Energy Tax Incentives and Climate Change Policy

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This report explores the way in which climate change policy, in the form of a carbon tax or cap-and-trade scheme, would interact with the existing portfolio of tax incentives for conventional and renewable energy. Federal energy policy has historically provided tax incentives for the development of domestic conventional energy resources, such as oil, coal, and gas, with the objective of increasing domestic energy security and correcting national security externalities. Starting in the 1970s, the purpose of energy policy was broadened to provide tax incentives for renewable energy with the aim of diversifying the domestic energy supply and responding to a growing awareness of environmental externalities. Now, with the increasing probability that the federal government will enact an economywide carbon pricing regime to address the externalities created by greenhouse gas emissions, policymakers should consider how existing policy would interact with the incentives created by climate change policy implemented through various carbon tax and cap-and-trade designs. This report provides a background on energy policy, focusing on federal tax incentives, and it identifies when energy tax incentives and carbon pricing will be complementary or conflicting from an economic efficiency perspective.

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I. Introduction

Over the past several years, we have witnessed a considerable growth of interest in and support for renewable energy. These energy resources, such as wind, solar, geothermal, and biomass, are self-sustaining and generally free of the polluting emissions that result from the burning of conventional fossil fuels. On the federal level, this support has been manifested notably in a rapid expansion of tax incentives,[1] culminating in the American

[1]By federal tax incentives, we generally mean the code provisions that depart from a neutral taxation of income from an activity and, in effect, provide a subsidy for that activity. Examples include accelerated depreciation of equipment, percentage depletion of mineral resources, and expensing of expenditures that otherwise would be capitalized. For purposes of assisting Congress in tax policymaking, the staff of the Joint Committee on Taxation annually produces a list of tax subsidies

(Footnote continued on next page.)

Recovery and Reinvestment Act of 2009.[2] Tax benefits for renewables constitute a growing and complex program that is already of major economic significance to several industries.

The recent enactments, however, are only the latest chapter in a long history of federal tax incentives for renewables. Support for renewables has persisted through what are usually regarded as major shifts in U.S. energy policy. The continued presence, in some form, of renewables incentives may signal an underlying continuity of energy policy.

As congressional statements show, energy legislation has sought to achieve several distinct goals, often simultaneously. Reflecting this approach, the tax code[3] has long included a variety of energy-related provisions, some of which may at least appear to work at cross-purposes. Today federal energy policy is poised to take a completely new direction with the likely enactment of an economywide program that would, directly through a carbon tax or indirectly through a cap-and-trade system, set a price for carbon emissions. The development of a carbon pricing scheme raises further questions about how the new regulatory regime would relate to the code's existing portfolio of energy tax incentives.

This report discusses the relationship of tax incentives for renewables with other energy tax provisions. It also explores the manner in which the existing system of federal energy tax incentives would interact with a carbon tax or a carbon cap-and-trade program. In particular, we ask whether the existing tax incentives program would conflict with an economywide climate change regulatory regime, or whether the two approaches together would form an efficient system to foster, over the long run, the substitution of renewable fuel for fossil fuel.

There are, of course, many regulatory and economic factors affecting the development and competitiveness of renewable energy. For example, federal support for various energy resources also occurs outside the tax system, and it may take the form of research and development spending and command and control regulation. Further, in the last decade, the market for electricity generation has been increasingly affected by state tax incentives and renewable portfolio standards, which mandate that portions of the electricity sold in the state be from renewable sources. In some areas of the country, states have joined together to begin the development of regional carbon cap-and-trade regimes. These complex factors and their effects are beyond the scope of this report.

The first half of this report, Section II, contains a brief account of the development of tax incentives for renewables in the broader context of federal energy tax policy. This review is intentionally selective and restricted to an outline of major themes. Until the 1970s, federal energy tax incentives were used principally to encourage the production of oil, gas, and other fossil fuels. Over the last three decades, more objectives have been added and given greater prominence in the formation of energy tax policy. New policy goals include reducing the cost of energy for U.S. consumers, protecting the environment from fossil fuel pollution, and improving domestic energy security. Energy policy is being influenced by concern over global climate change and a desire to mitigate the production of greenhouse gases, both in the United States and worldwide. Finally, with an eye toward the economic crisis, the new U.S. administration is advocating green energy policies in part because of their perceived positive spillover effects on U.S. technological development, economic growth, and employment. Some policy advocates view incentives for the development of renewable resources as important tools for achieving these goals. Importantly, however, Congress has not abandoned incentives for the domestic production of conventional fossil fuels.

Section II then continues with a discussion of the economic significance of energy tax incentives. The design of tax credits historically has had a bearing on the effectiveness of incentives for renewables in promoting the development of those resources, chiefly in electricity generation. The first half of this report closes with a review of the most recent developments in energy policy.

The second half of this report, Section III, uses an economic efficiency framework to discuss the manner in which tax incentives for renewable and conventional fuels are harmonious or contradictory in their policy effects. The section also considers the manner in which existing tax incentives would interact with climate change policy through a carbon tax or cap-and-trade regime, and it explores the extent to which these two systems would act in concert or be at cross-purposes with the existing tax structure. Our application of economic principles to those questions suggests that policymakers must consider the significant interactions between carbon pricing regulation and existing tax incentives if the United States is to avoid implementing a less effective or unnecessarily costly climate change program.

II. A Background on Energy Tax Incentives

Renewables are only one of the energy resources receiving benefits under the code, and they were by no means the first. Efforts to stimulate energy production through tax incentives are almost as old as the income tax itself. Congress departed early from an economically neutral taxation of the energy sector to promote more intensive development of the oil and gas industry.

A. The History of Energy Tax Incentives

Taxpayers in the extractive industries are permitted an annual depletion allowance that was originally intended solely for the recovery of their investment in a mineral deposit. Under the cost depletion method, the allowance is a proportional amount of the taxpayer's investment. The amount is intended to reflect the relative exhaustion of the deposit during the year. Beginning in 1926, however, Congress permitted oil and gas developers to claim

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depicted as deviations from a hypothetical normal tax base. *See* "Estimates of Federal Tax Expenditures for Fiscal Years 2008-2012," Oct. 31, 2008 (JCS-2-08) p. 5, *Doc 2008-23645*, *2008 TNT 217-5*. In the alternative fuels area, federal income tax energy incentives have frequently taken the form of tax credits.

[2]P.L. 111-5.

