

Why Cap & Trade is the
Wrong Policy to Curb
Greenhouse Gases for the
United States

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The George C. Marshall Institute

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Table of Contents

About the Author	1
Executive Summary	3
Introduction	5
How a Cap & Trade System for GHGs Would Work	6
Proposed C&T Systems	7
Principal Costs of a Cap & Trade System	9
Cost of Constraining Fossil Energy Use	9
Costs of Volatile Energy Prices	9
Rent Seeking Costs	10
Costs of Monitoring a C&T System	11
Political Incentives to Create a C&T System	15
Environmental Support for a C&T System	15
Alternative Means to Control GHGs	16
1. Command and Control	16
2. Voluntary Goals and Incentives	17
3. Tax-based approach	19
Conclusions	20
Endnotes	21

About the Author

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Executive Summary

U.S. policy towards controlling greenhouse gases (GHGs) has relied largely on voluntary actions to achieve its objectives. In 2002, President Bush announced a goal of decreasing the GHG intensity of national output (GHGs/GDP) by 18 percent over ten years, by 2012. Public/private partnerships, spending on research, development and deployment, and international agreements such as the Asia-Pacific Partnership on Clean Development and Climate have been principal tools in implementing this policy. Through 2006, the U.S. is ahead of schedule, having reduced the GHG intensity of its output over the past four years by almost 11 percent.

As concern over climate change has increased, however, a number of proposals have emerged in Congress and elsewhere that would compel more rapid reductions in GHGs. Most of these take the form of Cap & Trade (C&T), in which a fixed number of allowances to emit GHGs would be distributed annually by the government, and recipients allowed to trade them with one another. Many environmental organizations support the approach. A number of businesses also support it and for now it is the main policy approach to reduce GHGs under discussion within the U.S. Congress.

This paper argues that implementation of a GHG C&T system in the U.S. would be a serious policy mistake. Our conclusion is based on the following observations.

- A binding constraint on U.S. GHGs would impose costs on the economy by forcing other, higher-cost resources to substitute for energy in the production of output.
- Fixing the quantity of annual GHGs likely would result in volatile prices for allowances, and therefore in volatile prices for fossil fuels. Past research indicates volatility of oil prices has resulted in substantial GDP reductions. Estimates of the cost of a C&T system generally do not include such GDP reductions.
- C&T features such as safety valves, banking and borrowing can reduce some of these costs by relaxing the binding constraint. But there is opposition to these features and there are superior means to curb national GHGs.
- A C&T program essentially involves government creation of wealth, which businesses would seek and which government officials would dispense. The amount of wealth at stake could easily run between \$60 billion/year and \$150 billion/year. Resources expended by businesses to secure a share of this wealth might yield ample private returns, but their expenditure is socially wasteful. With tens of billions of dollars at stake, billions easily could be spent in this pursuit. Estimates of the cost of a C&T system generally do not include such socially wasteful expenditures.

- There would have to be extensive worldwide monitoring of a C&T program. Corrupt governments and private parties would have powerful incentives to create bogus allowances in order to secure transfers of wealth. Press reports indicate such activity already is taking place.
- In this country alone, thousands of firms would have to expend resources to monitor their use of allowances relative to fossil fuels. In addition, the Federal government would have to put its own administrative system in place. Hundreds of millions if not billions of dollars likely would be spent annually on such activities. Estimates of the economic cost of a C&T system typically do not include such expenditures.
- A goal-based voluntary approach to curbing GHG emissions offers advantages over a compulsory program. In particular, a goal of reducing GHG emissions relative to output (GHG intensity of GDP) allows for maximum economic growth, a key to resolving a variety of social issues, not just GHG restraint.
- The present goal-based approach could be strengthened through implementation of climate-related provisions of the Energy Policy Act of 2005 (EPA 2005) and through provision of incentives to more rapidly turn over the nation's capital stock towards more energy efficient versions.
- If stronger measures are desired, a tax-based approach would be much superior to a C&T system. If such a tax were set to equal the social cost that CO₂ emissions impose, it would provide appropriate incentives to reduce emissions while also providing a source of revenue to government that could be used for other purposes, including reduction of other taxes.
- A carbon tax would avoid the problem of price volatility and also would avoid rent-seeking behavior to secure free allowances and monitoring costs to assure the validity of allowances and emission numbers. While there would be administrative costs to assure that the tax was being paid, the U.S. government (as well as governments elsewhere) already has a tax collection administration in place.

The adoption of a C&T system would impose unnecessary and burdensome costs on the U.S. economy. Policy makers should oppose such a system and should consider means to strengthen the present goal-based approach, specifically through implementation of the climate provisions of EPA 2005 and through incentives to adopt more energy efficient capital equipment. If a stronger approach ultimately is desired, policy makers should opt for a carbon tax rather than C&T. A tax-based approach would avoid the wastes associated with a C&T system and would provide a source of revenue that could be used for other purposes. If used to reduce other taxes, the approach could both improve U.S. environmental performance and its own economic wellbeing.

Introduction

In recent months, momentum has been building in the U.S. Congress for a new policy to curb the country's greenhouse gases, namely capping the annual quantity emitted, distributing allowances in accordance with that quantity, and allowing trading of the allowances among emitters. Known as Cap and Trade (C&T), such a system is intended to curb greenhouse gases efficiently, by allowing emitters for whom reductions are expensive to purchase rights from those who can reduce their emissions inexpensively. Environmental organizations and a number of businesses have endorsed this approach¹ and there are many bills in Congress to implement such a system. Some states also are considering the approach. Despite opposition from the Bush Administration, C&T appears to be gaining favor and it may be only a matter of time until some form becomes official U.S. policy.

