Industrial Energy Efficiency and Corporate Tax Reform: Two Proposals

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ABSTRACT

This paper provides an overview and analysis of the potential impact on energy use in the industrial sector of two potential tax reform proposals currently part of the public debate. The foundational question is which potential new tax structure is most likely to increase investments by the industrial sector in energy efficiency. The most active proposal and one currently debated is that of lowering the corporate tax rate and broadening the base by eliminating tax expenditures. While this proposal does not prioritize energy efficiency, it does have the potential to improve energy use at the margin. The caveat is that it requires modernization by a large segment of the industrial sector because as industry modernizes, it becomes more efficient.

By contrast, the impact on energy use that is anticipated from enactment of an energy or pollution tax is substantial. While controversial, these concepts are still on the minds of many and could be combined with concepts such as lowering the corporate tax rate, eliminating tax expenditures in some type of grand bargain that fulfills the goals of tax reform. After examining the potential of each proposal to drive industrial modernization, we discuss how each concept might by itself, or in combination with other concepts, be part of a restructured tax system. The report concludes with a set of guidelines and recommendations for changes to the tax code in a way that is likely to have the greatest impact on energy consumption by industry.

Introduction

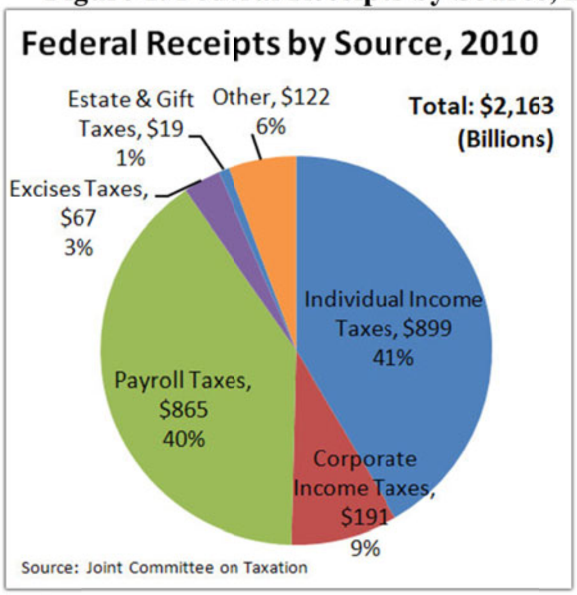
Though the primary purpose of taxes is to fund government operations, the Internal Revenue Code is replete with provisions, known as "tax expenditures," that have been enacted to promote various economic or social goals. Some of these provisions are broad based, impacting broad swaths of the tax base. Other provisions are targeted tax incentives intended to promote particular activities or investments such as energy efficiency.

Energy efficiency investments reduce operating expenses in a cost-effective manner and are associated with a host of benefits to society, from job creation to fossil fuel emission reductions (Laitner et al. 2012). These benefits make energy efficiency an excellent candidate for support by the government through the tax code. Additionally, much of the energy sector is not a properly functioning market that captures all costs. Externalities such as damage to the environment, human health, and natural security are not captured in the consumer price of energy. With all of these variables not accounted for in the market, it is appropriate for government to intervene and attempt to encourage activities such as investments in energy efficiency that cause a net reduction of externalities.

Industrial energy efficiency investments are for the most part process modernization projects. Replacing older equipment with newer equipment is generally accompanied by improvements in energy efficiency, even if energy efficiency was not the primary goal of the change (Laitner et al. 2012). Our analysis of two options presented in this report rest on the idea that investment (i.e., industrial modernization) leads to increased energy efficiency.

The tax code provides a powerful tool for the government to influence corporate decision-making and therefore a mechanism to encourage modernization. In 2010, the U.S. government reported receipts of $2.16 trillion, 9 percent of which was collected as corporate tax (OMB 2011). These are the taxes of most concern to industry and therefore the lever most often reached for when attempting to manipulate capital investments in the U.S. manufacturing sector.

Figure 1. Federal Receipts by Source, 2010



Currently, there are a number of important tax incentives that encourage investment in energy efficiency. There are three common methods of providing an incentive:

- Providing an incentive upon purchase of an asset deemed to be an "energy efficiency" asset;
- Providing an incentive for energy saved (or generated by renewable energy); or
- Providing an incentive to a manufacturer to manufacture more energy-efficient products.