[3]The Internal Revenue Code of 1986, as amended, and its predecessors.

an annual depletion allowance equal to a percentage of gross income from a mineral property.[4] In 1932 Congress extended this method, known as percentage depletion, to coal and other minerals.[5] Unlike cost depletion, cumulative percentage depletion allowances are not limited to the taxpayer's investment in the property, but continue as long as the property generates income. Thus, percentage depletion is in effect a production subsidy.[6] By the mid-1970s, the oil and gas depletion allowance was 27.5 percent, and it was 10 percent for coal.[7]

Another major benefit for oil and gas producers — the election to expense intangible drilling costs (IDCs) — entered the tax law in 1916.[8] IDCs, which can account for most development expenditures, include the nonequipment costs of establishing a well that would be capitalized under normal tax principles. In part because of those federal income tax incentives, between 1920 and 1970 oil and gas production rose as a proportion of total U.S. energy production from 16 percent to about 70 percent.[9]

During the 1970s, Washington policymakers and the public at large had a change of heart about the oil and gas sector. The twin "oil shocks" — the Arab oil embargo of 1973 and the Iranian Revolution of 1979 — led to dramatic increases in the price of crude oil and caused dislocations throughout the U.S. economy while profits increased for big oil and others involved in oil and gas development. Oil and gas tax benefits also became major elements in the growing tax shelter industry. Those tax shelters permitted wealthier individuals to claim depletion allowances and IDC deductions in excess of their investments in mineral properties and to reduce their tax liability on unrelated income.[10] Finally, the 1970s also witnessed the rise of the environmentalism movement. Influenced by environmental considerations, the public began to have a negative perception of the pollution from burning fossil fuels.

Congress responded to this situation first by limiting tax benefits for the oil and gas sector.[11] Petroleum became subject to regulation under President Nixon's wage and price control legislation. As part of an arrangement to phase out the regulation of oil prices, Congress imposed a windfall profit tax on domestically produced oil, which remained in effect until 1988.[12]

Importantly, however, Congress did not completely eliminate oil and gas tax benefits. In fact, it expressly reaffirmed its policy of promoting the discovery and exploitation of domestic oil and gas resources.[13] Although those incentives have gone through periods of expansion and reduction in the ensuing decades, significant tax incentives for domestic oil and gas production remain in the code today.[14]

In 1978 Congress passed its comprehensive response to the energy crisis, consisting of several items of legislation known as the National Energy Act. The House Ad Hoc Committee on Energy set forth its views on the changing energy landscape and stated the goals behind this legislation:

> The National Energy Act represents an effort to adopt a comprehensive set of policies which will allow the U.S. economy the time to make an orderly transition to an era of expensive energy resources, in particular oil and gas resources, from a past characterized by very inexpensive energy resources. And because energy use is so capital intensive, a full transition will take a long time. However, the incentives and penalties must be put in place now, with appropriate phase-ins, to ensure the timely and steady transition away from oil and gas resources, and toward the greater use of coal, uranium, renewable, and other energy resources.[15]

As part of this legislative package, Congress enacted new rules requiring electrical utilities to purchase power from independent alternative fuel generators termed

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[4]Richard Westin, *Mineral Properties — Exploration, Acquisition, Development and Disposition* (2002), A-49. In 1918 Congress already had permitted annual depletion allowances not restricted to investment in the mineral property. *Id*.

[5]*Id*. Today the coal allowance is 10 percent. Section 613(b)(4).

[6]*See* Treasury Department, "Tax Reform for Fairness, Simplicity, and Economic Growth" (1984), vol. 2, p. 230.

[7]Section 613(b)(1) and (b)(4) (1974).

[8]Salvatore Lazzari, "Energy Tax Policy: History and Current Issues," Congressional Research Service, Feb. 8, 2008, p. 2, *Doc 2008-3802, 2008 TNT 38-14*.

[9]*Id*. at p. 3.

[10]*See* H.R. Rep. No. 94-658, at 54-55 (1976) *as reprinted in* 1976 U.S.C.C.A.N. 588-589.

[11]Congress eliminated percentage depletion for the large integrated oil companies. For independent producers and royalty owners, the allowable percentage was gradually phased down to 15 percent and to a general limit of 1,000 barrels of depletable oil (or a natural gas equivalent) production per day. The percentage depletion deduction for regular tax purposes was generally limited to 65 percent of taxable income for the year. Tax Reduction Act of 1975, P.L. 94-12, section 501 (enacting section 613A, effective for tax years after 1974). The Tax Reform Act of 1976, P.L. 94-455, which mounted a general attack on tax shelters, included some excess intangible drilling and development expenditures (deducted for regular tax purposes) as a preference item for purposes of the individual minimum tax. It also provided for the recapture of previously deducted IDCs as ordinary income on a subsequent disposition of a mineral property. Tax Reform Act of 1976, sections 205 and 301.

[12]The Crude Oil Windfall Profits Tax Act of 1980, P.L. 96-223, was enacted as part of an arrangement to lift the price controls originally imposed by Nixon.

[13]*See* JCT, "General Explanation of the Crude Oil Windfall Profit Tax Act of 1980," 6-7 (1981); JCT, "General Explanation of the Revenue Act of 1978," 269 (1979) (characterizing the change to the minimum tax preference for IDCs as intended to help ensure continued meaningful incentives for domestic production).

[14]Current oil and gas tax incentives include percentage depletion for independent producers, expensing of IDCs, and 24-month amortization of geological and geophysical expenses of oil and gas exploration (seven-year amortization in the case of major integrated oil companies). The JCT estimates that those provisions will result in more than $15 billion in tax benefits over 2008-2012, mainly to corporate taxpayers. "Estimates of Federal Tax Expenditures," *supra* note 1, at 62.

[15]1978 U.S.C.C.A.N. 7677. In the Power Plant and Industrial Fuel Use Act of 1978, part of the national energy legislation, Congress required electrical utilities and industrial users to switch from oil and natural gas to fuels such as coal.

"qualified facilities."[16] The tax legislation comprising part of the package contained new incentives for the discovery and exploitation of a wide range of alternative resources intended to be used by qualified facilities as substitutes for oil and natural gas.[17] The prominence of energy security relative to environmental and other goals is further reflected in the emphasis on increased production and use of coal and coal-based substitutes for oil and gas. In the transportation sector, Congress sought to create incentives for the production of domestic alternatives to gasoline by reducing the fuel excise tax rate applicable to alcohol-based fuels.[18]

A major business tax incentive of the period was the investment tax credit. Under this provision, taxpayers generally were permitted to claim a tax credit equal to 10 percent of their investment in machinery and equipment. The credit amount would offset tax liability for the year in which the equipment was placed in service. In the 1978 legislation Congress extended those provisions to cover a wide variety of alternative energy and conservation equipment.[19] Property eligible for the investment tax credit included solar, wind,[20] and "alternative fuel property" — generally including equipment that burned or converted to fuel any resources other than oil or natural gas to generate power.[21] Regarding fossil energy, investment credits were made available for equipment that would extract oil from shale or natural gas from geopressurized brine.

