IER INSTITUTE FOR ENERGY RESEARCH

BEFORE THE
HOUSE COMMITTEE ON ENERGY AND COMMERCE
SUBCOMMITTEE ON ENERGY

FEDERAL ENERGY RELATED TAX POLICY
AND ITS EFFECTS ON MARKETS, PRICES, AND CONSUMERS

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Executive Summary

Economists generally agree that decentralized markets, operating through private property and the profit-and-loss test, allocate resources better than top-down central planning. In the context of tax policy, this principle means that policymakers should try to raise the desired amount of revenue in a manner that distorts consumer and producer behavior as little as possible.

This principle is routinely violated when it comes to tax policy and energy markets. A recent study estimates that from 2016-2020, the federal tax code will provide artificial support through energy-specific provisions that cost the Treasury (in the form of forfeited revenues) $82.7 billion, with the renewables provisions of the Production Tax Credit and Investment Tax Credit holding the #1 and #2 spots, receiving 47.5% of the total subsidy between them.

According to the Energy Information Administration (EIA), in Fiscal Year 2013 direct federal financial interventions (a measure that includes, but is not limited to, tax expenditures) for electricity production directed $5.9 billion to wind and $4.4 billion to solar, yet only $901 million for coal and $690 million for natural gas and petroleum electricity production. The difference in federal support is even more striking when adjusted for the level of output: On a per-megawatt-hour basis, in FY 2013 solar received $231 of support and wind received $35, while natural gas and petroleum received 67 cents and coal received 57 cents.

As these figures amply demonstrate, federal tax policy currently provides artificial encouragement to some sectors (such as wind and solar) at the expense of other energy sources. The popular slogan "all of the above" to characterize a sensible U.S. energy policy is defensible, if it means that policymakers will foster a level playing field. Artificially promoting the development of wind and solar actually raises the true cost of electricity generation, because it is currently much cheaper to produce electricity (all things considered) through coal and natural gas plants, rather than new wind and solar.

As these newer technologies develop, the market may gradually shift to a greater reliance upon them. However, if policymakers continue to use the tax code (as well as direct spending and regulations) to artificially promote the expansion of some energy sources, this will further distort behavior, reducing consumer welfare and in particular making the energy sector less efficient.

Introduction

Policymakers, members of the public, and even late-night comedians recognize there are problems with the current U.S. tax code. As a bipartisan presidential panel on tax reform concluded in 2005:

> If you were to start from scratch, the current tax code would provide a guide on what to avoid…[W]e have a tax code that distorts basic economic decisions, sets up incentives for unwise or unproductive investments, and induces people to work less, save less, and borrow more. By some estimates, this economic waste may be as much as $1 trillion each year.[1]

One example that economists often use to show how the tax code perversely encourages borrowing is the corporate tax treatment of debt versus equity finance. "[U]nder the U.S. tax system, corporations may deduct payments of interest from taxable income, but are not allowed to deduct dividends. The tax law therefore builds in a bias towards debt financing."[2]

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[1] President's Advisory Panel on Federal Tax Reform, 2005, p. 1, quoted in Harvey S. Rosen and Ted Gayer, *Public Finance* (New York: McGraw-Hill/Irwin), 9th edition, 2010, p. 477.
[2] Rosen and Gayer, *Public Finance*, p. 450.

However, although such commentary is common—and is very useful to get the general public as well as policymakers to see the way the tax code encourages behavior (in this case, a reliance on debt versus equity financing) that many see as undesirable—the "solution" often advanced is arguably a cure worse than the disease. Specifically, many tax reform proposals would deal with this problem by eliminating a firm's ability to deduct interest payments from its taxable income. Yet this suggested fix doesn't really match the tax treatment to the accounting realities; after all, from a company's perspective, interest payments to bond holders *are* a business expense, just as surely as wage payments to employees.

Rather than saying, "By allowing the deductibility of interest expense, the tax code artificially favors debt finance," it would be more accurate to say, "By taxing net income, the corporate tax artificially penalizes equity finance." In any event, economists generally agree that the *high rate of U.S. corporate income taxation*—currently the highest among advanced economies and one of the highest in the world[3]—distorts business decisions, including the method of financing. This effect is by no means trivial: A 2001 academic study by Gordon and Lee estimated that "lowering the corporate [tax] rate by 10 percentage points lowers the percentage of the firm's assets financed by debt by 4 percent."[4]

As this discussion indicates, the U.S. federal tax code has the power not simply to raise revenue for the government, but also to alter behavior by households and firms. Generally speaking, it is economically undesirable for members of the private sector to make decisions because of the tax code. Yet we have also seen that having a broad economic framework for interpreting the impacts of the tax code is also important, lest policymakers tweak the code to address a specific problem in ways that simply invite further difficulties down the road.

The distortions emanating from the tax code occur across the economy, but our topic in this analysis is the impact on energy markets in particular. Yet before we discuss this narrower field, we should first provide a general framework of the economic analysis of taxes.

General Principles in the Economic Analysis of the Tax Code

Before analyzing the specifics of U.S. federal tax policy and its effects on energy markets, we should first provide a general framework for the economic analysis of the tax code. Although

[3] Kyle Pomerleau, "Corporate Income Tax Rates around the World, 2016," Tax Foundation, August 18, 2016, available at: https://taxfoundation.org/corporate-income-tax-rates-around-world-2016.

[4] The quotation is from Rosen and Gayer, *Public Finance*, p. 451. They are referring to Roger H. Gordon and Young Lee, "Do Taxes Affect Corporate Debt Policy? Evidence from U.S. Corporate Tax Return Data" (2001), *Journal of Public Economics* 8: 195-224.

economists would differ in the importance they might attribute to each of the considerations in this section, the principles we discuss here are standard in this literature.[5]

The Economic Harm of an Inefficient Tax

Although the press often reports on tax code changes in terms of dollars—e.g. a "$240 billion tax hike over ten years"—academic economists usually have something else in mind when they discuss the economic harm or damage of the tax code. It is not the mere transfer of purchasing power from the taxpayers to the government that is the issue; after all, perhaps the government in principle could spend the money on something socially useful. Rather, when economists talk about the inefficiency of the tax code, they usually mean that it is *distorting behavior* away from the optimal patterns that would exist in the absence of tax incentives.

Among economists there is a default presumption in favor of allocating resources *not* through top-down, command-and-control policies, but rather through the decentralized decisions of consumers and firms operating in the context of a market economy with private property rights and freely floating prices. To be sure, any economics textbook could list specific areas in which the "free market outcome" might need to be augmented because of imperfections, but nonetheless there is a general presumption in favor of letting consumers and entrepreneurs "spontaneously" determine how society's scarce resources (including workers' labor hours) will be allocated among specific industries. The market's profit-and-loss test—operating on the basis of the "true" prices reflecting genuine scarcity—is the feedback mechanism by which resources are channeled into their most valuable uses.

Absent a compelling reason to doubt the market outcome in a particular case, as a general rule it will reduce the efficiency of the economic system when the tax code distorts incentives and leads consumers and producers to behave differently. To repeat, this is a different concept from the mere amount of tax revenues raised by a certain tax. For example, a $1 per box tax on Cheerios might raise the same total tax receipts as (say) a nickel tax on *all* cereal boxes, but most economists would consider the latter approach to be much more sensible, since it would raise the revenue in a way that did not distort consumer choices nearly as much.

When a tax causes individuals to alter their behavior in inefficient ways, the result is a *deadweight loss* to society; the private sector ends up poorer, not just because of the immediate loss of tax payments to the government, but also because tradeoffs have been artificially distorted by the tax code.