In some ways, the momentum for a C&T system is surprising. A number of prominent economists have warned that the approach is far less efficient than would be a tax-based approach.² European experiments with a C&T system have not gone well to date.³ Media reports indicate that in practice the approach has a number of pitfalls.⁴ All of this suggests that congressional focus on C&T as a means to curb greenhouse gases is heading the country in the wrong direction.

This paper argues that a C&T system would be far more costly than is yet understood. Present estimates of these costs omit several important factors and therefore understate what is likely to happen. Further, the system is likely to be unwieldy, subject to cheating and graft, enabling side payments to unsavory regimes, and necessitating large numbers of administrators. As a result, it likely will come to be viewed by the public as both unfair and bureaucratic, diminishing their support for its objectives.

There are, however, political incentives to establish a C&T system. In essence, a C&T system creates enormous wealth, which businesses hope to acquire and which Congress would have a hand in distributing. Both sides see opportunities. Voluntary GHG reduction goals, on the other hand, do not offer similar wealth-enhancing or political opportunities. Neither does a tax-based approach, which would offer a source of revenue for government that could be used for a number of purposes, including reductions in other taxes.

Many environmental organizations support a C&T system because it promises certainty with respect to quantitative reductions. We will argue that this is irrelevant and that reductions can be obtained in other, more efficient ways.

The paper focuses first on how a C&T system works and on some of the many proposals currently under consideration. We then explain the principal costs of such a system, and why they are frequently underestimated. Macroeconomic models can incorporate constraints within the economy, such as curbs on energy consumption, but rarely account for price volatility, administrative costs or rent-seeking behavior. We will explain why these will arise and what magnitudes of costs may be involved.

We then will discuss alternative means to curb U.S. GHGs. These range from the goal-based approach that the U.S. currently is following to Command & Control, C&T and a tax-based approach. We will briefly compare the advantages and disadvantages of the approaches. The goal-based approach that the U.S. has followed has produced surprisingly effective results to date, but can be strengthened, particularly through implementation of the climate provisions of EPAct 2005 and through incentives to turn capital stock over more rapidly. If stronger policy measures are desired, a tax-based approach would be much superior to C&T and should be chosen. C&T is poor public policy and should be abandoned.

How a Cap & Trade System for GHGs Would Work

A cap and trade system for GHGs would impose an annual limit on the quantity of such gases that could be legally emitted within the United States. Since CO₂ is the dominant U.S. greenhouse gas, the five other recognized classes of GHGs likely would be translated into CO₂ terms.⁵ Because there are as many as nine commercially significant hydrofluorocarbons and four perfluorocarbons as well as methane, nitrous oxide, carbon dioxide and sulfur hexafluoride, there are 17 distinct gases for purposes of such translation. These are shown below in Table 1. Rights or allowances to emit would be distributed, either freely via formulas devised by Congress and the Administrator or through public auction. Conceptually, to legally emit a ton of CO₂, the emitter would be required to turn a 1-ton allowance back into the government.

Table 1. Global Warming Potentials (GWPs) over a 100-year Time Horizon

Gas	GWP
CO2	1
CH4	21
N2O	310
HFC-23	11,700
HFC-32	650
HFC-125	2,800
HFC-134a	1,300
HFC-143A	1,300
HFC-152A	140
HFC-227ea	2,900
HFC-236fa	6,300
HFC-4310mee	1,300
CF4	6,500
C2F6	9,200
C4F10	7,000
C6F14	7,400
SF6	23,900

Source: EPA

Trading of allowances would be permitted and likely would take place on organized exchanges. The price of allowances would be determined mainly by the demand for fossil fuels and by the quantity of permits to emit CO₂ supplied by the government.⁶ Those able to curb emissions at costs less than this price could profit by selling some of their allowances to others.

The Administrator (probably EPA or DOE) would be responsible for monitoring GHG emissions and for being sure that each ton emitted had an allowance. The Administrator also would be responsible for seeing to it that allowances were legally obtained.

As usually envisioned, a C&T system would allow for offsets obtained either within the United States or internationally. Such offsets might be obtained domestically through certain types of agricultural programs or other means, or internationally through purchase of allowances on exchanges elsewhere or through the UN-approved Clean Development Mechanism or Joint Implementation projects.

A C&T system might include various other features. For example, participants might be allowed to bank allowances, saving them for future use. They also might be able to borrow from future years' allocations for use in the present. Usually, C&T programs with this latter feature charge interest in the sense that a borrower would be required to pay back more than one allowance for each allowance borrowed.

Some C&T systems also contain safety valve features, in which the government stands ready to sell additional rights at a pre-set price. The purpose of this feature is to keep the price of allowances from rising too much in any given year. C&T systems also can include a floor price, at which the government stands ready to purchase allowances to keep their price from going too low. One reason for doing so would be to protect investors who have invested monies in GHG reduction projects.⁷

Many other details surround specific C&T systems. These include who is covered, whether there are exemptions for small emitters, etc. Some of these are discussed further below.

Proposed C&T Systems

A variety of Cap & Trade proposals have been offered within the present Congress. We briefly review several to get a sense of what they cover.

Senator Dianne Feinstein (D-CA) has been among the more active Senators on climate change legislation. She and Senator Thomas Carper (D-DE) have proposed the "Electric Utility Cap and Trade Act" legislation that covers only the utility sector but which includes the six major greenhouse gases. Some allowances would be allocated and others sold at auction, with the proportion auctioned beginning at 15 percent in 2011 and reaching 100 percent in 2036. Existing utilities would receive allocations according to a formula specified in the bill, but a reserve of allowances would be established for allocation to "new covered units" and to others.

The bill contains several alternative means whereby allowances could be obtained. There is a safety valve provision that would allow the Administrator of the program to issue additional permits to prevent their price from rising excessively in a given year. Offset credits could be earned from both international and domestic sources. Also, allowances could be banked or borrowed, to be paid back with interest.