In 1980, in light of the "increasing urgency for finding and developing a broader and more abundant range of energy sources," Congress decided to expand credit eligibility to property using additional alternative energy sources "to accelerate conversion to these resources."[22] The energy investment credit was expanded to increase the credit rate to 15 percent for wind and solar property and to add a new 15 percent credit for ocean thermal property and a 10 percent credit for alternative fuel property fired with biomass. The energy credit provisions generally were extended through 1985.[23] Parts of those provisions were later extended for additional periods through the 1980s.

As we now know, the expectations during the 1970s that prices for conventional energy would continue to increase proved incorrect — crude oil prices peaked in the early 1980s and declined rapidly. With short exceptions, crude oil prices remained at relatively low levels until recent years.[24] It was in this benign environment, and operating from free market principles, that President Reagan's Treasury Department issued a report calling for comprehensive tax reform, including reform of energy taxation.

The Treasury proposal recommended termination of all tax incentives for conservation as well as all business tax credits for alternative energy. The report stated:

> Because these energy incentives apply only to certain targeted activities, they introduce a tax differential among investments. Energy tax incentives distort the allocation of resources, encouraging individuals and firms to undertake investments that are uneconomical at current and expected future market prices.[25]

The Treasury proposal also recommended termination of conventional fuel incentives, such as capital gain treatment for coal sale royalty payments.[26] It characterized percentage depletion and the expensing of IDCs in oil and gas production as subsidies that distorted investment incentives and were inefficient in their own terms, because percentage depletion often rewarded exploitation of known reserves and rewarded producing wells over discovery and development of new resources.[27] The report recommended repeal of these incentives as well. Reagan drew on the Treasury proposal and likewise generally sought to end energy tax incentives in his 1985 comprehensive tax reform plan.[28]

The movement for tax reform during the 1980s ultimately bore fruit in the Tax Reform Act of 1986. Congress, however, rejected the notion of outright termination of energy tax incentives, whether for conventional or alternative resources.[29] In the case of renewables, Congress

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[16]Public Utility Regulatory Policies Act (PURPA), P.L. 95-617, section 210.

[17]The Senate Finance Committee noted:

> Consumption of oil is rising rapidly while domestic production is declining. The resultant dependence on oil imports poses a serious threat to our economic well-being, our national security and our ability to conduct an independent foreign policy. . . . Clearly, the United States must curtail the growth in demand for imported oil, encourage conservation of oil and gas, increase domestic production of energy, and accelerate the shift to more abundant domestic sources of energy. This bill is designed to move toward these goals by providing a variety of tax incentives.

S. Rep. No. 95-529, at 6 (1978).

[18]Energy Tax Act of 1978, P.L. 95-618, section 221.

[19]*Id.*, section 301.

[20]The investment credit for solar and wind property originally was made refundable. *Id.*, section 301(c)(1).

[21]Section 48(l)(3), as enacted by the Energy Tax Act of 1978, section 301(b).

[22]JCT, "General Explanation of the Crude Oil Windfall Profit Tax Act of 1980," 69 (1981).

[23]Windfall Profits Tax Act of 1980, sections 221 and 222.

[24]Energy Information Administration, "Annual Energy Review 2007," p. 64. In 1987 Congress repealed the provisions of the Power Plant and Industrial Fuel Use Act that restricted the use of natural gas in electricity generation. Between 1988 and 2002 the use of natural gas for generation more than doubled. *See* http://www.eia.doe.gov/oil_gas/natural_gas/analysis_publications/n gmajorleg/repeal.html.

[25]Treasury, "Tax Reform for Fairness," *supra* note 6, at p. 227.

[26]*Id.* at p. 238.

[27]*Id.* at pp. 229-233.

[28]Treasury, "The President's Tax Proposals to the Congress for Fairness, Growth and Simplicity" (1985), pp. 227-236.

[29]Congress decided to retain some energy tax credits:

> to maintain an after-tax price differential between renewable and fossil fuel sources. The steep decline in 1986 in petroleum prices has eliminated the incentive to purchase or produce the equipment required to exploit renewable fuel sources. Without the offsetting stimulus from the tax credit . . . the experience gained in the production and use

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extended energy tax credits, albeit generally at reduced percentages, for solar, geothermal, and ocean thermal properties through 1988, and biomass property through 1987.[30] Although the act imposed new limits on percentage depletion for coal, oil, and gas production,[31] it maintained the tax credit for fuels produced from nonconventional sources[32] and the 60-cent-per-gallon excise tax credit for blended alcohol fuels.[33]

Congress returned to comprehensive energy policy again in the Energy Policy Act of 1992. As in the 1970s, this visit was occasioned in part by a disruption in the world oil market. According to the authors of the legislation in the House, their purpose was to:

> enact a comprehensive national energy policy that gradually and steadily increases U.S. energy security in cost-effective and environmentally beneficial ways. The bill seeks to reduce the costly impending rise in U.S. oil imports. . . . Three energy price shocks in the past two decades, each followed by a serious recession, have demonstrated the importance of energy policy to the nation's economic health. The latest shock triggered by Iraq's invasion of Kuwait in August, 1990 . . . reminded the American people that our dependence on the volatile Persian Gulf region for an increasing share of our daily oil consumption involves definite risks and costs. Administration economic spokesmen and others have pointed out that the doubling of oil prices during the [Iraq oil] embargo was a major cause of the 1990-1992 recession.[34]

The authors claimed that prior forays into energy policy had taught Congress the importance of markets and reliance on market incentives. In the electricity area, Congress noted that the promotion of independent renewable power under the qualified facility regime suggested that significant additional benefits were yet to be obtained from greater competition.[35]

In this regard, it appears that the 1992 effort looked at energy policy from an economic perspective, although a much broader one than that informing the 1984 Treasury proposal. Economists generally prefer a neutral system of taxing capital, which treats comparable investments in the same manner and avoids introducing distortions into business decisions. Targeted tax incentives are justified, however, to remedy market imperfections. Those imperfections include what economists would call the negative externalities of fossil fuel use — economic costs of consumption that are not reflected in fuel prices generated by the market. The House report referred to those market imperfections as providing the motivation for the tax subsidies included in the legislation:

> [The bill] addresses barriers that are specific to renewable energy projects: the exclusion of some pollution and supply access costs from energy prices and the high capital costs faced by renewables. While emissions control requirements serve to internalize some pollution costs, fossil fuels still impact the environment and also create costs when foreign supplies become insecure. Renewable energy projects lack these liabilities but are not appropriately rewarded in financing decisions.[36]

The House report also identified climate as a significant issue and endorsed taking ''cost effective actions that will reduce greenhouse gas emissions.''[37] The report recognized that the United States was not alone, either in causing the problem or providing the solution. Interestingly, Congress emphasized that the United States could play a role in reducing global carbon emissions and at the same time reap economic benefits by encouraging the export of U.S. renewable and efficient energy technologies.[38] As the House report noted:

> A huge fraction of increased greenhouse gases will come from the inefficient utilization of coal in the developing world [especially China and India]. Aggressive transfer of even conventional U.S. coal combustion technology to these countries could

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> of such fuels and the technological competence developed in their production during the past decade will dissipate and will not be readily available if a fossil fuel shortage recurs. The retained credits are extended through 1987 or 1988 at progressively reduced rates to permit renewable energy technologies to phase into the experience of operating in competitive markets.