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5 For a textbook reference on the general discussion in this section, see Harvey S. Rosen and Ted Gayer, *Public Finance* (New York: McGraw-Hill/Irwin), 9th edition, 2010, especially chapters 15-17, 19, and 21.

Economists quantify a particular tax's inefficiency according to its *excess burden*, which means the *extra* amount by which the taxpayer is made poorer, in order to transfer a particular amount of revenue to the tax collector. Economists differ widely in their estimates of the excess burden of U.S. taxation, but one 2006 analysis from an expert in the field concluded that it cost the private sector $1.75 for every $1 raised in government revenue.[6]

Examples of Economic Distortions Arising from the Tax Code

By artificially penalizing (or rewarding) certain behaviors, the tax code can distort activity and (in general) reduce economic efficiency. These distortions can take place on many fronts.

For example, because the tax code typically focuses on market exchanges, it distorts the tradeoff between labor and leisure. Consider a worker who earns $50 per hour of labor. Absent any tax considerations, the worker will supply additional labor hours until the point at which he values (on the margin) an hour of leisure more than the extra goods and services he could obtain with an additional $50. However, if there is a 10 percent sales tax, then an extra $50 in hand will really only yield approximately an extra $45 worth of goods and services to the worker. This will artificially reduce the attractiveness of selling labor time for wages, and will (other things equal) lead workers in the aggregate to consume more leisure, i.e. to work fewer hours.

For another example, consider an income tax. Like a sales tax, it too distorts the labor/leisure decision and reduces the attractiveness of working. However, a typical income tax contains the *additional* distortion that it artificially penalizes saving. Consider a worker who earns $10,000 in gross income, when interest rates are 3%. In the absence of any taxation, the worker can consume her income today and enjoy $10,000 worth of goods and services. Or, she can save her money for a year, earn an additional $300 in interest income, and enjoy $10,300 in goods and services next year. But with a 10% income tax, the tradeoff becomes $9,000 in enjoyment today versus $9,243 in enjoyment next year. Instead of reaping the full $9,000 x 3% = $270 in interest income as a reward for her year of abstinence, the worker is now only gaining an extra $243 in consumption by waiting for a year, because the gross interest income of $270 (= $9,000 x 3%) was also taxed at 10%, meaning an extra $27 went to the government on top of the original $1,000 income tax paid on the $10,000 in wage income. Thus, this worker is less likely to work, and on top of that is less likely to save, because of the artificial distortion of the income tax.

[6] The 75 percent estimate comes from Martin Feldstein, "The effects of taxes on efficiency and growth" (2006), NBER Working Paper No. 12201. Feldstein's result and a broader discussion can be found in James R. Hines Jr., "Excess Burden of Taxation" (2007), Office of Tax Policy Research, University of Michigan Ross School of Business, May 31, 2007, available at: http://www.bus.umich.edu/otpr/WP2007-1.pdf.

Minimizing the Excess Burden of Taxation

If the goal were to raise a given amount of revenue with as little distortion as possible, one solution would be to impose an equal, lump-sum head tax on every citizen. For example, if the government wanted to raise $3.3 trillion in revenue, and we assume there are 330 million identifiable people in the United States, then one possible tax system would simply assign a tax bill of $10,000 to every man, woman, and child in the country. If this were feasible, it would raise (roughly) the same amount as the current tax code but with hardly any distortion, because Americans' tax bill would have nothing to do with their behavior (except perhaps for the decision to remain within the United States).

However, most people—including economists—recognize that such an approach, although very efficient, violates the principle of tax *equity*. One obvious consideration when it comes to equity is "ability to pay"; most people think a billionaire should pay more dollars in tax than someone with no income or assets.

In this document, it is not my purpose to argue for a particular "optimal" design of tax policy. There are competing principles at stake, such as the tradeoff between efficiency and equity, as well as the broader, more philosophical questions of the proper size of government and the proper amount of resources to be transferred to the political sector away from the private sector.

Although we will not seek to answer these difficult questions here, even so we can (in the remainder of this subsection) consider methods of reducing the excess burden of taxation, i.e. ways of making the tax code more efficient. Then in later sections we apply our discussion to the case of energy markets.

A standard goal for minimizing inefficiency is to keep tax *rates* as low as possible, by applying them to as wide a base as possible. If we are to have an income tax, this means consolidating the number of tax *brackets* and *reducing arbitrary deductions*[7] *and credits* currently available. The logical end result of this approach would be a single, flat tax applied uniformly to the properly calculated net income of the entity.[8]

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7 It is important to note the word "arbitrary" in our statement. If a business is being taxed on its net income, it is perfectly sensible to allow the business to deduct its legitimate business expenses and thus reduce its taxable income. Part of the difficulty in tax reform is the treatment of household expenditures. When a household buys a new car, is that an investment or consumption?

8 A classic case for a single rate flat tax is Robert E. Hall and Alvin Rabushka, *The Flat Tax* (Hoover Institution), 2nd edition, 2007, available at: http://www.hoover.org/research/flat-tax. Note, however, that by allowing for the full deductibility of investment expenditures, the Hall/Rabushka flat tax is essentially a consumption tax, not an income tax.

The direct benefit of such a tax code is that it raises the target amount of revenue with the smallest top marginal tax rate (by using a single rate and the broadest possible base). Thus it minimizes the distortions we have discussed, on the leisure-labor and consumption-saving decisions. In other words, such a tax would reduce the current penalties on working and investment.

Beyond this direct benefit, there would also be economic gains in the form of the reduced compliance costs. Without myriad deductions and credits, households and firms would no longer need to retain as much paperwork, and would also save an extraordinary amount of time—both their own and the time outsourced to tax professionals—with a much simpler tax code.

Finally, if households and businesses knew that there was a firm commitment to simplicity in the tax code, they would reduce the amount of resources devoted to *rent seeking*. Currently, the tax code contains high (some might argue punitive) marginal rates as the default, but with many deductions and credits that favor particular groups or activities, thus shielding them from the high rates. But when the tax code implicitly "picks winners and losers," not only does this directly distort behavior, but it also makes it worthwhile for various groups to spend resources lobbying policymakers to tweak the tax code in ways favorable to them. Although these efforts are rational at the individual level, in the aggregate they are largely an "arms' race" that renders the resulting tax code even worse from an efficiency standpoint. A truly simple tax code would reduce the resources spent on such efforts. Resources would be allocated primarily through the incentives given by market prices, not the tax code.

This brief discussion has distilled some of the key principles of tax analysis from an academic economics perspective. In the real world, there are other considerations besides "textbook" efficiency (and equity). For example, a tax "reform" package might introduce new taxes that in theory are more efficient while phasing out other taxes. On paper this would seem to be a desirable change, but if in reality policy makers reintroduced the original tax *on top* of the new additions, then the result could be worse than the status quo.

Despite these difficulties, the framework we have presented summarizes some of the key lessons from economists on tax policy. We now apply this framework specifically to the tax code and energy markets.

THE U.S. FEDERAL TAX CODE AND ENERGY MARKETS

The general principles we discussed above apply to energy markets. For example, it is popular to endorse an "all of the above" approach to the various sources of energy production. We agree, but note that this does *not* mean that the tax code (or regulatory policy) should be designed with the intention of *promoting* certain energy sources while penalizing others.

Instead, an appropriate "all of the above" approach means setting a uniform playing field, with as low a tax rate as possible applied evenly to as broad a base as possible, so that the target amount of revenue is raised while minimizing the distortion of behavior. Just as consumer choice, guided by market prices, leads to the allocation of resources among different types of restaurants, so too should consumers ultimately be the ones to determine the market's mix of energy sources.[9]

In the remainder of this document we summarize some of the key facts concerning the tax treatment of the energy sector, and how this distorts markets and reduces consumer well being.