Monies from the sale of credits would go into a Climate Action Trust Fund, much of which would be controlled by the Administrator. There also would be subsidization of low carbon power generation technologies.

Senators John Kerry (D-MA) and Olympia Snowe (R-ME) have proposed a different approach. Their “Global Warming Reduction Act of 2007” aims at a 65 percent reduction in emissions from 1990 levels by 2050. It does not specify who is covered, leaving it to the program Administrator to make that determination. Allowances could be allocated or auctioned, and allocations could be made to entities either covered by or outside the cap. All six GHGs are included.

Other Senators and Congressmen have proposed their own versions of C&T legislation. Senators Joseph Lieberman (D-CT) and John McCain (R-AZ) have proposed the “Climate Stewardship and Innovation Act of 2007.” This Act identifies “covered entities” as companies in the electric, industrial and commercial sectors and importers of petroleum who emit a minimum of 10,000 tons of GHGs annually. The number of allowances is fixed at 6,130 million metric tons (mmts) in 2012 and gradually decreases to 2,096 mmts by 2050 and thereafter. There is no auctioning of permits in this bill. All six GHGs are covered. Congressman John Olver’s (D-MA) Climate Stewardship Act of 2007 contains many of the same provisions.

Congressman Henry Waxman’s (D-CA) “Safe Climate Act of 2007,” a companion bill to one introduced by Senators Barbara Boxer (D-CA) and Bernie Sanders (I-VT), caps 2010 U.S. GHGs at the 2009 level, compels 2 percent per annum reductions to reach 1990 levels by 2020, and then 5 percent per year reductions to reach 20 percent of 1990 levels by 2050. It does not specify which entities are covered, leaving that to the program Administrator. Permits can be distributed or auctioned. They also can be gained through international or domestic offset credits. There is a safety valve feature, as well as banking and borrowing.

One proposal sets a cap on GHG intensity (GHGs/GDP) rather than on absolute GHGs. Senators Jeff Bingaman (D-NM) and Arlen Specter (R-PA) have proposed legislation that would reduce GHG intensity 2.6 percent per year between 2012 and 2021, and 3 percent per year from 2022 forward. Like other proposals, it contains safety valve features, banking, offsets (both foreign and domestic), and provision for revenue generation through auctioning. A principal advantage of this approach is that its targets allow for GDP growth, a subject to which we shall return. Plausibly, however, the bill would result in a smaller GHG decrease over time than would some of the more stringent C&T proposals.

These various approaches indicate that a number of design questions surround a C&T program. What is the cap? Who is covered? How are allowances distributed? Is there a safety valve feature? Are there banking and borrowing? Are international and/or domestic offsets allowed? If some allowances are auctioned, what is done with the monies and who controls their allocation? The combination of features included in a particular bill will affect how that particular C&T system would affect the economy, but as argued below, almost any C&T system is likely to prove very costly.

Principal Costs of a Cap & Trade System

Cost of Constraining Fossil Energy Use

Since fossil fuels provide around 85 percent of the energy used in the U.S. economy, any program that constrains carbon dioxide emissions will effectively constrain U.S. energy use. In some instances it may be possible to cost effectively substitute other resources for energy, but more generally, constraints on the use of energy will result in less work performed within the economy and hence less economic output.

For the foreseeable future, contraction in the amount of fossil energy use from a cap and trade system is likely to impose rising costs in terms of GDP foregone. This is so because as income grows more energy will be demanded while less fossil fuel energy can be legally supplied. Technological progress may eventually result in more energy efficient capital equipment and in new, low-cost means to produce and distribute carbon-free forms of energy, but the costs of such energy are likely to be higher than fossil energy for some time to come.

For that reason, studies of C&T mechanisms to curb fossil fuel use have consistently shown reductions in output that tend to grow with time. The Energy Information Administration, for example, estimated that a C&T system proposed a few years ago by Senators McCain and Lieberman would have cost several tens of billions of dollars per year by 2025-2030.⁸ Similarly, analysts at MIT have modeled the effects of C&T systems on the U.S. economy and indicated that, depending on its features, such a system clearly will reduce consumer welfare even with relatively unrestricted international trading of permits and a low safety valve price.⁹

Costs of Volatile Energy Prices

Most macroeconomic models estimate the effects of constraints on fossil energy use on aggregate output. However, economists warn that the volatility of fossil energy prices associated with a cap on their use may generate additional large costs. Energy demand is inelastic, so that even small changes in demand relative to supply can result in sharp price movement. Volatility associated with permits would cause large relative price swings among economic sectors, create uncertainty among investors, and adversely impact aggregate demand.¹⁰

It is not clear that economic modeling of C&T proposals has included these costs. What is clear is that such volatility occurs. In the European Trading System, carbon prices fell by over two thirds in early 2006 when it became evident that there were too many permits relative to demand. According to one source, over the first 22 months of CO₂ permit trading in that market, price shifts averaged 17.5 percent per month.¹¹ Similarly, over the last decade, prices in the U.S. SO₂ program have had a monthly volatility of 10 percent and annual volatility averaging 43 percent despite a safety valve feature in that program allowing EPA to auction permits to temper price volatility.¹² Prices for allowances in that program have ranged from \$66/ton in 1997 to \$860/ton in 2006. Such volatility is inherent to a quantitative limitation on energy use such as would be imposed by a carbon emission C&T program, and can only be mitigated, but not eliminated, by safety valves and other escape features.