JCT, ''General Explanation of the Tax Reform Act of 1986,'' pp. 204-205 (1987).

[30] Tax Reform Act of 1986, P.L. 99-514, section 421.

[31] The conference committee rejected a House-passed provision to repeal percentage depletion generally for most oil and gas properties. Instead, the act eliminated percentage depletion for payments for advance royalties and lease bonuses. TRA 1986 section 412(a). The act also: provided for recapture of all previously deducted IDCs as ordinary income on a disposition of the property (*id.*, section 413); increased the percentage disallowance of certain IDC expenditures for oil and gas producers under section 291 (*id.*, section 411); and, for corporate coal producers, increased from 15 percent to 20 percent the disallowance of the excess of percentage depletion over remaining basis in the mineral property (*id.*, section 412(b)).

[32] Section 45K (formerly section 29). This nonconventional fuels credit, originally added as section 44D of the code by section 221 of the Windfall Profits Tax Act of 1980, remains in effect today. It provides a tax credit based on production. For many years the provision has provided significant benefits for oil and natural gas exploration and development from marginal sources such as shale, tar sands, coal seams, tight formations, and biomass.

[33] H.R. Rep. No. 99-841(II) at pp. 130-131 (Conf. Rep.).

[34] H.R. Rep. No. 102-474 (I) (House report) at p. 132. There was no Senate report on this legislation. The House report contains the most explicit statement of the purposes of the Energy Policy Act of 1992. *See* 1992 U.S.C.C.A.N. at 1954.

[35] *See* House report at 133. ''While PURPA was intended primarily to encourage renewable power and cogeneration, it also demonstrated the viability of independently generated power.'' House report at p. 138.

[36] *Id.* at p. 146.

[37] *Id.* at p. 152.

[38] *Id.* at p. 146.

halve the greenhouse gas emissions from that sector, as well as promote U.S. exports. Advanced clean coal technologies are expected to yield another 25-50 percent improvement.[39]

The Energy Policy Act of 1992 provided incentives for both conventional and renewable resources. It repealed the treatment of some excess oil and gas IDCs and percentage depletion amounts as minimum tax preferences for independent producers, and it made the energy investment tax credit permanent, but only for solar and geothermal properties.[40] The credits for biomass and ocean thermal property were allowed to expire.

Also, the law enacted a new production-based tax credit for electricity from wind and closed-loop biomass.[41] While the investment tax credit mechanism provided a lump sum benefit in the form of a credit against tax liability in the year a facility is placed into service, the production tax credit (PTC) permitted an owner/operator to claim a tax subsidy over time, to the extent that it actually produced electricity from qualifying renewable resources and sold it to third parties. The PTC is equal to 1.5 cents per kWh of electricity sold over the first 10 years of the project's life. The credit amount is indexed for inflation and currently stands at 2.1 cents per kWh.[42] The PTC amount originally was subject to several additional limitations discussed below, including reduction if the alternative generation project received other tax credits, government grants, or subsidized financing.[43] The effect of the PTC is to subsidize the higher costs of alternative energy, permitting developers to enter the electricity market at a price that is more competitive with conventional generation.

Under the 1992 energy act, the PTC was to remain in effect only until 1999, presumably because it was believed that during this period the industry would become economically viable. The credit has been extended on several occasions, up to the present.

B. Significance of Tax Incentives for Renewables

The significance of the initial renewables PTC was relatively small and restricted to wind power. Tax expenditure estimates by the Joint Committee on Taxation staff suggested that wind production credits would be less than $100 million annually during the 1990s.[44] In contrast, incentives claimed for oil and gas percentage depletion and expensing of IDCs were expected to be several times greater.

In 2004 Congress enacted a major expansion of the PTC, extending the credit to several other renewable resources, including open-loop biomass, solar, geothermal, municipal solid waste, small irrigation power, and refined coal.[45] Generally, however, those resources received only half the amount of credit per kWh and for a period of only five years.

Energy analysts have identified several features of the PTC and the renewables industry itself that are said to impede the effectiveness of the tax incentive. For example, the intermittent nature of wind and solar power prevents their use in baseload situations, which makes them direct competitors of natural gas. Thus, their competitiveness can be greatly affected by perceptions of the long-term price of natural gas. Further, because the credit may be claimed only to the extent that electricity is actually generated and sold, the relatively low capacity factors of weather-dependent energy can limit the PTC's benefit for wind and especially solar power.

As noted above, past congressional practice has been to renew the PTC only for relatively short periods, and its extension at any given time has been unpredictable. Critics argue that this uncertainty effectively eliminates the incentive for renewable projects with longer lead times, such as biomass and geothermal, because it may be impossible to see the project through from planning to completion before the credit is expected to expire. Also, the lack of certainty about longer-term support has been cited as an impediment to the development of a U.S. manufacturing base for renewable technologies, which could operate at commercial scale with resulting declines in costs.[46]

Despite those difficulties, it appears that the PTC has contributed to the development of a significant wind power industry. Wind electricity generation capacity almost tripled between 2003 and 2007, and this increase accounted for most of the progress in non-hydro renewable generation.[47] The subsidy has been estimated to provide developers with a discounted present value equal to about one-third of the capital costs of wind farm projects. Viewed differently, the PTC effectively lowers the cost of wind-generated electricity by about 2 cents per kWh,[48] making wind competitive with natural gas or combined cycle coal-fired generation under some circumstances.

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[39]*Id.* at p. 147.

[40]Act sections 1915 and 1916.

[41]Act section 1914, enacting new section 45. Closed-loop biomass is any organic material from a plant that is planted exclusively for purposes of being used at a qualified facility to produce electricity. Section 45(c)(2). This provision had limited effect, because there has apparently never been a closed-loop biomass facility for which the credit has been claimed.

[42]Notice 2008-48, 2008-21 IRB 1008, *Doc 2008-11478*, *2008 TNT 102-17*.

[43]Section 45(b)(3) (1993).