Energy Information Administration (EIA) Assessment of Energy "Subsidies" as of FY 2013

The Energy Information Administration (EIA), an independent agency within the Department of Energy (DOE), in 2015 issued a report on the "direct federal financial interventions and subsidies that are provided by the federal government, provide a financial benefit with an identifiable federal budget impact, and are specifically targeted at energy markets," for Fiscal Year 2013.[10] The term "subsidy" here is construed broadly, and includes not only direct cash assistance but also preferential treatment in the tax code that reduces an entity's tax liability.[11] We present some of EIA's key findings below.

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[9] We deal with possible objections to such a strategy—such as the "market failure" argument in the context of carbon dioxide emissions and climate change—below.

[10] Energy Information Administration, "Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2013," March 12, 2015, available at: https://www.eia.gov/analysis/requests/subsidy/.

[11] The EIA report notes (p. xi) that because it focuses on measures that are specifically targeted to the energy sector, its analysis does not include *all* federal provisions that might benefit the energy sector. For example, "Section 199 of the American Jobs Creation Act of 2004, referred to as the domestic manufacturing deduction, provides reductions in taxable income for American manufacturers, including domestic oil and gas producers and refiners." In later sections we address some of the popular complaints about the "tax breaks" given to the oil industry.

Table 1. Value of Energy Subsidies By Major Use, FY 2010 and FY 2013 (millions of 2013 dollars)

Subsidy and Support Category	FY 2010	FY 2013
Electricity-Related	**11,694**	**16,112**
Fuel and Technologies Used for Electricity Production	10,862	14,928
Transmission and Distribution	833	1,184
Fuels Used Outside the Electric Power Sector	**10,710**	**5,206**
Conservation, End Uses, and Low-Income Home Energy Assistance Program (LIHEAP)	**15,574**	**7,940**
Conservation	7,069	1,964
End Uses and Other Technologies	3,127	2,860
LIHEAP	5,378	3,116
Total	**37,979**	**29,258**

Source: EIA (2015), "Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2013," Table ES1.

As Table 1 indicates, as of FY 2013 EIA had cataloged some $29 billion in direct federal financial intervention in energy markets, with $16 billion going to electricity, $5 billion going to other fuels, and just under $8 billion going to conservation, end uses, and low-income energy assistance.

We now break down the totals by energy type.

Table 2. Quantified Energy-Specific Subsidies and Support By Type, FY 2013 (millions of 2013 dollars)

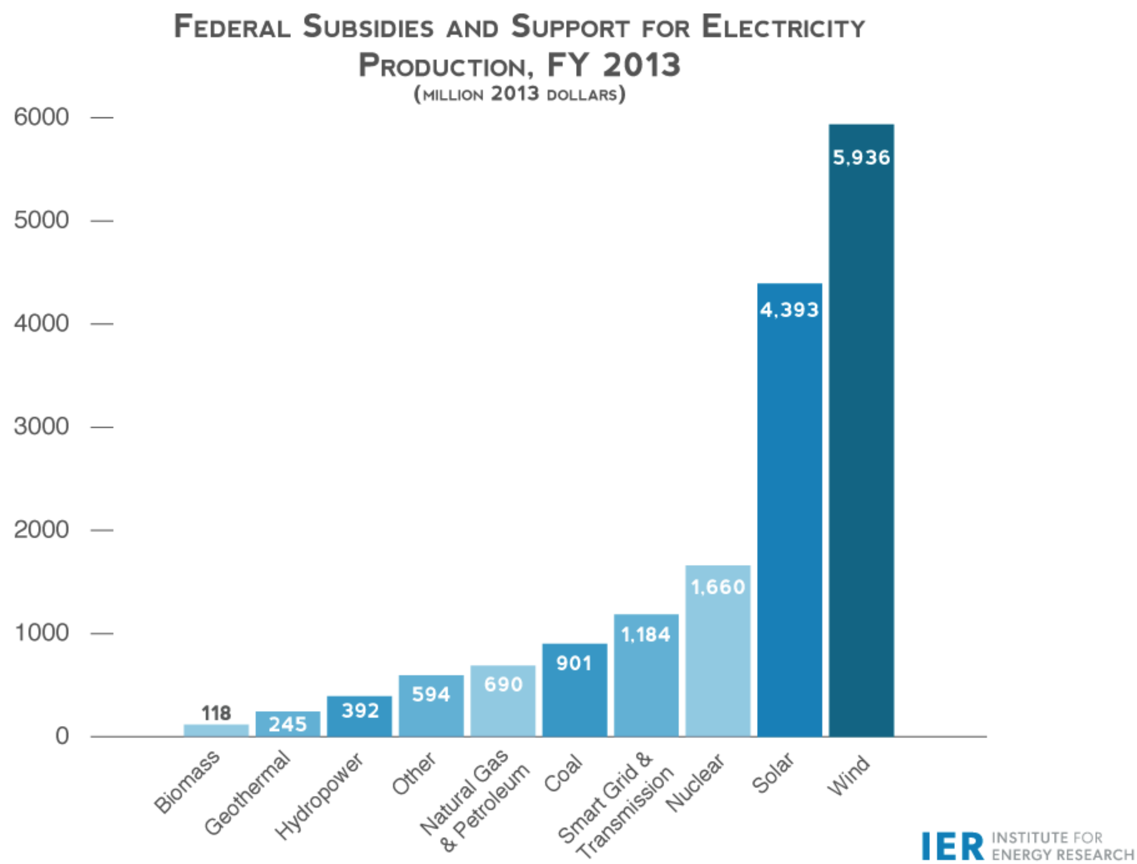
Beneficiary	Direct Expenditures	Tax Expenditures	Research and Development	DOE Loan Guarantee Program	Federal and RUS Electricity	Total	ARRA Related
2013							
Coal	74	769	202	-	30	1,075	129
Refined Coal	-	10	-	-	-	10	-
Natural Gas and Petroleum Liquids	62	2,250	34	-	-	2,346	4
Nuclear	37	1,109	406	-	109	1,660	29
Renewables	**8,363**	**5,453**	**1,051**	**-**	**176**	**15,043**	**8,603**
Biomass	332	46	251	-	-	629	369
Geothermal	312	31	2	-	-	345	312
Hydropower	197	17	10	-	171	395	216
Solar	2,969	2,076	284	-	-	5,328	3,137
Wind	4,274	1,614	49	-	-	5,936	4,334
Other	209	-	380	-	5	594	229
Subtotal Renewables Electric	**8,291**	**3,783**	**977**	**-**	**176**	**13,227**	**8,597**
Biofuels	72	1,670	74	-	-	1,816	6
Electricity - Smart Grid and Transmission	**8**	**211**	**831**	**-**	**134**	**1,184**	**780**
Conservation	**833**	**630**	**501**	**-**	**-**	**1,964**	**1,574**
End Use	**3,513**	**1,997**	**466**	**-**	**-**	**5,976**	**2,046**
LIHEAP	3,116	-	-	-	-	3,116	-
Other	397	1,997	466	-	-	2,860	2,046
Total	**12,891**	**12,428**	**3,491**	**-**	**449**	**29,258**	**13,166**

Source: EIA, Table ES2

As Table 2 indicates, in the realm of specific energy types, renewables—in particular, solar and wind—received the lion's share of federal support. Specifically, of the $29.3 billion in total federal financial intervention, $15.0 billion went to renewables (with $5.9 billion to wind and $5.3 billion to solar), while only $2.3 billion went to natural gas and petroleum liquids, $1.7 billion went to nuclear, and $1.1 billion went to coal.

In Figure 1 we present this same information in graphical form.

Figure 1.



Source: EIA, Table ES2

We can further refine EIA's analysis by looking just at electricity production subsidies.