How costly would volatility in fossil energy prices be? Empirical evidence suggests that past oil price shocks have had strongly adverse effects on the macroeconomy.¹³ Price increases for fossil fuels such as have occurred in the SO₂ trading program almost surely would adversely impact the U.S. economy. Given the economy's size, even a reduction in the rate of growth of as little as 0.1 percent in a single year from such a shock would imply costs of over \$13 billion. More likely, slowdowns in growth from highly volatile energy prices would be greater, last longer and be of greater magnitude.¹⁴

Rent Seeking Costs

Loosely defined, rent seeking involves people's efforts to secure wealth through lobbying of regulatory or legislative officials. Government creation of wealth through a C&T system offers considerable opportunity for individuals to engage in rent seeking of a specific form, namely the securing of free allowances through lobbying those responsible for the program.

How great might the wealth created by a carbon dioxide C&T system be? The U.S. emits approximately six billion tons of carbon dioxide per year, and almost 6.5 billion tons of CO₂-equivalent, if other greenhouse gases are included. The price of allowances would depend on the specifics of the C&T system in place, but it is not fanciful to believe that price could be somewhere in the range of \$10/ton to \$25/ton. If the allowance price were as much as \$25/ton of carbon dioxide, there would be upwards of \$150 billion to be allocated annually, which means there could be as much as \$150 billion to be obtained through strategic rent seeking.

Resources expended in the pursuit of allowances may have private payoff, but there is no social product. In essence, the effect of such lobbying would be to redistribute a fixed quantity of allowances or increase the total number granted. No socially useful output is produced. Any resources expended in such pursuit therefore are pure social waste.

How much would be expended in the pursuit of this form of government-created wealth? Depending on the scope of coverage of a particular C&T system, there could be thousands if not tens of thousands of parties who would seek to obtain allowances based on past emissions, future expected emissions, or “special” situations of one sort or another. These would include industrial companies, commercial firms, utilities, oil producers or refiners, oil importers, natural gas producers and importers, and many others. The broader the scope of the C&T program, the greater the number of rent seekers and the more resources expended.

To the extent that permits are auctioned instead of given away, the incentive to seek rents via permit allocation is diminished. For example, the Northeast Regional Greenhouse Gas Initiative, a state-based C&T system, specifies that all permits will be auctioned to the highest bidders. But most Federal proposals contemplate initially auctioning only a small portion of allowances, if any at all.

Given this fact, vigorous competition to secure permits through lobbying activity should be expected. In the process, firms and individuals will spend on permit acquisition until, at the margin, the costs become greater than the expected benefits. Firms that are able to secure greater wealth in the form of free permits than what they spend in the process would earn “profits” on the activity, while those who secure less permit wealth than what they spend would experience losses. At the limit, rent seekers could exhaust the rents available in their competition for allowances, i.e., competition for allowances could drive profits from this activity to zero. If the market value of allowances were \$150 billion/year, this would imply \$150 billion/year in socially wasteful expenditures. This extreme seems unlikely, particularly on an ongoing basis, but certainly the annual expenditure of a few billion dollars in the pursuit of many tens of billions of dollars is plausible.

Rent seeking costs generally are not included in economic forecasting models such as those used by DOE. Thus, these costs are in addition to costs imposed by constraining fossil energy use and from energy price volatility.

Costs of Monitoring a C&T System

The costs of monitoring emissions of GHGs and their associated allowances will depend on what entities and what gases are included and what means of offsetting emissions are allowed. Because C&T would be worldwide in scope, monitoring costs will depend on what system of international emission allowances and international trading comes into being.

Most congressional proposals extend across much of the economy, include all six GHGs, and allow both domestic and international offsets. The challenges and associated costs of policing such a system appear formidable. Fossil fuel use would have to be closely monitored. Trades of emission rights also would have to be

monitored to be sure the rights exchanged are real and not bogus. This applies both to parties within the United States, where business scandals are not unknown, and internationally, where country monitoring of emissions and emission reduction projects is likely to be imperfect. Because fraudulent allowance sellers can earn considerable wealth while buyers have weak incentives to assure that allowances are legitimate, the scope for fraud is great.

In the United States alone, a C&T system will include thousands and possibly tens of thousands of emitters.¹⁵ Each will be required to maintain precise records of fossil fuel use, their types and amounts, and to track their use of carbon allowances to be sure the two match. They also will need to protect their allowances from theft and possibly insure them since in aggregate they will carry substantial value. Further, they will need to track prices in allowance markets to assess whether they should be net sellers or buyers at any given time, or whether they should engage in hedging activity. Those who seek to create offsets will have to prove to administrators that the offsets are genuine. If great varieties and numbers of offsets are created, large numbers of administrators will be needed to monitor the activity.

Joint implementation projects offer opportunities to create offsets in other Kyoto Protocol Annex I countries. These include the countries of the former Soviet Union, including Russia itself. Question arises whether governments in some of these countries will strictly enforce rules intended to prevent questionable claims. The incentive to credit offsets is strong because investments in Joint Implementation projects by western companies provide hard currency and job opportunities, all in exchange for certification that GHG emissions are lower than they otherwise would have been.

Cap and trade extends beyond Annex I countries, with offsets available via the Clean Development Mechanism from anywhere in the world. In many developing countries, even well intentioned governments will find it difficult to closely monitor activities claimed to provide GHG reductions. Elsewhere, governments may be tempted to actively support fraudulent programs. It would be relatively easy for such a government, for example, to publicly announce it will build an energy inefficient plant and then to collaborate with a Western company to substitute a more efficient version in order to generate offsets.