[44]JCT, "Estimates of Federal Tax Expenditures 1995-1999," Table 1 (year), *Doc 94-10140, 94 TNT 221-3*.

[45]American Jobs Creation Act of 2004, P.L. 108-357, section 710.

[46]Many of those issues were discussed during a 2005 congressional hearing, "Tax Credits for Electricity Production From Renewable Sources: Hearing Before the Subcomm. on Select Revenue Measures of the H. Comm. on Ways and Means," 109th Cong. (2005).

[47]Energy Information Administration, "Renewable Energy Consumption and Electricity Preliminary 2007 Statistics," Table 4 (May 2008).

[48]Ryan Wiser et al., "Using the Federal Production Tax Credit to Build a Durable Market for Wind Power in the United States," Laurence Berkeley National Laboratory (2007), p. 3.

C. Recent Developments in Energy Policy

The post-2004 period has seen a very rapid expansion of energy tax incentives — in all directions.[49] In addition to the expansion in the PTC, the American Jobs Creation Act of 2004 also enacted new tax credits for the production of biodiesel and biodiesel mixtures (section 40A), low-sulfur diesel fuel (section 45H), and oil and gas from marginal wells (section 45I). As noted above, the Jobs Act also made synthetic fuels production from coal eligible for the section 45 production tax credit (section 45(c)(7)).

The Energy Policy Act of 2005 was enacted as a response to once again rising oil prices and concerns about electrical system reliability after the 2003 blackout. The legislation was several years in the making, and its varied provisions reflect the congressional compromises that were necessary along the way. In the nuclear area, the legislation streamlined regulatory approval processes and provided loan guarantees and insurance in the event of future regulatory changes. On the tax side, the legislation enacted more lenient rules for funding decommissioning expenditures and a new tax credit for the production of electricity from advanced nuclear power facilities (section 45J). The 2005 energy act also contained tax credits for investments in clean coal facilities (sections 48A and 48B). The Energy Policy Act of 2005 also contained a variety of new tax credits for energy-efficient commercial and residential buildings and vehicles, and it provided additional tax benefits for oil and gas production[50] and infrastructure development.[51] Another new provision permitted tax credit bond financing of renewable generation facilities by state and local governments and cooperatives (section 54).

The 2005 legislation was criticized for a perceived lack of focus and on grounds that its incentives amounted to a series of giveaways to industry sectors.[52] In any event, although hardly reflecting the neutral market-oriented approach of the Reagan years, this energy tax legislation espoused the long-standing goal of stimulating abundant domestic energy production from a variety of resources.

The return of a Democratic-led Congress and the election of President Obama have signaled yet another course change in energy policy. The Emergency Economic Stabilization Act of 2008, signed into law by President Bush, made several modifications, liberalizations, and extensions of the code's portfolio of energy tax incentives. For example, it extended the section 45 renewables tax credit through 2009 or 2010 and made many modifications to the credit, including the addition of marine resources as an eligible energy source.[53] It also extended through 2016 the section 48 energy investment tax credit for solar, geothermal, and other energy property and provided a 10 percent investment tax credit for combined heat and power property.[54] The act reduced the section 199 domestic production deduction for oil- and gas-related production activities,[55] but extended the beneficial treatments of percentage depletion[56] and the expensing of some refinery investments.[57] The act liberalized existing tax credits for advanced clean coal facilities and enacted a new tax credit for carbon sequestration investments (new section 45Q). Interestingly, section 117 of the act provides for a report by the National Academy of Sciences regarding which provisions of the tax code have the greatest impact on greenhouse gas emissions.

Most recently, the American Recovery and Reinvestment Act of 2009 again extended and liberalized many existing tax incentives, particularly for renewables.[58] Notably, the act provides that renewable generation facilities eligible for the section 45 PTC may instead elect an upfront 30 percent energy investment tax credit.[59] This measure applies even to those renewable resources receiving only half of the section 45 PTC rate and thus, at least temporarily, puts all the renewables on the same footing. Further, in recognition that the economic downturn has reduced taxpayers' ability to use tax credits, the act permits those eligible to receive a credit to apply instead for a grant in the same amount.[60] This grant program is to be administered by Treasury.

By extending the period of effectiveness and providing flexibility regarding the form in which the incentive is received, those recent enactments appear to have fashioned more effective tax incentives for development of the renewable energy sector. Revenue estimates suggest that $11 billion additional renewables tax credits will be claimed over the next five years because of those new provisions.[61]

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[49]Mainly as a result of the 2004 and 2005 tax legislation, the number of energy tax expenditures increased from 11 in 1999 to 38 in 2007. Energy Information Administration, "Federal Financial Interventions and Subsidies in Energy Markets 2007," p. 220 (2008).

[50]Act section 1329 provided for 24-month amortization of geological and geophysical costs of oil and gas exploration. The act also enlarged the size of refinery operations permitted to be held by independent oil and gas producers for purposes of claiming percentage depletion (section 1328), and also contained several provisions for accelerated recovery of oil and gas infrastructure investments.

[51]The act provided for temporary expensing of 50 percent of some refinery investments (section 1323) and for accelerated depreciation of natural gas distribution pipelines (section 1308).

[52]Michael Grunwald and Juliet Eilperin, "Energy Bill Raises Fears About Pollution, Fraud," *The Washington Post*, July 30, 2005.

[53]P.L. 110-343, sections 101 and 102, Div. B.

[54]Act section 103, Div. B.

[55]Act section 401, Div. B.

[56]Act section 210, Div. B (extending through 2009 the suspension of the taxable income limit on percentage depletion from marginal wells).

[57]Act section 209, Div. B.

[58]P.L. 111-5, act section 1101 extends the coverage of the PTC to most renewable-fueled electricity generation facilities placed in service through 2014 and for wind facilities through 2013.

[59]Act section 1102(a), adding new section 48(a)(5).

[60]Act section 1603.

[61]JCT, "Estimated Budget Effects of the Revenue Provisions Contained in the Conference Agreement for H.R. 1, the American Recovery and Reinvestment Act of 2009," Feb. 12, 2009 (JCX-19-09), *Doc 2009-3215*, *2009 TNT 28-17*.

III. Interactions With Climate Change Policy

As we have seen, over the years policymakers have articulated several goals for energy tax legislation, such as maintaining low energy prices, improving domestic energy independence, protecting the environment, combating global climate change, and driving U.S. technological and economic growth. Although those priorities overlap to an extent, they remain distinct and may require trade-offs for policymakers who wish to pursue multiple objectives simultaneously through the tax subsidy mechanism.