Table 3. Electricity Production Subsidies and Support, FY 2013 (millions of 2013 dollars)

Beneficiary	Direct Expenditures	Tax Expenditures	Research and Development	DOE Loan Guarantee Program	Federal and RUS Electricity[a]	Total	Share of Total Subsidies and Support
Coal	61	642	167	-	30	901	6%
Natural Gas and Petroleum Liquids	18	662	10	-	-	690	4%
Nuclear	37	1,109	406	-	109	1,660	10%
Renewables	**7,408**	**3,373**	**722**	**-**	**176**	**11,678**	**72%**
Biomass	62	9	47	-	-	118	1%
Geothermal	221	22	2	-	-	245	2%
Hydropower	194	17	10	-	171	392	2%
Solar	2,448	1,712	234	-	-	4,393	27%
Wind	4,274	1,614	49	-	-	5,936	37%
Other	209	-	380	-	5	594	4%
Subtotal Renewables Electric	**7,408**	**3,373**	**722**	**-**	**176**	**11,678**	**72%**
Biofuels	-	-	-	-	-	-	-
Electricity - Smart Grid and Transmission	**8**	**211**	**831**	**-**	**134**	**1,184**	**7%**
Total	**7,532**	**5,996**	**2,136**	**-**	**449**	**16,112**	**100%**

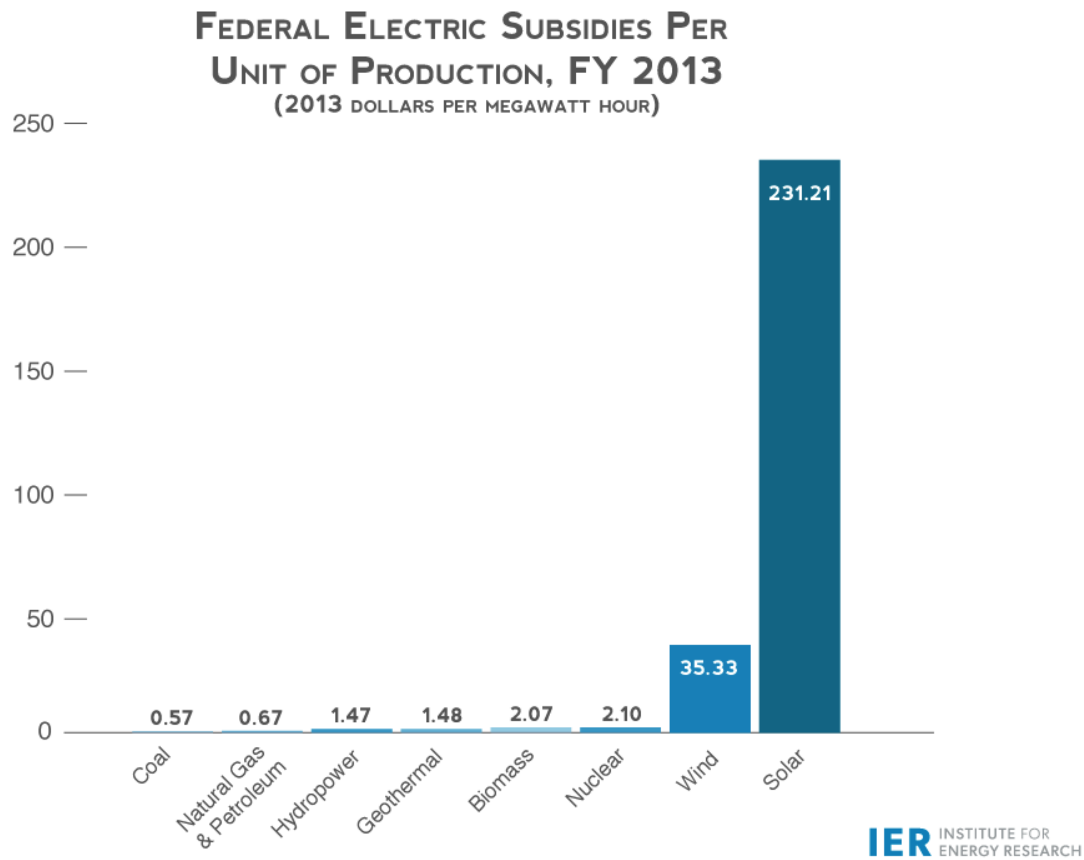
Source: EIA, Table ES4

As Table 3 shows, when we restrict our attention to electricity production, federal financial intervention totaled $16.1 billion. Of that amount, 37 percent went to wind, 27 percent went to solar, 10 percent went to nuclear, 6 percent went to coal, and 4 percent went to natural gas and petroleum liquids.

Finally, although the EIA report does not directly provide these figures, we can use the information from the report to calculate federal support for electricity production *per unit of electricity produced*.[12] We present these findings in Figure 2.

[12] For more information on these calculations, and on EIA's rationale for not directly providing the data, see Mary Hutzler, "EIA Report: Subsidies Continue to Roll In For Wind and Solar," Institute for Energy Research blog post, March 18, 2015, available at: http://instituteforenergyresearch.org/analysis/eia-subsidy-report-solar-subsidies-increase-389-percent/.

Figure 2.



Source: IER calculations based on data from EIA (2015), "Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2013."

As Figure 2 illustrates, once we adjust for the level of electricity output (in MWh), the disparity in federal support becomes even more lopsided, because wind and solar constitute such a small share of the total market. At $231 per MWh, the support for solar is some 400 *times* the support for coal.

Congressional Research Service (CRS) Assessment of Energy Tax Provisions, 2016-2020

Although the data from the EIA report were illuminating, the report's definition of "federal financial interventions and subsidies" included direct grants (which are not part of the tax code). To gain a tighter focus on energy tax provisions, we can rely on the latest Congressional

Research Service (CRS) report that specifically tallies them.[13] Table 4 summarizes the latest CRS findings.

[13] The CRS data is included as an Appendix to the memo to committee members from the U.S. House of Representatives Committee on Energy and Commerce, March 27, 2017, available at: http://docs.house.gov/meetings/IF/IF03/20170329/105798/HHRG-115-IF03-20170329-SD002.pdf.

Table 4. Federal Energy Tax Provisions and Their Budgetary Impact, 2016 Actual Cost and Projected 2016-2020 Cost