A number of economists have stressed these points. Commenting on the prospect of international trading of CO₂ allowances, Richard Cooper states:

“...international trading entails potentially large transfers between law-abiding citizens in rich countries such as the USA, Canada, Europe and Japan to corrupt officials and their favored oligarchs in countries less meticulous about the rule of law – or directly to the governments of such countries. These transfers would not be conditioned on anything beyond willingness to sell emission rights that had been internationally agreed.”¹⁶

William Nordhaus puts the cheating issue bluntly:

“Cheating will probably be pandemic in an emissions-trading system that involves large sums of money. There are very poor intrinsic incentives for honesty in a cap-and-trade system. The purchasing unit gets a permit whether or not any true reductions take place by the selling unit....emissions evasion is a positive sum game for the two parties. If tax evasion in the U.S. is in the order of 10 or 20 percent of taxes due, is there reason to believe that emissions evasion in Ukraine or Romania would be substantially less?”¹⁷

Robert Shapiro makes clear the scope of monitoring necessary for a C&T system with worldwide trading opportunities.

“Any global cap-and-trade program will have to cover hundreds of thousands of installations in scores of countries, and trades will require accurate measurements of energy production on both sides of (the) transaction, before and after the trade. That may be plausible in advanced countries with elaborate, professional regulatory systems, but it’s considerably less so in transitional economics such as the Czech Republic, Romania and China, and frankly implausible in places such as Russia and the Ukraine. Cap-and-trade systems may provide incentives as well as opportunities for cheating and corruption in the measurement of the energy and emissions subject to trading, because the buyer and the seller can gain by understating their actual energy production and emissions as doing so raises the seller’s income and reduces the buyer’s per-unit cost. Even if only the seller cheats by understating its energy production and emissions (creating or increasing the permits it can offer for sale), the buyer has no incentive to discover or reveal the fraud.”¹⁸

Are these various claims and warnings unrealistic? The *Financial Times* recently ran several feature articles covering the market for offsets. In one of these,¹⁹ it detailed three principal problems:

- a. The risk of fraud, such as the sale of credits from carbon reduction projects that do not exist.
- b. Funding of carbon reduction projects that would have occurred anyway.
- c. The risk of companies selling the same credits several times over.

The *Financial Times* also described instances in which companies claimed credits simply from reducing their operations. It raised too the specter of credits sold for future promised reductions which fail to materialize. An environmental adviser at HSBC, the UK’s biggest bank, is quoted by the paper as follows:

“The police, the fraud squad and trading standards need to be looking into (serious credibility concerns in the offsetting market). Otherwise people will lose faith in it.”²⁰

Could the United States avoid problems of monitoring emissions and allowances elsewhere by running a self-contained C&T system, with no international trading? In theory this could occur, but differences in the domestic and international prices of allowances likely would quickly drive the U.S. to integrate internationally. It is probable that a U.S.-only allowance market would have higher allowance prices than the rest of the world, leading U.S. firms to complain that they are at a competitive disadvantage relative to firms elsewhere, an argument that likely would have political resonance. If, on the other hand, the U.S. price were lower than elsewhere, there would be incentive to earn profits by selling allowances, something that would improve the foreign trade balance as well. This too likely would motivate U.S. integration with markets elsewhere.

The costs of monitoring are difficult to predict. To get a sense of their magnitude, suppose we assume that within the U.S. alone 10,000 entities would be covered, each assigning a single person to manage all of its C&T related activities. At a roughly estimated cost of \$75,000/year per person so assigned, this would be \$750 million/year. The Federal government would need its own administrative staff, perhaps costing an additional \$50-100 million/year. If disputes arose, necessitating legal representation and use of court time, further costs would be involved. Private and public monitoring costs of \$1 billion/year for the U.S. alone do not seem beyond reason.

Table 2 below summarizes the costs of a C&T system.

Table 2. Cost Categories of a C&T System

Cost Category	Potential Amount	Comment
Constrained fossil fuel use	In time, \$10's of billions/year	Magnitude depends on system design
Allowance price volatility	Periodic GDP growth impacts of a few tenths of 1 percent	Could occur frequently
Rent seeking	Potentially the entire rents (\$60 billion/year or higher), though probably less	High at first, diminishing once allowance allocation rules are put in place
Monitoring & Administrative	As much as \$1 billion/year in U.S. alone	Higher costs to monitor worldwide emission offsets

Political Incentives to Create a C&T System

A number of large U.S. companies have come out in favor of a C&T system. Several environmental organizations support it. Groups associated with commodity trading such as the Chicago Climate Exchange are strongly supportive. And Congress has focused almost exclusively on C&T, ignoring economists' advice that a tax-based approach would be superior, even though some leading members appear to recognize it is a better approach.²¹ What accounts for C&T's political momentum?

The principal driver is the ability to obtain and to distribute government-created wealth. If a C&T system constrains U.S. energy use, then allowances will have monetary value, and the system taken as a whole will have a great deal of value. We previously indicated the value of these allowances might run between \$60 billion and \$150 billion per annum.²² The possibility of tapping these amounts year after year already has attracted considerable private sector interest in the creation and maintenance of such a system.

The trading of allowances provides further wealth-enhancing opportunities. Those who specialize in creating markets and in facilitating transactions in these markets have clear incentive to support a government-established C&T system. Six billion allowances provide an extensive trading base, and though some allowances might never be traded others might be traded several times. Even a small charge per trade should ensure market makers of a stream of wealth for many years to come.

From a political perspective, C&T makes eminent sense. There is widespread public support for controlling GHGs, so it is easy to support a means to do so. New taxes can be a hard sell, particularly if not linked to tax reductions elsewhere. But even more to the point, a C&T system requires a Federal allowance distribution mechanism. Even if Congress delegates authority to an Executive agency such as EPA or DOE to administer a tradable allowance system, it retains ultimate control. Those who seek larger allocations will seek to influence Congress regarding the initial rules for distribution and will seek congressional help if they are dissatisfied with Administrative decisions. This strengthens the positions of congressional incumbents, who can expect political support in exchange for their interventions. The ability to distribute government-created wealth of great magnitude is simply too potentially rewarding from a political perspective to ignore.