The first and last options are the easiest because determination of action is quite simple. A consumer has or has not made a qualifying purchase; the manufacturer has or has not manufactured a qualifying product. The second option is problematic as determination of energy savings, the proving of a negative, can be technically difficult. Additionally, collecting the data can be time consuming and for these reasons such incentives are uncommon in the tax code.

The most common practice is to provide consumers with incentives, either through tax deductions or credits, upon proof of purchase of a qualifying device. Examples include the personal income tax credit for purchase of a hybrid automobile, a corporate income tax deduction of up to $1.80 per square foot of improved building space and the 10 percent investment tax credit for CHP installations. Examples of other tax credits include the tax credit to appliance manufacturers for making energy-efficient dishwashers, clothes washers or refrigerators, and the tax credit to building contractors for building energy-efficient housing.

There are many provisions in the tax code that encourage energy efficiency though most target the residential market. A few targeting corporations are listed below.

Table 1. Current Tax Incentives

Provision/Section	Tax Incentive
Exclusion for Energy Conservation Subsidies Provided by Utilities: Section 136	Provides an exclusion from gross income of the value of any subsidy, (whether direct or indirect) by a public utility to a customer for the purchase or installation of any energy conservation measure. "Energy conservation measure" refers to any installation or modification primarily designed to reduce consumption of electricity or natural gas or to improve the management of energy demand with respect to a dwelling unit.
Energy Credit for Combined Heat and Power (CHP) Systems: Section 48	Provides a ten percent credit for combined heat and power (CHP) property placed in service before January 1, 2017.
Energy Efficient Commercial Building Deduction: Section 179D	Provides for a deduction up to a maximum of $1.80/sq.ft. of reconditioned space for an amount equal to the cost of energy efficient commercial building property placed in service during the taxable year.
Treatment of Smart Meters and Smart Grid Property: Section 168	Reduces the recovery period from 20 to 10 years for qualified smart electric meters and qualified smart electric grid systems.

Note: All sections relate to the Internal Revenue Code: Title 26, subtitle A, Chapter 1.

The Case for Tax Reform

Many believe corporate tax reform is necessary to make the U.S. tax system more competitive relative to its trading partners. The United States is one of the few nations that do not use a territorial international tax regime (In a territorial system, offshore business income is not subject to home country taxation.) In the U.S., off shore income is subject to the tax of the host country and to the U.S corporate tax rate up to a maximum of 35 percent total. Since the U.S. rate of 35 percent is the highest among developed countries, profits that are not repatriated are taxed at a lower rate than those brought back to the U.S. A second motivation for reforming the tax code is its complexity. It has been over thirty years since the last major revision of the corporate tax code and with each year additional provisions and complexity are added. Even if all of these provisions are intended to reduce the effective rate companies pay, the compliance costs is viewed by many as burdensome. Its contribution to the economy as a whole is certainly questionable. As a result, interest is growing in lowering the corporate tax rate and broadening the corporate tax base. The resulting simpler, more predictable tax code would lower compliance transaction costs and reduce capital investment risks. The elimination of many existing tax expenditures could bring new health to dysfunctional markets and provide consumers with new and better solutions than have been available in the past while also increasing tax revenues and enabling broad based changes that have the potential to create even greater economic impact.

Two Options for Tax Reform

There are many proposals currently under consideration by various caucuses of the U.S. Congress. The Obama Administration has issued a framework for what tax reform might look like, Congressional leadership has spoken of the need for tax reform, and both the House and Senate tax-writing committees have held numerous hearings (Sherlock, and Crandall-Hollick) on a variety of tax reform subjects over the last two years. This paper will examine the two of the concepts and discuss their potential to influence energy use in the industrial sector.

The first proposal is to lower the corporate tax rate and eliminate most tax expenditures. The Administration has suggested lowering the corporate tax rate to a 25 to 28 percent range, and offsetting that revenue loss by broadening the tax base by eliminating various corporate tax expenditures. Proponents believe a flatter tax base with a lower tax rate will increase competitiveness, reduce economic distortions caused by high tax rates and tax preferences, and simplify the administration of tax law (NAM 2012).

The second proposal is for a tax on pollution and/or energy. Widely dismissed after the failure of Cap-and-Trade legislation three years ago, there appears to be renewed interest as lawmakers struggle to eliminate enough tax expenditures to reach the desired rate reductions. Additionally, the mounting evidence of a changing climate has convinced an increasing percentage of the public that action is warranted and a carbon tax could meet that need.