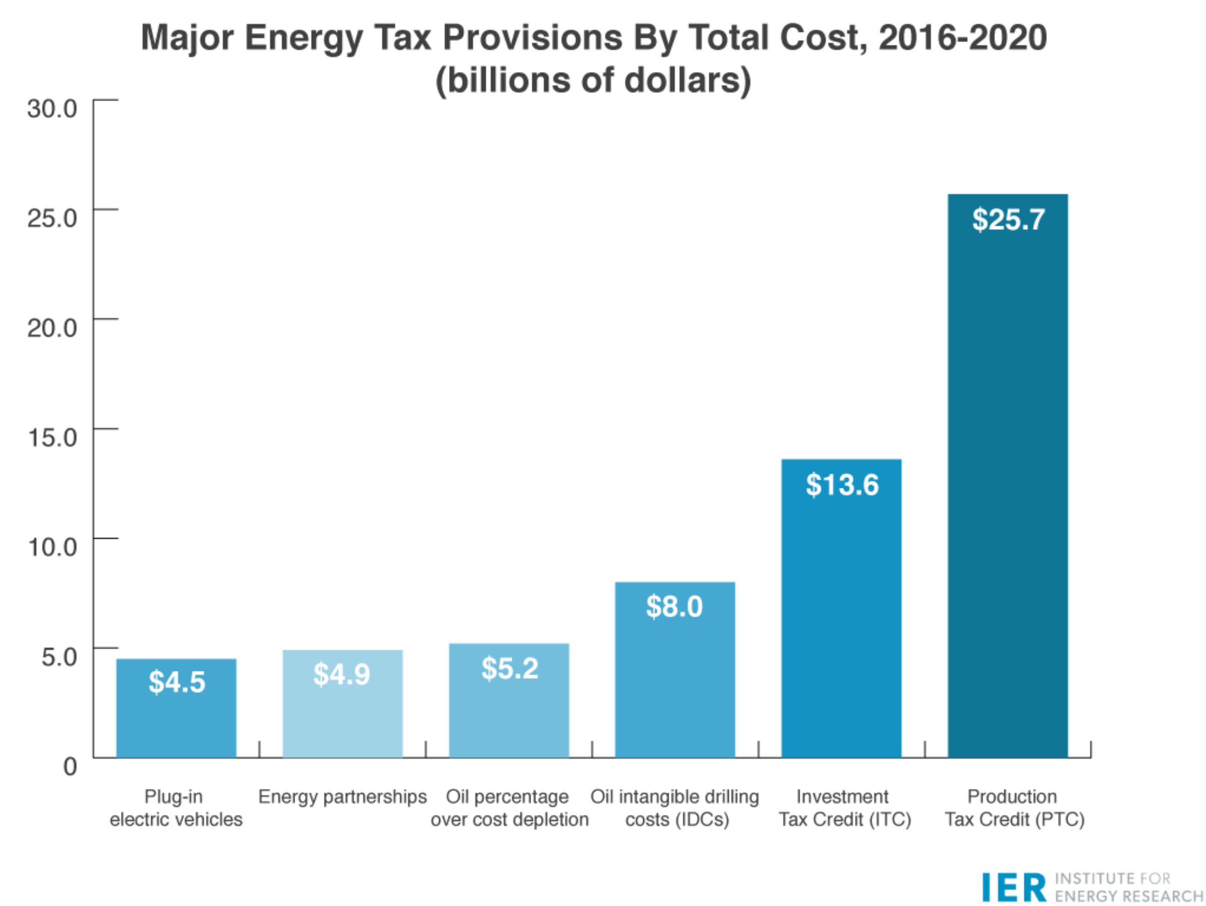
Tax Provision Item or Category	2016 Cost	2016-2020 Cost	% of 2016-2020 Cost
FOSSIL FUEL TAX PROVISIONS			
Expensing of percentage over cost depletion	$0.9	$5.2	6.3%
Expensing of intangible drilling costs (IDCs) and dvmpt expenditures for hard minerals	$1.8	$8.0	9.7%
Amortization of G&G expenditures for oil and gas exploration	$0.1	$0.6	0.7%
Coal production credits		$0.2	0.2%
Credits for investing in clean coal facilities	$0.2	$1.0	1.2%
Amortization of air and pollution control facilities	$0.5	$4.2	5.1%
Exceptions for energy-related publicly traded partnerships	$0.9	$4.9	5.9%
Credit for alternative fuels and alternative fuels mixtures	$0.8	$0.9	1.1%
RENEWABLES TAX PROVISIONS			
Production Tax Credit (PTC)	$3.4	$25.7	31.1%
Investment Tax Credit (ITC)	$2.6	$13.6	16.4%
Section 1603 grants in lieu of tax credits	$1.2	$1.9	2.3%
Residential energy-efficient property credit	$1.1	$3.2	3.9%
Five-year cost recovery of certain energy property	$0.3	$2.0	2.4%
Credits for holders of clean renewable energy bonds		$0.6	0.7%
Credit for biodiesel, renewable diesel, and second-generation (cellulosic) biofuels	$2.2	$2.6	3.1%
Advanced energy manufacturing tax credit	$0.3	$0.8	1.0%
ENERGY EFFICIENCY TAX PROVISIONS			
Credit for nonbusiness energy property	$0.5	$0.9	1.1%
Exclusion of energy conservation subsidies provided by public utilities		$0.1	0.1%
Qualified energy conservation bonds		$0.3	0.4%
Plug-in electric and other alternative fuel vehicles	$0.3	$4.5	5.4%
OTHER ENERGY TAX PROVISIONS			
Exclusion of interest on state and local government private activity bonds for energy production facilities		$0.7	0.8%
Depreciation recovery periods for energy specific items	$0.4	$1.8	2.2%
Deferral of gains from the sale of electric transmission property	-$0.2	-$1.0	-1.2%
TOTAL FOR ALL TAX PROVISIONS	$17.3	$82.7	100.0%

Source: Adapted from Congressional Research Service,[14] Table 1.

As Table 4 indicates, of the measures analyzed by the CRS study, by far those with the largest cost (in the sense of tax expenditures) were the Production Tax Credit (PTC) at $25.7 billion and the Investment Tax Credit (ITC) at $13.6 billion, both targeted to renewable energy. The two costliest measures catering to oil and natural gas, namely the expensing of intangible drilling costs (IDCs) at $8.0 billion and percentage vs. cost depletion at $5.2 billion, constituted a much smaller budgetary impact.

In Figure 3 we chart the six costliest items in the CRS study.

Figure 3.



SOURCE: Adapted from Congressional Research Service, Table 1.

14 See the appendix to the committee members memo at: http://docs.house.gov/meetings/IF/IF03/20170329/105798/HHRG-115-IF03-20170329-SD002.pdf.

Federal Revenues By Energy Source

In previous sections we have provided statistics on the amount of federal tax support (in the sense of targeted deductions and credits) for participants in energy markets. To place these numbers in context, it may help to see the revenues actually *collected* by the federal government through various channels from the energy sector.

Unlike many other industries, those in the energy sector do not simply pay corporate income tax to the federal government, but often may make very large *non-tax* payments because the federal government legally owns resource-rich lands and waters. "When companies extract natural resources on federal lands and waters, they pay royalties, rents, bonuses, and other fees, much like they would to any landowner. This non-tax revenue is collected and reported by the Office of Natural Resources Revenue (ONRR)."[15]

In Table 5 we summarize the results posted at the Department of Interior's website, concerning the 2015 payments of non-tax extraction revenues:

Table 5.

	Federal Extraction Revenue (2015)				
Commodity	Total	Securing Rights	Before Production	During Production	Other
Oil and Gas	$6,159,534,275	$682,107,972	$237,555,805	$ 5,281,260,458	-$41,389,960
Coal	$1,131,925,660	$453,264,014	$1,347,056	$671,453,229	$5,861,362
Geothermal	$14,014,431	$0	$1,737,839	$11,986,017	$290,575
Offshore Wind	$3,245,090	$431,482	$2,804,843	$0	$8,765

Source: Department of the Interior, https://useiti.doi.gov/explore/#revenue

As Table 5 illustrates, extraction revenues in 2015 from oil, natural gas, and coal dwarfed those of geothermal and wind; the totals are $7.3 billion versus $17 million. (We can't present the data graphically, because the small values for geothermal and wind wouldn't even show up in the chart.)

To reiterate, the data in Table 5 only show the *non-tax* revenues associated with extraction activities. We might also wonder about standard corporate income tax revenues associated with various energy sources. Unfortunately, such data do not seem to be available from government sources in this format.

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15 Quotation from: https://useiti.doi.gov/explore/#revenue.

However, we can get some idea of the respective contributions to federal tax receipts by looking at the latest IRS report on corporate tax returns broken down by "minor industry." We present the relevant information in Table 6.