Environmental Support for a C&T System

By and large, environmentalists support a C&T system because it provides certainty with regard to the quantity of U.S. carbon emissions in any given year. From that perspective, other approaches such as a tax, while perhaps moving in the right direction, might not achieve what is desired, namely a steady reduction at a known rate.

The argument, while correct as a matter of arithmetic, misses a principal point with regards to GHG emissions. It is the total stock of GHGs, not the annual quantity emitted, that matters with regards to climate change. Small differences in the rate of U.S. emissions in a given year make little difference to the overall stock, but could impose very large differences in costs. A tax-based approach can be adjusted over time if it is not achieving desired results, but once a tax is in place, the cost of carbonaceous fuels is known. In contrast, quantitative limitations on fossil fuel use can result in large and rapid changes in their prices. For this reason, economists resigned to a C&T system recommend safety valves in the form of government sales of permits if their price reaches a ceiling.²³ However, as pointed out above, even with a safety valve there can be considerable allowance price volatility. Moreover, some environmentalists oppose safety valves because they destroy the certainty that quantitative limitations yield, and some of the congressional C&T proposals do not include such safety valves.

Alternative Means to Control GHGs

Aside from C&T, there are three broad means to curb U.S. greenhouse gases. These are command and control, voluntary goals and incentives, and a carbon tax. We discuss each in turn.

1. Command and Control

Under command and control, the Federal government would specify GHG reduction technologies that industrial companies, utilities and others would be required to adopt. In the U.S., this technique has been widely used to mandate reductions in criteria pollutants and toxic emissions. In those applications, the government has sought to identify the best pollution control technology available for a particular application and then mandated industry use of that technology as Best Available Control Technology, Reasonably Available Control Technology, or some other specification.

To some extent, a command and control approach already is being imposed within the United States with regards to greenhouse gases. In several states, utilities are required to meet Renewable Portfolio Standards, standards which specify a required percentage of power generation from renewable forms of energy by a given date. In New York, for example, utilities are required to produce 25 percent of their power from renewable sources by 2013.

At the national level, automakers are subject to Corporate Average Fuel Economy standards, which the Bush Administration has proposed to increase and which also would increase if energy legislation presently under consideration in the Congress is enacted. In addition, national energy efficiency standards are imposed on household capital equipment such as washing machines, refrigerators and dishwashers.

The problem with the approach is that it tends to be very costly. The technologies required are generally higher in cost, raising prices for consumers of the products involved and sometimes leading to taxpayer-provided subsidies. In the New York Renewable Portfolio Standard program, for example, a surcharge is placed on customer bills and the monies from the surcharge are used to pay the extra costs of producing renewable energy. In addition, a production tax credit has been established in the state for the production of “green” energy.

Though there are examples of Federal and state proposals to curb GHGs through command and control schemes, the approach is generally not favored because of its high costs. Cap and trade is generally preferred even within the environmental community because it promises to achieve the same ends at lower costs.

2. Voluntary Goals and Incentives

Over the past fifteen years, the United States has basically adopted a policy of voluntary goals and incentives to reduce GHGs. At the national level, President Bush announced that the U.S. would seek to reduce the GHG intensity of its output by 18 percent between 2002 and 2012. Present indications are that this goal is likely to be exceeded. Data for changes in the GHG intensity of GDP between 2002 and 2006 are given in Table 3. Over four years, U.S. GHG intensity has decreased by almost 11 percent, almost 60 percent of the stated goal.

Table 3. Changes in GHG Intensity of U.S. GDP 2003-2006

	change in U.S. GHGs	change in U.S. GDP	percent change in GHG intensity of GDP
2003	0.7	3.0	(2.3)
2004	2.0	4.2	(2.1)
2005	0.6	3.2	(2.5)
2006	(1.3)*	3.3	(4.5)
Total: 2002-2006			(10.9)

**Because data for total GHG emissions are not yet available, the 2006 number is for CO₂ emissions from energy use only. These normally comprise over 80 percent of total U.S. GHGs.*

What tools are being used to achieve such reductions? For one, the U.S. government has encouraged private sector entities to adopt their own GHG goals. EPA, DOE and the U.S. Department of Agriculture participate in a variety of public/private partnerships which seek to secure commitments from private companies to reduce their GHGs. A number of environmental organizations have made similar agreements with companies in which the latter commit to reducing their GHGs.

The U.S. also is a member of the Asia-Pacific Partnership on Clean Development and Climate, a grouping of six countries including China and India that seek to reduce GHGs both in their own countries and elsewhere through the application of energy efficiency technology. An important aspect of the Partnership is that it brings two developing countries that are growing rapidly and which have very large economies into a framework intended to curb the growth of GHGs.

Very recently, the Bush Administration announced its intent to work with the leaders of the world's fifteen largest energy users to establish a worldwide framework for GHG reductions over the next several decades. The framework would set longer term goals for GHG reductions that in turn would inform nearer term strategies. The approach stands in contrast to the Kyoto protocol, which stipulated short term targets for a select set of countries without enunciating longer term goals for all countries or strategies to achieve them.

In addition to setting GHG reduction goals and seeking to get others to do so, the U.S. is spending about \$3 billion annually on climate change research, development and deployment. A good portion of these monies are dedicated to finding cost-effective means to reduce GHGs, either through energy efficiency or through renewable fuels, and to promoting their use within the private economy.

The strength of the current U.S. approach is that it recognizes that, while curbing GHGs is important, it is only one of many social goals. Growth of GDP is paramount because it provides the wherewithal to achieve all of the goals, including but not limited to GHG reduction. Thus, the focus is on the GHG intensity of output, seeking to curb GHGs while allowing for maximum GDP growth.