Proposal 1: Lower the Rate & Broaden the Base

In the tax reform plans put forward both by President Obama and by the Republican Party (Calmes and Cushman 2012) the corporate tax rate would be reduced from its current rate of 35 to somewhere between 25 and 28 percent. This tax rate reduction would be paid for by eliminating many current tax expenditures. In 2012, the effective corporate rate was reported by the Financial Times to be 31.9%, or about 3 percent less than the nominal rate (Demos 2012). Theoretically, this proposal will achieve revenue neutrality by eliminating a sufficient volume of tax expenditures to achieve the desired twenty percent reduction in effective rate.

This action is expected to result in energy savings under the theories that lower corporate tax rates lead to more investment in factory modernization (U.S. Chamber of Commerce 2012), and that modernization includes savings that result from investments in combined heat and power, and transformative technologies (Elliott et al. 2008). Research has shown a direct correlation between the vintage of manufacturing infrastructure to energy efficiency, so tax policies that promote capital stock turnover will reduce the energy intensity[1] of the manufacturing base. (Elliott et al. 2008; Laitner et al. 2012).

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[1] While simple in concept, the term "energy intensity" embodies a rather complex set of interrelated metrics throughout the entire production chain within the industrial sector. It is anchored to the numerous steps within the production process, from the extraction of materials, chemical feedstocks, and energy resources themselves to the processing and fabrication of the final goods demanded by other sectors of the economy. An excellent discussion of this topic can be found in the 1995 EIA report *Measuring Energy Efficiency in the United States' Economy: A Beginning* http://tonto.eia.doe.gov/ftproot/consumption/0555952.pdf.

Policy Implications

Plans for tax reform that call for lower tax rates accompanied by reducing or eliminating tax expenditures have already been widely circulated (U.S. Chamber of Commerce 2012). A great deal of support exists for these types of plans among policymakers. For example, such a system is featured prominently in Congressman Paul Ryan's plan for tax reform that he developed as Chairman of the House Budget Committee during the 111th Congress (Ryan 2010). Such a plan would allow companies to predict future tax burdens with a higher degree of certainty thereby reducing the overall risk of capital projects and thereby increase the volume of them.

Currently, many tax incentives including those relating to energy efficiency are often in place for only a short period of time. Future extensions are often uncertain. Uncertainty can be a major disincentive to making large capital investments, so a tax reform plan that emphasizes a lower tax rate may do a better job than investment-specific tax incentives at reducing energy intensity over the long term. On the other hand, the energy savings that result from these incentives is certain to be lost in the short term.

It is unlikely that a realistic plan for tax reform would call for *all* tax expenditures to be eliminated. There would be political challenges associated with removing any particular tax expenditure and some of the incentives favoring energy efficiency have an influential constituency. However, if the target is a 25-28 percent corporate tax rate as has been suggested in recent proposals by the President and members of Congress, it would be necessary to eliminate a large number of tax expenditures, many of them such as accelerated depreciation are quite popular. Though not impossible, it seems unlikely.

Effect on Energy Use

Lowering the corporate tax rate will save energy if doing so will cause manufacturers to increase their investments in capital equipment and if those investments reduce the sector's overall energy intensity. The first half of this equation was examined in a recent Harvard University and PricewaterhouseCoopers study of 85 countries that found an inverse relationship between investment by the manufacturing sector and the effective corporate income tax rate. An increase in the first-year effective tax rate by ten percent reduces the aggregate investment to Gross Domestic Product (GDP) ratio by 2 percent and reduces the rate of foreign direct investment by 2.3 percent. (Djankov, et. al. 2010). That they did not find this relationship in the service sector is informative. Furthermore, they found the correlation is robust if controlled for other variables such as regulatory compliance burden, inflation, and other tax liabilities.

ACEEE has examined the second half of the equation quite extensively over the past six years. In a 2012 examination of the long-term energy efficiency potential for the country, it found that periods of rapid decline in energy intensity followed energy price shocks and periods of major capital investments (Laitner et al. 2012). During the late 1970s and early 1980s the nation's energy intensity declined at above 3% per year. During the late 1980s and early 1990s, the intensity improvements stalled as low energy prices and economic downturns slowed investment in manufacturing capacity. Since the mid-1990s we have seen industrial energy intensity resume its decline at a rate of about 1% per year.

With the relationships between tax rate and investment rate, and between investment rates and energy intensity established, we can conclude that it is reasonable to assert that a lower energy intensity in the industrial sector is likely to accompany a decrease in the corporate tax rate.