Table 6. Select Data on Corporate Tax Returns by Energy-Related "Minor Industry," Tax Year 2013 (money amounts in thousands of dollars)

Minor industry	Number of returns		Income subject to tax	Total income tax after credits
	Total	With net income		
	(1)	(2)	(9)	(14)
Total returns of active corporations	**5,887,804**	**3,580,938**	**1,258,482,675**	**293,357,284**
Agriculture, forestry, fishing and hunting	**136,493**	**81,466**	**3,454,923**	**1,000,266**
Agricultural production	101,274	61,019	3,077,600	885,826
Forestry and logging	8,745	5,667	116,791	37,993
Support activities and fishing, hunting, and trapping	26,473	14,779	260,532	76,448
Mining	**35,603**	**23,070**	**25,807,535**	**4,896,248**
Oil and gas extraction	18,877	12,872	11,911,704	1,943,270
Coal mining	996	420	*84,706	32,220
Support activities for mining	10,522	7,508	6,656,688	1,943,516
Utilities	**7,845**	**4,637**	**4,871,477**	**1,450,017**
Electric power generation, transmission, and distribution	1,427	370	1,604,178	299,671
Natural gas distribution	646	363	765,062	396,785
Water, sewage, and other systems	5,272	3,486	140,729	49,872
Combination gas and electric	501	417	2,361,508	703,689
Manufacturing	**242,755**	**155,960**	**472,449,903**	**88,191,133**
Petroleum and coal products manufacturing	1,039	739	123,428,735	6,908,479
Petroleum refineries (including integrated)	207	67	122,576,521	6,630,850
Asphalt paving, roofing, other petroleum and coal products	831	672	852,214	277,629
Wholesale and retail trade	**960,845**	**586,154**	**204,075,889**	**60,990,498**
Petroleum and petroleum products	7,083	4,455	2,468,771	407,787
Gasoline stations	45,376	28,538	1,398,024	453,186
Transportation and warehousing	**219,600**	**141,699**	**27,680,388**	**8,824,125**
Pipeline transportation	519	435	939,546	334,057
Other transportation and support activities	43,975	29,979	11,263,282	3,492,250

Source: Adapted from IRS, Statistics of Income (SOI), Returns of Active Corporations, Table 1, available at: https://www.irs.gov/uac/soi-tax-stats-returns-of-active-corporations-table-1

As Table 6 shows, in Tax Year 2013 oil and gas extraction alone contributed far more in total income tax (after credits) than the entire electric power generation, transmission, and distribution industry—$1.9 billion versus $300 million. And note that this latter figure is the *entire* listing for electric power, meaning it includes electricity generated by natural gas and coal, which account for the overwhelming bulk of total U.S. electric generation.

In summary, although we cannot find reports from official sources that expressly tabulate the total federal receipts broken down by energy type, it is safe to say that oil, natural gas, and coal generate vastly more in net payments to the U.S. government than renewable energy sources. These facts should be considered along with the earlier statistics concerning the disparity in tax expenditures ("subsidies") by energy type.

The History of the PTC and Its Impact on the Wind Sector

As discussed earlier, the Production Tax Credit (PTC) is the single most expensive (from the perspective of forfeited revenue) energy-targeted tax provision; the latest CRS report projected that the PTC would account for a tax expenditure of $25.7 billion from 2016-2020. Because of its relative significance, and also because of its perverse effect of *negative* wholesale wind prices, we discuss the PTC in detail in this section.[16]

Brief History of the PTC

The PTC was first enacted in 1992 and, as of this writing, has since been extended ten times. The PTC provides owners of wind facilities a tax subsidy[17] tied to the general price level that currently works out to $23 per megawatt-hour (MWh) of electricity generated for the facility's first 10 years of operation. To put the size of the subsidy in perspective, prices in wholesale electricity markets averaged $30 per MWh in 2016.[18] Furthermore, because the PTC is a tax credit, its official current value of $23 per MWh actually corresponds to a pre-tax wind price of $23 / (0.65) = $35 per MWh, with the current corporate tax rate of 35 percent. (As we will see, this explains why wind producers are willing to accept negative wholesale prices even below minus $20 per MWh.)

The PTC was extended in January 2013 and expired at the end of that year. In the extension bill, however, Congress expanded the qualification criteria to include facilities that had commenced construction by the end of 2013 instead of requiring that facilities be complete.[19] The change in language enabled the Internal Revenue Service (IRS) to expand eligibility to projects that had not initiated physical construction but had merely secured financing, including many facilities that began or will begin operation between January 1, 2014 and January 1, 2016.[20] (As a result, the government would have been providing PTC support through the year 2025.)

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16 This material draws heavily on the IER study, "The Case Against the Wind Production Tax Credit," November 2014, available at: http://instituteforenergyresearch.org/wp-content/uploads/2014/11/The-Case-Against-the-PTC-Nov-2014.pdf.

17 Some analysts make a distinction between a tax credit (which reduces tax liability) and an explicit payment issued by the federal government, reserving the term "subsidy" for the latter. However, with the wind PTC the distinction is not crisp in practice, because the tax credit is so large that many wind operations cannot take full advantage of it. That is why they bring in Wall Street firms to effectively auction off the tax credit to outside financiers, and it also explains why so many renewable groups clamor to make the PTC a *refundable* tax credit.

18 Electricity wholesale prices for 2016 available at: https://www.eia.gov/electricity/wholesale/#history

19 Nick Juliano, IRS guidance clarifying PTC eligibility seen as boon for developers, E&E News Greenwire, August 11, 2014, http://www.eenews.net/greenwire/stories/1060004314/.

20 Although the PTC has expired, developers can qualify for the tax credit without starting physical construction on a wind facility. The IRS released a guidance document stating that a project would be eligible for the PTC if it had either: (1) started "physical work of a significant nature" or (2) satisfied "the Safe Harbor with respect to a facility," as long as the developer made "continuous progress towards completion" once the construction phase had begun.

As of this writing, the latest legislation[21] concerning the PTC is the Consolidated Appropriations Act, 2016 (H.R. 2029, Sec. 301), passed in December 2015. This legislation enacted a gradual "phase out" of the PTC. Specifically, for wind facilities commencing construction in 2017, the PTC is reduced by 20 percent; for those starting in 2018, the PTC is reduced by 40 percent; and for those starting in 2019, the PTC amount is reduced by 60 percent.

A Perversion of the Market: The PTC and Negative Wholesale Wind Prices

The case of the PTC is an excellent illustration of how generous tax code "support" for a particular energy type—in this case, wind—can lead to results that clearly make no economic sense. Specifically, at times of low demand wind operators can end up driving wholesale electricity prices into very negative territory—even below minus $20 per MWh. Because the PTC is only applicable for actual production, the owners of a wind facility can reduce their overall tax liability by the PTC credit even if they are "losing money" on the wind generation itself.

Although it might make sense for certain producers to offer negative prices for brief periods to the grid in order to avoid a disruptive shutdown of generation, this does *not* make sense for wind operators. "Unlike nuclear and fossil-fueled generation[,] wind generation is physically flexible, as it can be shut down or turned back on reasonably quickly by altering the pitch of the turbine blades or by disconnecting or reconnecting the turbines to the electric grid."[22] Clearly, the unusual practice of prolonged selling at *negative* prices is driven by the tax code, not the underlying economic realities.