The U.S. record in reducing GHG intensity of output compares favorably to that of most other Western nations.²⁴ The absolute level of U.S. GHG intensity of output is approaching that of Germany and Italy, two countries that are considerably more densely populated. Thus, while the policy does not guarantee absolute reductions in U.S. GHGs, it does curb them relative to output, and appears to be doing so at a relatively rapid rate.

One way in which a voluntary goal-based program to curb GHGs could be strengthened would be through appropriations support for the climate-related provisions of EPAct 2005. These provisions encourage public/private partnerships to conduct GHG reducing technology demonstration projects as well as State Department-led efforts to deploy climate change technology in developing countries.

Another way would be through incentives to adopt energy efficient capital stock more rapidly. For example, more rapid depreciation of new, energy efficient manufacturing equipment would induce faster turnover of capital stock in that sector. Similarly, tax incentives to purchase more fuel efficient passenger vehicles would induce more individuals to acquire such vehicles. Generally speaking, the faster the turnover of the U.S. capital stock, the more rapidly the energy intensity and GHG intensity of output will fall.

3. Tax-based approach

Many economists have suggested that a tax on carbon emissions would be an appropriate approach to curbing GHGs. They reason that GHGs impose an external cost, i.e., a cost not borne by the emitter, so that a tax in the amount of the external cost would promote socially desirable behavior.

Such a tax would be imposed on fossil fuels based on their carbon content. The tax presumably would be passed through to energy users, providing incentive to curb the use of fossil fuels. It also would provide incentive to develop and use low-carbon or no-carbon fuels. Just as a C&T system might gradually tighten an annual cap, a tax could be raised by a given percentage from year to year to achieve ever greater reductions.

A carbon tax would extract wealth from the private sector. The wealth could be used to finance reductions in taxes elsewhere, to pay for GHG-reducing research or for other purposes. In a recent paper,²⁵ scholars at the American Enterprise Institute have provided estimates of tax revenues and GHG reductions that could be accomplished with a carbon tax. At \$10/ton of CO₂, for example, sufficient revenues would be obtained to reduce the corporate income tax rate by 20 percent or income or payroll taxes by 6-7 percent. According to the analysis, such a tax rate also would reduce U.S. GHGs by about 7.5 percent.

Could a tax-based approach be applied worldwide? All governments have tax systems in place, though they vary by types of taxes used, rates, etc. A carbon tax would require new regulations as to method of calculation, frequency of remittance, etc. To apply such taxes efficiently, taxes or subsidies already in place that affect carbon use should be counted. This would complicate a carbon tax but can be accomplished. The point is that widespread country application of carbon taxes is feasible.

With a tax approach, governments would have incentive to collect the proceeds. This contrasts with C&T, where buyers have weak incentive to assure the validity of proffered sales, and governments must expend resources to police tradable allowance markets.

The strengths of a carbon tax approach are that it provides appropriate incentives with regard to curbing CO₂ emissions and takes advantage of known, in-place methods of implementation. It also provides revenues which can be used to reduce other, distortionary taxes. From an economic perspective, its properties are much superior to those of C&T.

Conclusions

To date, the U.S. has adopted a voluntary, goal-based approach to reducing GHGs. The goal is to reduce the GHG intensity of output. The advantage of the approach is that it has not constrained the growth of GDP, thus enabling the country to devote resources to a variety of social goals. At least one congressional proposal, that of Senators Bingaman and Specter, would follow this approach in the sense that it would constrain the GHG intensity of U.S. output, not the absolute quantity of GHGs. Most congressional proposals, however, would constrain the absolute quantity.

A Cap & Trade system is by far the most politically popular approach now under discussion. This policy would create a great deal of wealth which would be enthusiastically pursued by private sector entities and the distribution of which would be at the discretion of Congress. This helps to explain why many companies favor such an approach and why many in Congress find it attractive.

From a social perspective, however, C&T is poor policy. Quantitative limits on GHGs will adversely affect GDP because they will compel substitution of higher cost inputs to replace fossil fuels, and because they will generate volatility in the cost of energy. Also, private parties will expend resources in the pursuit of government-created wealth, yielding gains to these private entities but resulting in socially unproductive expenditures. Incentives to create bogus allowances will be strong, and resources will be needed to police allowances on a worldwide basis. Taking all of these costs into account, in the United States alone the social costs of such a system are likely to reach several tens of billions of dollars annually.

The present U.S. approach could be strengthened through implementation of the climate provisions of EAct 2005 and through the use of incentives to adopt more energy efficient capital and to turn over capital more quickly. More rapid depreciation allowances for energy efficient equipment would be one option, tax incentives for the purchase of energy efficient vehicles another. In general, more rapid turnover of the capital stock will result in more rapid reductions in the energy intensity and GHG intensity of output.

If stronger policy measures to reduce U.S. GHGs are considered, a carbon tax set so as to reflect the external cost of CO₂ would be much superior to C&T. Monies obtained could be used to reduce other forms of taxes. If handled in that way, the U.S. tax system could be improved by such a measure.

Congress should rethink its desire to impose a C&T system. The Administration should continue to oppose such a system, and should consider means to strengthen its present approach, specifically through implementation of the climate-related provisions of EAct 2005 and through incentives to adopt more energy efficient capital equipment. If a stronger approach ultimately is desired, a carbon tax should be considered in lieu of a C&T system. By doing so, the wastes associated with C&T can be avoided. That alone would be worth a great deal.