How large might that reduction in energy intensity be? The industrial sector represents 30 of the approximately 100 Quads[2] of energy consumed in the U.S. each year (EIA 2010). In 2010, EIA projected intensity will decline at an annual rate of 0.96% while manufacturing economic activity will grow at an average annual rate of 1.13% (from 2012-2035, after the economy was projected to recover), so overall manufacturing consumption is projected to increase as well since economic activity grows faster than intensity declines. Thus barring significant policy changes, energy use in the industrial sector will increase from 30 Quads in 2010 to 33 in 2050. This is considered the "Reference Case" in the ACEEE report "The Long-Term Energy Efficiency Potential: What the Evidence Suggests" (Laitner, et al. 2012). The report also analyzed an aggressive policy on energy – the "Advanced Case" – that would maintain a 2% annual reduction in energy intensity that would reduced industrial consumption to 21 Quads in 2050; and a maximum potential option – the "Phoenix Case" – which would drive consumption to 16 quads. The 2% rate represents a rate of decline that McKinsey (2009) identified as a rate of intensity that could be sustained in the industrial sector and was observed in the 1970s. To drive this doubling of the rate at which energy intensity decreases, ACEEE (Elliott, Shipley & McKenney 2008) determined that the following must happen:

- Need for new technologies, products, and processes
- Access to industry-specific technical experts, assessments, andtraining for workers
- Availability of trained and capable workers
- Access to capital required to implement process investments needed to realized productivity opportunities

Using the Harvard numbers, we can calculate that reducing the corporate tax rate from an effective rate of 31% to 28% has the potential to increase investment rate by 2% and possibly 4% if reduced to 25%. The 2012 investment rate in the U.S. of 12.9% (CIA 2012) is used for the purpose of this calculation. An increase of 4% in the investment rate equals 13.4%.

Table 2. Potential Increase in Investment due to Reduce Tax Rate[3]

	Baseline	Proposal Scenario
U.S. GDP	$15 trillion	$15 trillion
Investment Rate	12.9%	13.4%
Net Investment	$1.9 trillion	$2.0 trillion
Difference		$100 billion

An increase of $100 billion per year in investment would certainly go a long way towards modernizing the U.S. economy. The increase in investment would be shared by all other sectors

[2] A *quad* is a quadrillion (10^{15}) Btu's of energy, about the amount of energy used in all sectors of the economy by the state of Arkansas, Kansas, or Oregon in a year.
[3] There are many qualifiers associated with the Harvard-PricewaterhouseCoopers value that are not incorporated into this analysis. Therefore this calculation should only be considered as an order of magnitude indicator.

of the economy and they too would likely see energy efficiency improvement resulting from increased investment.

Concerns. Predicting the impact on energy use in the industrial sector that might result from reducing corporate tax rates is very complicated and fraught with unknowns. Will the increased revenues that result be reinvested? This is the assertion with debate regarding repatriation of foreign profits, a related justification for reducing the corporate tax rate. There is considerable debate whether the 2004-2005 tax holiday that brought $312 billion back into the U.S. was invested or dispersed to shareholders as dividends or used to buy back stocks in spite of provisions in to prevent the latter (Saleh Rauf 2012), (Riley 2012). Put simply: will corporations with a short-term focus be more likely to make long-term investments at a 25 percent tax rate than at a 35 percent tax rate?

It should be noted that an increase in capital investment addresses only the last of the four types of investments required for improving the energy efficiency of the economy.

Given that the goal for this proposal is revenue neutrality, many sectors might not see any change in their effective tax rate. Without some mechanism that requires investment in exchange for lower tax rate, there is no guarantee of a net increase in investment. When combined with the likely reductions in targeted incentives, this is doubly worrisome. However, if part of this reform proposal included investment requirements and maintained or even increased targeted incentives, then it would have a high probability of reducing the energy intensity of the industrial sector at a rate faster than its current trend.

Proposal 2a: Tax on Pollution

The concept of a carbon tax has been raised by environmentalists, policy makers, and others over the years as a mechanism to address looming budget deficits and mitigate the generation of carbon dioxide and other greenhouse gas emissions associated with climate change (Ramseur et al. 2012). The attractiveness of such a tax is that it discourages activities with negative effects much as taxes on cigarettes, alcohol and gambling do. These are often called Pigovian taxes and are a respected concept within the field of economics (Nadel and Farley 2012).