Several serious proposals to target those goals through major additions to U.S. energy policy have been introduced recently.[62] With those developments, the near-term prospect of an economywide regime designed to reduce greenhouse gas emissions and dependency on carbon-based energy in the United States is now very real. As the debate gains momentum, it is worthwhile to explore how federal climate change policy would interact with existing tax incentives for renewable energy and with the remaining incentives for conventional energy. We recognize that the tax incentives discussed above were all enacted in response to significant policy concerns. Thus, our conclusions below are not intended as recommendations for increasing or eliminating any particular incentives; rather, they are meant to highlight the important relationships among various incentives and the relationships between those incentives and a carbon tax or cap-and-trade scheme.

It is possible, of course, to judge the effectiveness of policy mechanisms in absolute terms — for example, by determining whether the United States is actually achieving independence from the need to import any foreign energy resources. The discussion here takes a different approach. We ask whether the selected policy mechanisms are efficient *in economic terms*. In other words, do the policy tools help the market generate price signals that take account of all of the costs of various energy resources and lead consumers to make efficient choices? Answering this question requires starting with a firm grasp of the economics of energy incentives.

Based on the foregoing survey of the development of U.S. energy tax and climate change policy, the primary policy objectives can be summarized as follows:

- a preference for domestic energy over imported sources, motivated by national security interests and a desire to develop domestic energy resources;
- a preference for renewable energy over conventional energy, motivated by environmental and climate change concerns and by the desire to expand domestic energy resources; and
- a preference for energy efficiency and low-emissions energy sources to reduce energy dependence and address climate change through lower carbon emissions.[63]

There is considerable overlap among these preferences and among their intended benefits. Increasing energy efficiency, for example, also results in reduced dependency on energy in general, including foreign sources, which may have national security benefits.

The complexity of the incentives also increases the likelihood that some might contradict each other. Other things being equal, incentives that reduce the cost of conventional energy make renewable energy projects less attractive. In these circumstances, to be effective, incentives for renewable energy may need to offset both their own higher costs and the incentives that promote domestic conventional energy.

The policy mix would be further complicated by the adoption of policies that impose a price on greenhouse gas emissions either directly, as through a carbon tax, or indirectly, by a cap-and-trade scheme regulating the quantity of emissions and allowing the price to be set by market forces. The remainder of this report attempts to reconcile those sometimes complementing and sometimes competing preferences as they are implemented through the use of energy tax incentives and climate change regulation.

A. Correcting Externalities With Energy Policy

In principle, the objective of tax incentives or of carbon prices is to correct the market-generated prices for the existence of externalities. Externalities are costs and benefits to society that are not captured directly by the parties to a transaction — the buyers and sellers of energy — and are therefore not reflected in the market prices.[64] Goods for which the transaction price doesn't include all costs and benefits will tend to be either over- or under-consumed, respectively.

For energy, the negative externalities from national security and environmental costs cause consumers to choose more than the socially optimal quantity of particular types of energy resources that tend to be supplied from unstable regions or pollute the environment. Put another way, if consumers themselves paid a unit price that included the social cost of providing a source of revenue to governments that threaten U.S. interests or the environmental cost of emitting particulate matter and

[62]The latest being H.R. 2454, the American Clean Energy and Security Act of 2009, introduced by Reps. Henry A. Waxman, D-Calif., and Edward J. Markey, D-Mass., on May 15, 2009.

[63]Of course, policymakers and their constituents also have other preferences in mind when formulating public policy. We take these as sufficiently exhaustive and generally agreed on for the purpose of this discussion.

[64]In economic terms, an externality exists when marginal cost (or marginal benefits) faced by producers (or consumers) does not equal the social marginal cost (or social marginal benefit) faced by all members of society. Markets for public goods such as national security and a clean environment are textbook examples of externalities and are most relevant to this discussion.

greenhouse gases, they would choose to consume less of the energy that generated those costs.[65]

National security externalities are present when, for example, purchasing oil from foreign dictatorships provides those governments with the funds to cause mischief. As a result, the U.S. taxpayer is required to spend more on defense and diplomacy or to endure the existence of greater threats to our national security. Those considerations were apparent to Congress when it enacted the Energy Policy Act of 1992, and they are evident to most Americans today. Yet, because market prices do not include those costs, individual U.S. consumers of foreign oil do not account for them when choosing to consume energy. It would therefore be economically efficient to introduce a price mechanism to correct the relative cost of domestic and foreign conventional energy and bring consumers' marginal price in line with the social costs and benefits.

Similarly, environmental externalities are created when the price individuals pay to consume energy does not include the environmental cost to third parties. To a large extent, regulation of vehicle and particulate emissions already builds many localized environmental costs into conventional energy prices. For example, cars are required to be equipped with catalytic converters, and coal power plants are required to have sulfur dioxide scrubbers.[66] Therefore, the prices of those cars and electricity will reflect the costs of these physical abatement measures. However, it is unlikely that all local environmental costs, such as the health effects of vehicle pollution, are reflected in conventional fuel prices. Moreover, in the absence of a price for greenhouse gas emissions, the costs associated with climate change clearly are not accounted for.

Without an effective pricing mechanism to correct for national security and environmental externalities, the socially optimal consumption of various energy resources could not be achieved. Although the existing tax incentives, by subsidizing and thus lowering the production costs of domestic and renewable energy resources, may lean in the right direction, it is very unlikely they get the price right. In other words, it is unlikely that existing policy accurately adjusts for the positive and negative externalities of various energy sources.[67]

Whether or not it is articulated by policymakers, climate change policy proposals are intended to account for externalities. But how will climate change policy interact with existing tax incentives for domestic conventional and renewable energy, and what is the chance of getting the price right under a carbon pricing regime intended to reduce greenhouse gas emissions? To answer those questions, it is necessary to understand the distinction between the two primary policy alternatives: a carbon tax and carbon cap and trade.

In general, it is well understood that a carbon tax and cap and trade are mirror images of each other. Under a carbon tax, the price of carbon (or carbon-equivalent of other greenhouse gases) is set by government policy. That price influences behavior and leads to generation of a particular quantity of carbon emissions. However, because we do not fully understand the link between carbon prices, technological alternatives, and consumer behavior, it is very difficult to predict what quantity of carbon would result from a particular level of tax.

By contrast, under cap and trade the maximum quantity of carbon emissions is set by government policy. In this case, our lack of knowledge about the link between prices and the demand and supply of greenhouse-gas-emitting energy makes it difficult to predict the resulting prices.

Therefore, the choice between a carbon tax and cap and trade is essentially the choice between two types of risk: quantity and price. Those who tend to emphasize environmental risk typically prefer to fix quantity in line with catastrophic outcomes predicted by climate change models and make the price the residual. Those who emphasize economic costs prefer to fix the price at the level they consider economically sustainable and make the quantity of greenhouse gas emissions the residual.