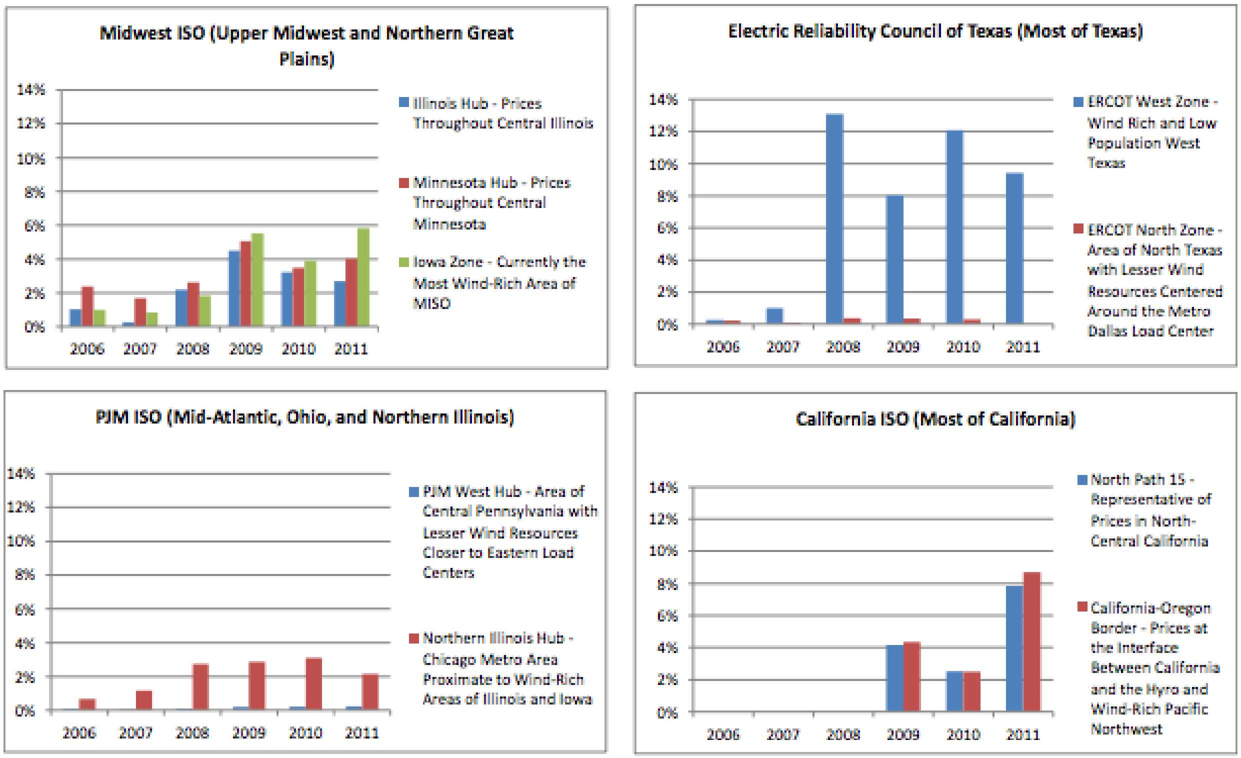
Furthermore, with the expansion of wind capacity over time, this phenomenon of negative wholesale electricity prices became more pronounced, as we illustrate in Figure 4.

Many facilities that are placed in service before January 1, 2016 will satisfy the continuous progress standards. http://www.irs.gov/pub/irs-drop/n-14- 46.pdf

[21] The current status of the PTC is taken from: https://energy.gov/savings/renewable-electricity-production-tax-credit-ptc. (Accessed March 25, 2017.)

[22] Frank Huntowski, Aaron Patterson, and Michael Schnitzer, "Negative Electricity Prices and the Production Tax Credit," The NorthBridge Group, September 10, 2012, available at: http://acore.org/wp-content/uploads/2012/09/Negative-Electricity-Prices-and-the-PTC-Sept-2012.pdf, p. 7.

Figure 4. Percentage of Hours with Negative Real-Time Electric Energy Prices in Select Markets, 2006 – 2011



NOTE: California ISO data not available prior to 2009.
Source: Huntowski et al. 2012,[23] Figure 6.

As Figure 4 indicates, the phenomenon of negative wholesale electricity prices became much more common in certain markets especially after 2007. It is natural to attribute this increase in large part to the growing proliferation of wind capacity.

Wind Advocates Connect PTC With Wind Capacity Growth: That's Not a Good Thing

We should note that even the *supporters* of wind energy fully agreed that the PTC has been and continues to be vital to the expansion of wind capacity. For example, the current page devoted to the PTC at the website of the American Wind Energy Association (AWEA) says:

> Thanks to this policy certainty, 18 gigawatts of wind power capacity are now under construction or in advanced development. With the PTC phasedown, wind

[23] Frank Huntowski, Aaron Patterson, and Michael Schnitzer, "Negative Electricity Prices and the Production Tax Credit."

> energy can [continue] growing to supply 10 percent of U.S. electricity by 2020 and support tens of thousands additional well-paying jobs.
>
> With the help of the PTC and ITC, U.S. wind farms now provide enough power for 24 million American homes and attract billions in private investment to the U.S. economy each year…
>
> The PTC and ITC has driven more wind development…[24]

The AWEA analysis is undoubtedly correct that a generous tax credit—so generous that it justifies paying customers to take the product—will encourage the expansion of a particular sector. But by itself, this is evidence that the outcome is a *distortion*, because of the artificial advantage given to wind. Or, from the other side, we could say that the tax code (with the PTC) has placed an artificial *disadvantage* on electrical generation sources that do *not* qualify for the credit.

Although artificial tax advantages can make outcomes "rational" at the individual level, from the perspective of the overall economy they are inefficient. It would distort producer and consumer behavior less if the target amount of tax revenues were raised on a more uniform basis, with resources flowing into various energy types based on their actual profitability and reliability.

Artificial Federal Support for Certain Energy Sources Leads to Inefficiency

To understand the inefficiencies resulting from an artificial advantage given to wind and solar, consider the levelized cost of electricity generation from various sources.

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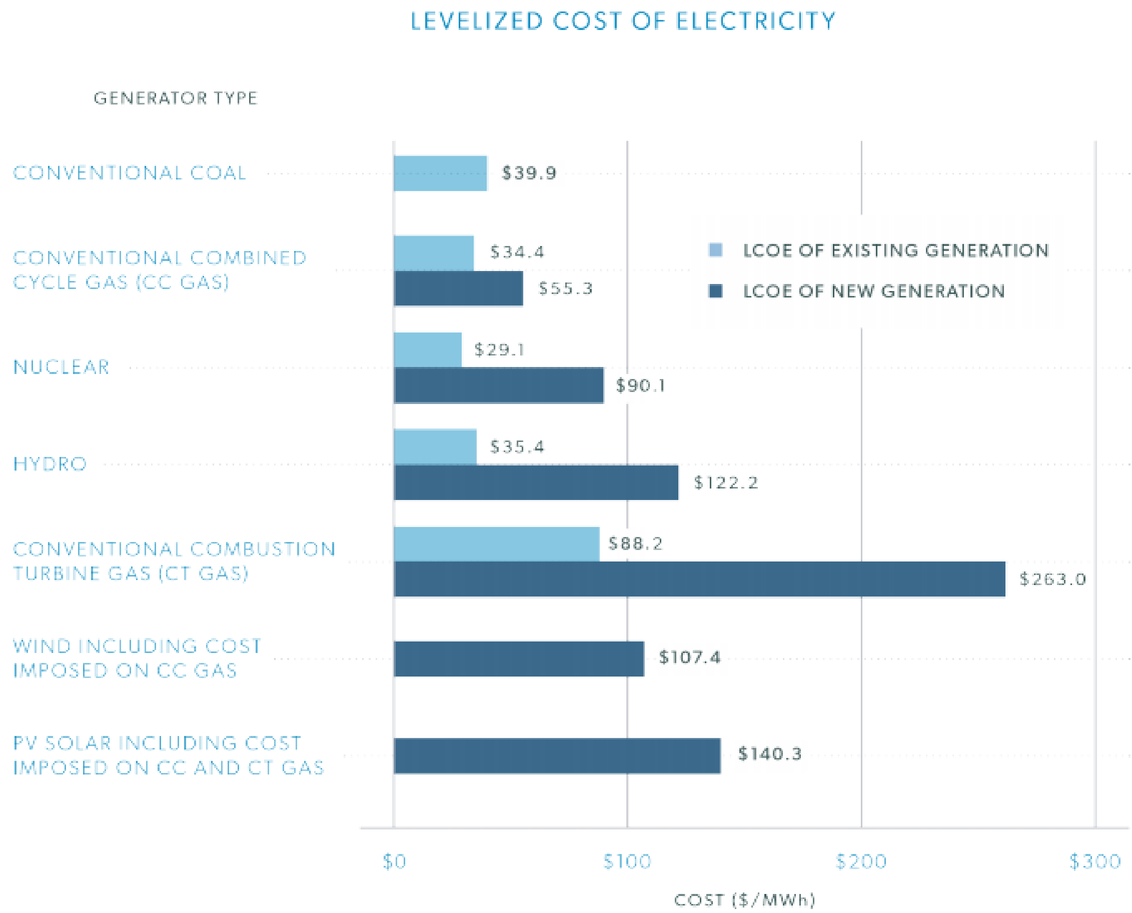
[24] American Wind Energy Association (AWEA), "Production Tax Credit," available at: http://www.awea.org/production-tax-credit. Accessed March 25, 2017.