A pollution tax need not be tied to carbon emissions, but could be assessed on all types of man-made emissions into the atmosphere and the nation's waterways. The tax would be collected from the emitter as part of its federal tax liability. These taxes are attractive because they are comparatively easy to assess as most large emitters have the ability to determine directly or indirectly the volume of pollutants they emit, and because by making pollution more expensive, it is discouraged. Other, less polluting technologies become more cost competitive and market forces are put to work to reduce our collective impacts on the environment. A pollution tax would make fossil fuels and electricity generated from them more expensive. This would encourage investments in energy-efficient technologies and practices. Since electricity derived from renewable energy systems would not produce pollution, it would not be taxed and would become more cost competitive. This will encourage investments in renewable energy and energy efficiency since both will be immune from the tax.

One facet of such a taxing structure that may gain it support is that companies will have a non-accounting mechanism for controlling their tax rate. Companies incur considerable expense complying with the tax code and activities that increase company productivity do not always decrease tax liability. This compliance cost decreases with the stability of a tax system. A stable tax system combined with a mechanism that enables companies to reduce their effective tax rate in parallel with decreasing their operating costs could be compelling to many corporations.

Proposal 2b: Energy Tax

An energy tax could be assessed just like a sales tax. All energy purchases, retail or otherwise, would be assessed a tax (Currently, utility sales to manufacturers for electricity, natural gas and water that is used in manufacturing, are not subject to state sales or use tax). This national energy sales tax would be assessed on all forms of energy (electricity, natural gas, gasoline, steam, etc.) at the time of sale. It would encourage investments in energy efficiency even more than an equivalent tax on pollution because all forms of energy, even renewable energy, would be assessed.

Policy Implications

If recent history is a guide, then an energy tax would be difficult policy to enact: In 1993, the Clinton Administration proposed a tax based on the Btu content of various energy sources. The proposal passed the House but was soundly rejected by the Senate. Beyond the multitude of stakeholders already aligned against such a plan, consumers of energy would have immediate visibility of the tax, just as they do any sales tax. They would "feel" it more than a pollution tax, which by contrast is likely to be collected at the source and thus the visibility of its contribution to price obscured. There is also the issue of what constitutes “energy” and how its value is assessed. For example, if steam is derived from burning coal, is the consumption of coal taxed, or the consumption of steam? If the steam is created by burning natural gas, is the tax rate the same? Assessing a tax as close to the beginning of the fossil fuel energy supply chain as possible would do much to simplify collection and resolve the issues mentioned above, though it would then start to look more like a pollution tax.

As outlined earlier, government assesses an array of taxes and fees to encourage and discourage certain behaviors and investments, or creates exemptions from taxes to do the same. An energy tax conceptually is intended to discourage energy use and encourage efficiency. In a time of constrained energy supplies, this might be palatable as it motivates for a common good. However, recent changes in the natural gas industry have many feeling that a return to times of bountiful supplies of energy is at hand and that there is no longer a need to discourage energy consumption. At this point, an energy tax would function much like a value added tax (VAT), a form of taxation common around the world but that has considerable opposition in the U.S.

Potential to Save Energy

To the degree that energy efficiency will be a component of efforts to reduce carbon dioxide emissions, a carbon tax is a very promising mechanism to drive down the energy intensity of the industrial sector as there is a straight forward market signal that encourages less use of energy. We can use the example of British Columbia to evaluate the ability of a carbon tax to reduce energy use. The Canadian province of British Columbia has had a modest carbon levy in place since 2008 that started at $10 per ton of carbon in its first year and rose by $5 per ton each year thereafter. This is equivalent to 9-cent tax on a gallon of gasoline, rising 5 cents per gallon each year (Plumber 2012). A recent report from the University of Ottawa's Sustainable Prosperity group checks in with British Columbia's carbon tax experiment and finds that it appears to be accomplishing at least some of its goals. The province has reduced its carbon emissions at a modestly faster rate than the rest of Canada, even after the country's 2008-09 recession ended. Emissions dropped all across Canada at about the same rate during the recent recession, but when growth returned in 2010, emissions in British Columbia continued to decrease even though its economy grew at a slightly faster rate than the rest of Canada (University of Ottawa. 2012).