This distinction also has a direct effect on our ability to account for externalities in light of existing policies. Under a carbon tax policy, it is important to figure out what the level of the carbon tax should be to address externalities and to determine how it would interact with preexisting tax measures. By contrast, under cap and trade, the market price of carbon would automatically adjust for the existing tax structure. Both of those points are discussed in detail below.

Our conclusions in this section are intended to make readers aware of the relationships among the various incentives and carbon pricing schemes, not to prescribe specific policy actions. Also, our conclusion applies only to tax incentives for the production of these resources. In recent years, for example, the policy focus for coal resources has taken the form of research programs and tax incentives for the deployment of clean coal technologies, reflecting that coal-fired generation will likely continue to account for much of U.S. electricity generation.

B. Carbon Tax and Energy Tax Incentives

In the absence of other tax measures, the socially optimal carbon tax on energy consumed in the United States would fully account for externalities. The carbon tax would be set at a level that:

- reflects the long-run marginal cost of every ton of greenhouse gas emissions; that is, the price would reflect the value of the environmental damage that would be avoided by not emitting the last unit of greenhouse gas; and
- reflects the long-run marginal cost of using imported conventional energy compared with domestic energy, which means the carbon tax on emissions

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[65]How much consumer behavior will change is determined by the elasticity of demand, which is a function of budget constraints and the availability of substitutes.

[66]Regulation of automobile exhaust has caused most cars to be fitted with catalytic converters since 1975. The same is true of SO_2 scrubbers for flue gas exhaust on coal- and gas-fired power plants.

[67]This is the fundamental challenge to correcting externalities through subsidies or taxes. Achieving the socially optimal price and quantity equilibrium is theoretically possible, but it requires accurately identifying and quantifying the net social costs and benefits.

produced using imported energy sources would be appropriately higher than the carbon tax on domestic primary energy supplies.

In other words, to be effective, a carbon tax on imported energy would need to cover both environmental and national security externalities. What does this mean when there are existing tax incentives for domestic conventional energy sources and for renewable energy? The answer is complex, and it depends on the characteristics of the energy market when the tax incentive is being applied.

Tax incentives for domestic oil producers, for example, do not have a significant effect on the price of oil in the United States. This is because U.S. producers are not the marginal source of supply. That is, the global price of oil is unlikely to be affected by the additional domestic supply stimulated by those tax incentives. Because domestic producers selling in the United States will charge close to the world market price for their oil,[68] tax incentives for domestic oil production are likely to achieve the purpose for which they were intended by Congress. The incentives encourage substitution toward investment, production, and therefore consumption of domestic oil without encouraging substitution away from renewable energy and, importantly, without encouraging additional oil consumption by distorting the price.[69]

However, the story of tax incentives for domestic natural gas and coal producers is more complicated. Although coal and gas are both internationally traded, prices tend to be much more localized. When U.S. tax incentives increase domestic production, the additional supply drives domestic prices down. As a result, tax incentives not only encourage a switch from foreign to domestic energy sources, but also are likely to encourage greater consumption and to discourage adoption of renewable energy by reducing the cost of conventional energy.

Put another way, a uniform carbon tax on oil consumed in the United States could coexist with the current tax incentives for domestic oil producers. Of course, the question remains of how to make sure both the tax incentives and the carbon tax are set at the appropriate level to ensure that prices accurately capture environmental and national security externalities. However, we can conclude that existing tax incentives and a carbon tax are in principle compatible.

A carbon tax is much less compatible with domestic tax incentives for conventional energy sources when production incentives can affect the price of the commodity, as with coal and natural gas. In that case, the existing tax incentive structure pulls in the opposite direction, and the tax incentives for conventional energy would tend to cancel out the effect of the carbon tax.

On the other hand, production tax incentives for renewable energy pull in the same direction as carbon taxes. If the carbon tax is accurately set at the level that reflects the long-run marginal cost of emissions (including all externalities), the production incentives for the renewable energy would be redundant and would lead to an oversupply of renewable resources. The result would be a reduction in greenhouse gas emissions in excess of the amount that is economically efficient. Under those circumstances, the cost of avoiding an externality, such as climate change, would exceed the cost of the adverse effects of climate change itself. Other things being equal, it would be necessary to reduce the level of the carbon tax to reflect the presence of existing tax incentives.

It may appear that an oversupply of renewable energy and an excess reduction in greenhouse gas emissions is merely a theoretical concern. It certainly appears that the required emission reductions predicted in climate change models are so large that no politically viable level of carbon tax would likely ever result in sufficient abatement — emission reductions — to avoid excessive costs of climate change.

However, the possibility of an unnecessarily high carbon tax is a very real concern for two important reasons. First, climate models are highly uncertain. It is generally accepted that anthropogenic emissions are only one factor contributing to climate change and that some degree of climate change cannot be avoided. Policy should therefore strive to avoid a catastrophic climate tipping point.[70] But very little is known about where that point is. Hence, the cost avoided by abating the marginal ton of greenhouse gases is unclear. It may be relatively low.

Second, renewable technologies are rapidly evolving. The marginal cost of abatement is likely to be much lower in the future than it would be today. Thus, a carbon tax that may appear too low to induce significant emission reductions under today's technology may actually be too high, given future energy alternatives. This is important because climate change depends on the concentration of greenhouse gases over time rather than the accumulation of emissions in any single year. To achieve a particular concentration of greenhouse gases in the atmosphere, it is possible to trade off emission reductions today against emission reductions in the future. For this reason, the socially optimal carbon tax may appear too low from our limited perspective based on today's technology.

C. Conclusion for Carbon Tax Design

To summarize, designing a carbon tax that is compatible with existing tax incentives requires two crucial considerations. First, if a carbon tax is introduced, it is important that it align with tax incentives for domestic conventional energy sources when the production incentives are able to alter the domestic price, as with coal and natural gas. Second, it is important to adjust the tax to account for any additional incentives already granted to renewable energy. That is to avoid the unnecessarily high

[68]Economists refer to this as import parity. Domestic production is small relative to the global supply, and therefore U.S. producers are price takers in a global market.

[69]This would appear to be the case with production incentives for domestic substitutes for oil, such as alcohol fuels.

[70]*See, e.g., The Stern Review Report on the Economics of Climate Change*, ch. 8, "The Challenge of Stabilization" (Oct. 30, 2006).

economic burdens of greenhouse gas abatement with costs that exceed the benefits.

