower than otherwise as resources are diverted from their highest and best use. If markets are allowed to select the energy technologies that are deployed rather than government officials using tax incentives, subsidies or a CES mandate, costs to consumers and the federal government's budget will be reduced. Policies that encourage the responsible development and transportation of U.S. oil and gas resources should be accelerated so as to promote a cleaner environment and stronger economic and job growth.

Figure 1. Clean Energy Standard: Impact on U.S. Gross Domestic Product
(Change in Real GDP from Reference Case (Billion $2005))



Source: "Analysis of Impacts of a Clean Energy Standard", Energy Information Administration, November 2011, http://www.eia.gov/analysis/requests/ces_bingaman/pdf/ces_bingaman.pdf

Figure 2. Electricity Prices: States with Renewable Portfolio Standards versus States without RPS



Source: Data for August 2011. Energy Information Administration, Table 5.6.A, http://www.eia.gov/electricity/data.cfm#sales

Table 1. Estimated Levelized Cost of New Generation Resources, 2016.

Plant Type	Capacity Factor (%)	U.S. Average Levelized Costs (2009 $/megawatthour) for Plants Entering Service in 2016				
		Levelized Capital Cost	Fixed O&M	Variable O&M (including fuel)	Transmission Investment	Total System Levelized Cost
Conventional Coal	85	65.5	3.9	24.5	1.2	95.1
Advanced Coal	85	74.7	7.9	25.9	1.2	109.7
Advanced Coal with CCS	85	92.9	9.2	33.3	1.2	136.5
Natural Gas-fired						
Conventional Combined Cycle	87	17.5	1.9	44.6	1.2	65.1
Advanced Combined Cycle	87	17.9	1.9	41.2	1.2	62.2
Advanced CC with CCS	87	34.7	3.9	48.6	1.2	88.4
Conventional Combustion Turbine	30	45.8	3.7	69.9	3.5	123.0
Advanced Combustion Turbine	30	31.7	5.5	61.3	3.5	102.1
Advanced Nuclear	90	90.2	11.1	11.7	1.0	114.0
Wind	34	83.3	9.5	0.0	3.4	96.1
Wind – Offshore	34	209.7	28.1	0.0	5.9	243.7
Solar PV[1]	25	194.9	12.1	0.0	4.0	211.0
Solar Thermal	18	259.8	46.6	0.0	5.8	312.2
Geothermal	91	77.4	11.9	9.5	1.0	99.8
Biomass	83	55.4	13.7	42.3	1.3	112.6
Hydro	53	78.5	4.0	6.2	1.8	90.5

[1] Costs are expressed in terms of net AC power available to the grid for the installed capacity.

Source: Energy Information Administration, Annual Energy Outlook 2011, April 2011, DOE/EIA-0383(2011)

Table 2. Estimated Revenue Cost of Energy Tax Provisions: 2009 and 2010

($ billions)

Provision	2009	2010
Fossil Fuels		
Expensing of Exploration and Development Costs for Oil and Gas	0.3	0.7
Percentage Depletion for Oil and Gas	1.3	0.5
Amortization of Geological and Geophysical Costs for Oil and Gas Exploration	(i)	0.1
15-year Depreciation for Natural Gas Distribution Lines	0.1	0.1
Election to Expense 50% of Qualified Refinery Costs	0.5	0.7
Credit for Producing Fuels from a Non-Conventional Source	0.1	(i)
Amortization of Air Pollution Control Facilities	(i)	0.1
Credits for Investments in Clean Coal Facilities	0.2	0.2
Subtotal, Fossil Fuels	2.5	2.4
Renewables		
Production Tax Credit (PTC)	1.3	1.4
Accelerated Depreciation for Renewable Energy Property	0.3	0.3
Section 1603 Grants in Lieu of Tax Credits[a]	1.1	4.2

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

Source: See: http://www.nationalaglawcenter.org/assets/crs/R41953.pdf. Data from Joint Committee on Taxation and the Department of the Treasury.

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

a. The figures reported for the Section 1603 grants in lieu of tax credits and the excise tax credits for alcohol fuels and biodiesel are outlays as reported in the President's FY2012 budget.

b. The $6.5 billion tax expenditure reported by the JCT for alcohol fuels is largely attributable to "black liquor" qualifying for a tax credit as an alternative fuel mixture. Black liquor is no longer eligible for federal tax incentives designed for alcohol fuels or biofuels (although taxpayers that were eligible during 2009 but did not claim the benefit may file an amended return).