Figure 5.



SOURCE: Stacy and Taylor (2016),[25] p. 5.

There are two important takeaways from Figure 5. First, note that with these estimates, electricity from new wind and solar generation is more expensive than electricity from new gas or nuclear generation. Second and perhaps more important, the relevant comparison on the margin is the levelized cost of *existing* generation, if the issue is whether policymakers want to actively reduce generation from some sources (such as coal) and replace it with growth in other sources (such as wind and solar). On this margin, the increases in costs of generation are even more pronounced.

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[25] Thomas F. Stacy and George S. Taylor, "The Levelized Cost of Electricity From Existing Generation Resources," Institute for Energy Research (IER), July 2016, available at: http://instituteforenergyresearch.org/wp-content/uploads/2016/07/IER_LCOE_2016-2.pdf. (Note that the IER study's figures do not directly correspond to those reported by EIA, because the study authors believe certain realistic adjustments are needed to produce more accurate estimates. See the study for more details.)

The Economic Impact of Certain Tax Provisions Related to the Oil Sector

Although the PTC is explicitly designed to foster growth in electricity generation from renewables, there are other aspects of the current tax code that provide benefits to the oil sector. For example, the provision for percentage depletion (rather than cost depletion, which is more analogous to standard depreciation of business expenses) gives an artificial advantage to oil production under certain conditions.[26] However, we note that the percentage depletion is *not* available to integrated oil companies and is limited to output below 1,000 barrels per day;[27] this is not a "tax break for Big Oil" as many critics allege.

Two other provisions—namely, the Domestic Manufacturer's Section 199 deduction and the allowance of Last-In, First-Out (LIFO) inventory accounting—are beneficial to oil and natural gas companies. However, it is incorrect to classify these as "tax breaks for oil and gas companies" as critics often allege. These are standard tax code provisions available to all sectors. (In fact, the Section 199 deduction has been made artificially *lower* for oil and gas companies than for others, with the former only able to claim a 6 percent deduction versus the standard 9 percent deduction for other manufacturers.[28])

Two Challenges to the General Principle of Allowing the Price System to Guide Energy Markets

Before closing, we should address two common challenges made to the general presumption of letting free consumer and producer decisions guide energy markets, without outside "steering" from the political process. These challenges are the "infant industry" argument and the concern over anthropogenic climate change.

The infant industry argument claims that a new domestic industry needs a helping hand from policymakers (such as in the form of protective tariffs or other preferential tax treatment) to get up and running. In general this is a dubious proposition. Private investors are just as capable of forecasting the long-term benefits of today's investments, and indeed have more incentive to get their forecasts right because their own money is on the line.

Regarding federal support for renewables, the infant industry argument is particularly weak since these arguments have been made for decades. These are not infant industries, these are grown adults. If they can't compete (except in niche markets) on a level playing field with other sources of electrical generation, this reflects economic realities, not birthing pains.

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26 See Timothy Fitzgerald and John Horowitz, "Economics of the Tax Treatment of Depletable Costs," November 11, 2014, Working Paper.

27 There are other limitations on percentage depletion; see: http://www.ipaa.org/wp-content/uploads/downloads/2012/01/2009-04-PercentageDepletion.pdf.

28 See: http://www.thetaxadviser.com/issues/2010/may/sec199.html.

A completely separate argument claims that the "negative externality" from carbon dioxide emissions is not reflected in market prices, and therefore the tax code (so it is alleged) implicitly gives a "subsidy" to carbon-intensive energy sources. In this view, providing federal support for alternative energy sources is merely mitigating this long-standing bias.

The present document concerns tax policy, not climate science. However, we refer to IER's work on the dubious use of the "social cost of carbon" as a policymaking tool.[29] It is important for policymakers to realize that *even if* we stipulate the physical science of climate change as codified in, for example, the Intergovernmental Panel on Climate Change (IPCC) reports, that *it does not follow* that the U.S. government should therefore adopt measures to penalize carbon dioxide emissions. The "social cost of carbon" is *not* an objective fact of the world, analogous to the charge on an electron or the mass of the moon. Rather, it is an arbitrary concept dependent on subjective parameters such as the discount rate applied to estimates of damages that will not occur for centuries. Once we consider these and other complications—such as the interaction of penalties on carbon dioxide emissions with existing inefficiencies in the tax code—the case for promoting alternative energy sources becomes much weaker.

Conclusion

Although they differ on the emphasis to be given to certain priorities, economists generally agree that if we were to design a tax code from scratch, the desired revenue would be raised by applying the tax to as broad a base as possible, with as low a rate as possible. Adding in artificial privileges to particular groups is a self-defeating and inefficient process, because it distorts consumer and producer behavior and invites "rent seeking" from groups trying to shield themselves from unfavorable tax treatment. When policymakers try to steer markets through the tax code, it makes Americans poorer because resources are no longer being channeled into their most important uses. This includes the resources being spent in complying with the (unnecessarily complex) tax code itself.

In the context of energy, there are several provisions of the tax code that give advantages to particular producers or consumers. A recent Congressional Research Service (CRS) study estimated that from 2016-2020, the total cost of these energy tax provisions would be $82.7 billion. Of the provisions analyzed, the two most expensive were the Production Tax Credit (PTC) and the Investment Tax Credit (ITC), both tailored to renewable energy.

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[29] For example, see Robert P. Murphy's testimony on "The 'Social Cost of Carbon': Some Surprising Facts," before the Senate Committee on Environment and Public Works, July 18, 2013, available at: http://www.instituteforenergyresearch.org/wp-content/uploads/2013/07/2013.07.18-Murphy-EPW-Testimony-on-Social-Cost-of-Carbon-FINAL.pdf.

It is clear that these tax provisions distort energy markets. For example, the generous PTC has made it commonplace for wholesale electricity prices to be negative, because wind producers can benefit financially once the tax credit is taken into account. Yet it is inefficient to artificially encourage wind (and solar) in this manner, because their correctly-calculated levelized cost of generation—particularly when we look at *existing* facilities which some wish to retire through policy—is so much higher than that of coal and natural gas.

A popular slogan says that the U.S. should embrace an "all of the above" approach to energy sources. This is a sensible stance, if understood to mean that policymakers do not try to *foster* those energy sources that are currently providing only a small share of total output. Both theory and history have shown that private property and market prices lead to superior outcomes than top-down planning. This result holds for energy markets just as it does for restaurants.