D. Cap and Trade and Energy Tax Incentives

Under a cap-and-trade scheme, the price of a carbon allowance will reflect the marginal cost of emissions reductions required to achieve a given level of cumulative greenhouse gas. The latter is the ''cap'' that is set by policymakers. The price of emissions allowances will depend on the level of the cap and on the emission reduction measures recognized under that cap.[71]

Under some very restrictive — and highly unlikely — conditions, the price of carbon that emerges under a cap-and-trade scheme would equal the long-run marginal cost of the negative externality created by emitting greenhouse gases. That is, the price would be equal to the socially optimal carbon tax. The necessary conditions are:

- that the cap, over time, reflects the level of cumulative emissions required to minimize the net costs of climate change; in other words, the long-term accumulation of emissions allowed by the cap is optimal;
- that trade is possible across time periods; with intertemporal trade, greater emissions are allowed today while emission reduction is more expensive, in the expectation that emissions can be cut more radically in the future at lower cost; and
- all viable emission reduction measures, from anywhere in the world, are recognized in the trading scheme, which allows global emissions to be reduced by pursuing the least costly abatement options.

Of course, it is very unlikely that any cap-and-trade scheme introduced in the United States would meet those conditions. First, the successive aggregate caps would be set by policymakers for a finite period and would likely represent some technologically viable and politically acceptable track. Only by sheer luck would it coincide with the optimal emissions path.

Second, it is very unlikely that all viable emission reduction options would be included in such a scheme. Part of the problem lies with transaction costs. Many highly efficient emission reduction measures are small scale and very difficult to monitor. Small-scale projects, like planting a single tree, have benefits, but the transaction and administrative costs of verifying greenhouse gas abatement of that magnitude are too high to justify the effort.[72]

An important related issue is whether foreign emission reduction opportunities are allowed in the scheme. As noted in the legislative history to the Energy Policy Act of 1992, economic activities in developing countries tend to generate more greenhouse gases per dollar of output than economic activity in developed countries. This is attributed to technically inefficient equipment and a lack of access to better technology. Therefore, most opportunities for low-cost emission reduction are found in less-developed countries. Preventing those emissions reduction opportunities from entering the domestic market for carbon allowances would raise the marginal cost of compliance in the U.S. economy.[73] Reflecting the 1992 Energy Policy Act debate and current concerns, many analysts would argue (trade agreement issues aside) that encouraging technology transfer and the export of pollution control equipment has the dual benefit of achieving lowest-cost global emissions reductions and driving U.S. economic growth.

To sum up, any cap-and-trade scheme in the United States would lead to carbon prices that represent the marginal cost of abatement under the rules of the scheme. That marginal cost would depend on the critical design elements of the scheme outlined above, such as the level of the emissions cap and the permissible sources of emission reductions (or offsets). Those features of cap and trade also have consequences for the scheme's interaction with existing tax incentives for renewable energy sources. The relationship depends on whether the marginal abatement — the emissions reductions efforts — within the scheme occurs inside the United States or abroad.

If marginal abatement occurs within the United States — if cheaper foreign emission reduction opportunities are not allowed to count — then existing tax incentives for energy would be fully priced into the scheme. In other words, the carbon price will reflect the marginal cost of abatement after the tax incentives are taken into account.

By making renewable energy less costly, the tax incentives will lower the marginal cost of abatement. The carbon price will be reduced by the equivalent amount, and a portion of the cost of abatement will stay with taxpayers rather than electricity ratepayers or other energy consumers. In other words, when foreign emissions credits are excluded, the domestic cap-and-trade scheme and the renewable incentives will complement each other.

The situation is more complicated regarding tax incentives for production of domestic carbon-based fuels. When those incentives do not change the price of energy, as is the case with oil, they will have no effect on the carbon price. Under those circumstances, the tax incentives will not be distorted and will continue to serve the purpose of compensating for national security externalities. In contrast, when production tax incentives do alter

[71]That is, not all potential abatement measures will be allowed to count in meeting an emitter's emissions reduction targets. This issue is discussed immediately below.

[72]Similarly, all existing carbon trade schemes exclude energy efficiency measures. For example, retrofitting a building with insulation would reduce energy consumption, and hence would lower greenhouse gas emissions. However, most emission trading schemes exclude those activities because it is extremely difficult to identify the baseline energy consumption for a building and to measure exactly how much emissions are reduced by installing insulation.

[73]The Environmental Protection Agency's review of the American Clean Energy and Security Act of 2009 stated: ''The use of domestic and international offsets, which serve as important ways to finance emission reductions in agriculture, forestry, and industry, significantly reduces the cost of achieving the [draft legislation's] goals. Excluding international offsets from the cap and trade program raises allowance prices 96%.'' ''EPA Review of the Waxman-Markey Discussion Draft,'' Apr. 20, 2009.

the domestic price of carbon-based energy, as is the case with coal and natural gas, they will tend to widen the gap between conventional energy and sources with lower emissions. By lowering the cost of conventional energy, existing tax incentives reduce the cost of more carbon-intensive energy and therefore increase the carbon price that is necessary to achieve the optimal level of greenhouse gas abatement. Hence, for coal and natural gas, the carbon price generated within a cap-and-trade scheme would need to be higher to offset the cancelling effect the tax incentives create.

The outcomes change if the U.S. cap-and-trade scheme were to allow foreign emission reduction credits, such as the emission reduction units allowed under the Kyoto Protocol's Clean Development Mechanism. In a carbon market with full credit for unlimited foreign offsets, it is likely that the bulk of emission reduction would occur outside the United States. Therefore, the price would reflect the marginal cost of abatement abroad. U.S. tax incentives don't affect the marginal cost of abatement abroad, so domestic incentives would no longer be priced into the scheme.

Under these circumstances, tax incentives for renewable energy combined with cap and trade would lead to excess emission reductions and an oversupply of renewable energy. In other words, an internationally linked cap-and-trade scheme designed to address the environmental externalities of climate change will not account for the additional environmental benefits targeted by renewable energy tax incentives in the United States. From this perspective, the two policies would duplicate the effort to compensate for the negative environmental externalities and, as a result, would generate inefficient and unjustified economic costs.

By contrast, as long as international emission credit prices are not influenced by the domestic tax incentives, support for domestic conventional energy production would not conflict with the objectives of the cap-and-trade scheme. Incentives for developing domestic energy could effectively address national security externalities without interfering with the ability of the cap-and-trade scheme to account for climate change at the least cost.

E. Conclusions for Cap-and-Trade Design

Put more succinctly, designing a cap-and-trade scheme that is compatible with existing tax incentives requires two important considerations. First, if marginal abatement occurs domestically, the implicit carbon price will have to be higher to offset the incentives that lower the price for domestic conventional energy. Second, if marginal abatement occurs outside the United States, then, to the extent that the existing domestic incentives attempt to price in negative environmental externalities (as opposed to national security externalities, for example), those incentives will generate an oversupply of renewable energy, and the carbon price under the climate change policy will reflect a marginal cost of emissions abatement that exceeds the environmental benefits.