An analysis of three different carbon tax proposals was conducted by the Massachusetts Institute of Technology (MIT) Joint Program on the Science and Policy of Global Change using the Emissions Predication and Policy Analysis (EPPA) modeling tool in 2008. It found that these proposals would be able to reduce Carbon Dioxide (CO2) emissions by 25 to 46% by 2050 (Metcalf et al. 2008). Though there will not be a one for one reduction in energy use with CO2 emissions reduction, the correlation is a direct one and therefore we can assert that a carbon tax will induce a considerable reduction in industrial energy intensity.

Another study by MIT found that a carbon tax could generate annual revenue of up to \$111 billion by 2015, \$182 billion by 2030 and \$337 billion by 2050 (Rausch and Reilly 2012). If this money were funneled back into efficiency investments throughout the economy, the industrial sector would benefit directly though financial assistance and indirectly through market pull for more efficient products and services.

Concerns. These benefits come at a cost. A pollution or energy tax will have negative impacts on the economy in the short term. Research indicates that a 0.34 percent reduction in overall output for the economy and 1 percent for the energy-intensive manufacturing sectors is a likely side effect of a carbon tax (Adkins, et al. 2010). Some pollution-intensive facilities are likely to relocate in other countries with less restrictive policies.

A pollution tax or energy tax pulls money out of the private sector that could be used to invest in energy efficiency. Without compensating spending by the government to assist the private sector with development and deployment of such systems, the maximum potential energy savings is unlikely to be achieved.

Conclusion

If the ultimate goal of tax reform is to develop a new corporate tax code that does a more effective job of funding the government and facilitating growth of the economy than the existing scheme, there are many proposals under consideration that would appear to move us in that direction. However, no "perfect" tax code exists—tradeoffs will be made. Each proposal will have its strengths and weaknesses. The two concepts discussed in this paper involve significant changes to the existing tax code. These changes will in turn produce significant impacts on the economy, many of which are not entirely known. Undertakings with such broad ramifications take considerable political will.

The proposal that currently appears to have considerable political momentum—lowering the corporate rate and broadening the base—will likely affect investment rates and by extension energy use. However, the impact of the goal of revenue neutrality on how much the change in effective tax rate if affected by the change in nominal tax rate is as important as it is unknown. If all that is achieved is simplification of the tax code, then the assumption is that stability of the tax code reduces investment risk and that is what will ultimately drive investment. These changes produce only indirect influences on energy use, and a weak ones at that.

By contrast, the status quo is to offer incentives that create market pull for energy efficiency. Though the potency of these incentives could be increased - by locking them in for longer periods of time, thereby establishing stability and predictability - they have a smaller impact on the budget and are more effective at driving energy efficiency than the first proposal.

An even more effective method to influence the market is to institute Pigouvian taxes such as a carbon tax that encourages investments with low environmental impacts and discourages actions and investments with greater impacts. It not only will drive investments in energy efficiency, it will provide corporations with a new mechanism to control their effective tax rates. Even if the price per ton of carbon increases over time, the tax payer's individual liability is likely to be stable as technology and business practices improve.

However, a pollution or energy tax is likely to be unpopular in the private sector and will likely result in movement of investments overseas. Without a decrease in other tax liabilities, a new tax will remove from the investment pool funds that could be used to invest in efficiency.

Of course none of these options is exclusive of the others. A reduction in the corporate tax rate could be combined with an emissions tax, and targeted incentives for investments in efficiency to encourage investments that ultimately reduce a facility's exposure to emission fees. Such a structure could be constructed to be revenue neutral and implemented incrementally so as to mitigate disruption to the economy. This all of the above approach could compensate for market failures in the energy sector, improve competiveness of U.S. manufacturing sector and reduce energy consumption in all sectors. Regardless of the details selected, incorporation of the following four considerations into a new tax code is likely to produce the best results.

- Industrial modernization results in greater productivity and should be encouraged by the government. There are many economic benefits, one of which is greater energy efficiency;
- Business can be more proactive in making investments when the tax code is simple and stable;
- Government has a role to play when markets do not capture all costs and benefits. There are several market failures in the current energy markets and pending a solution, it is appropriate for the government to intervene with corrective action. These should be structured to achieve energy related goals valued by a majority of the country;
- Whenever possible, there should be an intuitive connection between a tax and the goals of society. There should be a connection between what is taxed and the nation's needs

The tax code, to the degree that it can be designed to accomplish economic and environmental policy goals, should be so constructed. There is broad consensus that the nation can and should do a better job of managing its energy resources. It is in the long-term interest of the nation to use energy more efficiently and so it is also in the best interest of the county to have a tax code that encourages energy efficiency for the long term.

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