Endnotes

1. Supporters include Environmental Defense, the Natural Resources Defense Council, the Sierra Club, General Electric, Alcoa, BP, Caterpillar, and Duke Energy. Also, the National Commission on Energy Policy, an ad hoc group of prominent former policy makers, supports a GHG Cap & Trade system.
2. These include, among others, Greg Mankiw and Richard Cooper of Harvard, William Nordhaus of Yale, and William Pizer and Ian Parry of Resources for the Future.
3. Many problems have arisen, the main one being the extreme volatility of carbon emission allowances.
4. The *Financial Times* reported in April 2007 that some carbon offsets being offered on international markets are of dubious origin and questionable validity. It editorialized for a carbon tax to replace the European use of C&T. The *Los Angeles Times*, citing the complexities of a C&T system, also has recently editorialized for a carbon tax ("Time to Tax Carbon," May 29, 2007).
5. This is a matter of translating their instantaneous global warming impact plus their longevity in the atmosphere into their global warming potential (GWP), expressed in CO₂ equivalent terms. Some GHGs have large impacts but last fewer years than CO₂, necessitating formulas that take both into account.
6. The demand for products associated with emission of other greenhouse gases also would affect allowance demand.
7. This feature could result in payments from U.S. taxpayers to allowance holders. If allowances were freely distributed, then not only would recipients obtain government-created wealth directly, but some of that wealth would be guaranteed.
8. EIA, Office of Integrated Analysis and Forecasting, "Analysis of S.139, The Climate Stewardship Act of 2003," June 2003. Charles River Associates also analyzed this bill and generated considerably higher costs estimates than EIA's. "The Full Costs of S.139, With and Without its Phase II Requirements," Oct. 2003.
9. Sergey Paltsev, John M. Reilly, Henry D. Jacoby, Angelo C. Gurgel, Gilbert E. Metcalf, Andrei P. Sokolov and Jennifer F. Holak, "Assessment of U.S. Cap-and-Trade Proposals," MIT Joint Program on the Science and Policy of Global Change, Report No. 146, April 2007.
10. Safety valve features are one means to reduce these costs. Banking and borrowing of allowances is another. But such features are included in the SO₂ trading program, yet it has exhibited considerable price volatility.
11. Robert J. Shapiro, "Addressing the Risks of Climate Change: The Environmental Effectiveness and Economic Efficiency of Emissions Caps and Tradable Permits, Compared to Carbon Taxes." February 2007, p. 6.
12. *Ibid.*, p. 5.
13. See James D. Hamilton, "Historical Effects of Oil Shocks," Jan. 2004. The paper is linked to the James D. Hamilton home page: www.econ.ucsd.edu/~jhamilto/

14. According to Hamilton, the Suez Crisis, which raised oil prices only about 10 percent, adversely affected U.S. GDP for six quarters in 1957-58, with quarterly effects ranging from 0.26 percent to 0.76 percent of GDP over that time span. The average effect on GDP over a slightly longer period that includes a recovery quarter was approximately 0.3 percent.
15. 2001, the Congressional Budget Office (CBO) cited a Center for Clean Air Policy estimate that a U.S. C&T system aimed at fossil fuel processors and importers would cover fewer than 2000 entities (“An Evaluation of Cap-and-Trade Programs for Reducing U.S. Carbon Emissions,” June 2001). However, Phase 1 of the European Trading System covered some 12,000 installations, yet covered only about 45 percent of EU emissions of carbon dioxide alone. Phase 2 will be extended to cover more entities and will include all six greenhouse gases, suggesting that greater numbers yet will be involved. The number of entities covered depends on how a C&T system is designed, the further downstream (towards fuel use) the more entities involved.
16. Richard N. Cooper, “Alternatives to Kyoto: the Case for a Carbon Tax,” February 2005.
17. William D. Nordhaus, “Life After Kyoto: Alternative Approaches to Global Warming Policies,” December 2005.
18. Robert J. Shapiro, “Addressing the Risks of Climate Change: The Environmental Effectiveness and Economic Efficiency of Emissions Caps and Tradable Permits, Compared to Carbon Taxes,” February 2007
19. “Beware the carbon offsetting cowboys,” *Financial Times*, April 6, 2007, p. 4.
20. “Industry caught in carbon credit smokescreen,” *Financial Times*, April 6, 2007, p. 1.
21. Congressman John Dingell (D-MI), Chairman of the House Energy and Commerce Committee, recently said that “I realize that just about every economist—including President Bush’s former Chief Economist (Greg Mankiw)—says that a carbon tax would be a better approach. *That’s probably true.* But it’s also true that many members of Congress remember only too clearly the letters B, T and U. So cap-and-trade may be the most realistic way to reduce greenhouse gas emissions.” Speech to the Detroit Economic Club, May 14, 2007, (emphasis added).
22. The National Commission on Energy Policy proposes a \$10/ton price for carbon permits, rising at 5 percent (real) per year. Taking six billion allowances to emit a ton of carbon as a round number, this implies \$60 billion of government-created wealth in the first year, around \$63 billion in the second, etc. But this may be the low end. Before they crashed in early 2006, EU carbon emission permit prices had reached the equivalent of about \$40/ton. At this price, the aggregate annual value of six billion one-ton allowances would be \$240 billion.
23. See for example Ian W.H. Parry and William A. Pizer, “Emission Trading versus CO₂ Taxes,” Resources for the Future Background, May 2007. Parry and Pizer state that carbon taxes have several advantages over C&T systems but that these can be partially captured within the latter through features such as safety valves and banking.
24. See Michael E. Canes, “A Cap and Trade System v. Alternative Policies to Curb U.S. Greenhouse Gases,” George C. Marshall Institute, 2006, p. 12.
25. Kenneth P. Green, Steven F. Hayward & Kevin A. Hassett, “Climate Change: Caps vs. Taxes,” Environmental Policy Outlook, AEI online, June 1, 2007.

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