Table 3. Effective Tax Rates for Energy-Related Capital Investments, 2007

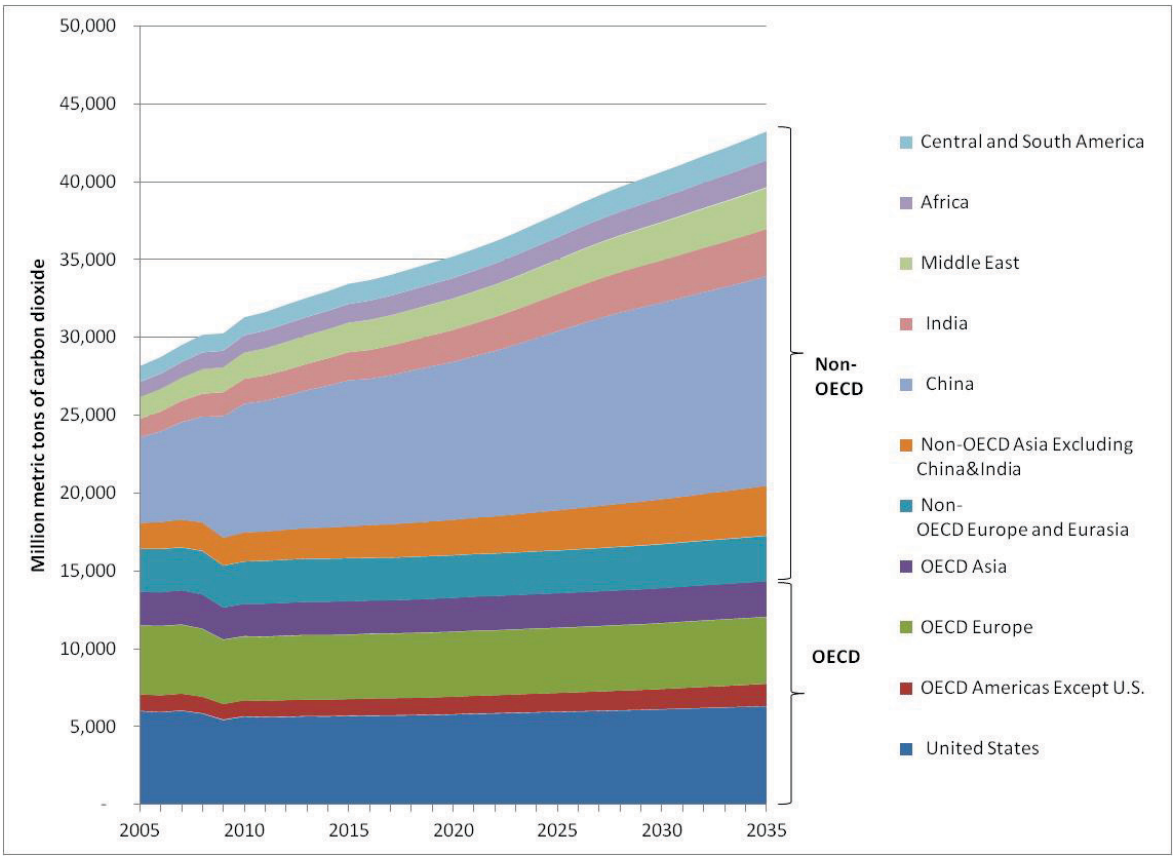
	2007 Law	No Tax Credits	Economic Depreciation
Electric Utilities: Generation			
Nuclear	-99.5	32.4	-49.4
Coal (Pulverized Coal)	38.9	38.9	39.3
Coal (IRCC)	-11.6	38.9	-10.3
Gas	34.4	34.4	39.3
Wind	-163.8	12.8	-13.7
Solar Thermal	-244.7	12.8	-26.5
Petroleum			
Oil Drilling, Non-Integrated	-13.5	-13.5	39.3
Oil Drilling, Integrated	15.2	15.2	39.3
Refining[a]	19.1	19.1	39.3
Natural Gas			
Gathering Pipelines	15.4	15.4	39.3
Other Pipelines	27.0	27.0	39.3

Source: See http://www.nationalaglawcenter.org/assets/crs/R41953.pdf. Data from Gilbert E. Metcalf, "Investment in Energy Infrastructure and the Tax Code," in *Tax Policy and the Economy*, ed. Jeffery R. Brown, 24 ed. (The University of Chicago Press, 2010), pp. 1-33.

Notes:

a. The effective tax rate on refining capital reflects the 50% expensing allowance available in 2007 for investments in additional refinery capacity.

Figure 3. World Carbon Dioxide Emissions by Region



Source: International Energy Outlook 2011, Energy Information Administration, U.S. Department of Energy.