

Cleaner, Cheaper, Smarter

The Case for Auctioning Pollution Allowances in a Global Warming Cap-and-Trade Program

U.S. PIRG Education Fund

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Executive Summary

Global warming poses a profound threat to America's future. Science suggests that, to avoid the most dangerous impacts of global warming, America and the world must take immediate action to reduce emissions of global warming pollutants. In the United States, that means halting the growth in global warming emissions now, reducing emissions by at least 15 to 20 percent by 2020, and achieving reductions of at least 80 percent by mid-century.

There are many policy tools that can be used at the state, regional and federal level to reduce emissions of global warming pollution. Among the most powerful of those tools are enforceable, science-based caps on global warming pollution. In some cases, emission caps have been paired with a mechanism that allows for the trading of pollution allowances. This combined policy approach is called "cap-and-trade."

Under a cap-and-trade system, policy-makers establish an overall cap on global warming emissions from all or part of the economy. Polluters must hold permits, called "allowances," for every unit of pollution they emit, with the total number of allowances limited by the cap. Polluters are then free to buy, sell or trade allowances as they see fit.

The structure of a cap-and-trade program is critical to its success. One of the most important decisions policy-makers must make when designing a cap-and-trade system is how to distribute allowances. Allowances can be given away for free to polluters or other entities, sold at an auction, or distributed through a combination of the two methods.

Auctioning all allowances under a cap-and-trade program is fair, reduces the societal cost of achieving emission reductions compared to giving allowances to polluters for free, and promotes a transition to a clean energy economy. For those reasons, allowances should be auctioned in any global warming cap-and-trade program.

Auctioning allowances is fair.

- The air is a commonly held resource, to be managed for the benefit of the public. As a result, it is fair to require polluters to pay the public for the use of that resource and to hold them responsible for the costs their pollution imposes on society. Giving away pollution allowances absolves polluters of

that responsibility and even provides some polluters with a new opportunity to profit. Auctioning allowances, on the other hand, ensures that all polluters pay based on the amount of pollution they release.

- Auctioning allowances removes the potential for favoritism and market distortion in the distribution of free allowances.

Auctioning allowances enables emission reductions to be achieved at lower cost to society than if allowances are given away to polluters.

- Studies have estimated that auctioning allowances can reduce the societal cost of achieving a given level of emission reductions through cap-and-trade by as much as half.

- Auctioning allowances prevents polluters from gaining "windfall" profits as a result of cap-and-trade.

    - When allowances—which are items of monetary value—are given to polluters for free, it can allow polluters to benefit financially without having to take any action to reduce their emissions.

    - Europe's emission trading system, which includes free distribution of the vast majority of allowances, has resulted in power plant owners receiving billions of dollars in windfall profits from the pollution program. In the United Kingdom alone, windfall profits from emission trading have been estimated at nearly $2 billion. These profits come directly from the pocketbooks of consumers.

Auctioning allowances encourages a transition to clean energy sources.

- Giving allowances away to polluters for free based on their historic emissions (often called "grandfathering") rewards owners of highly polluting facilities and discourages innovation. Auctioning allowances treats all emitters—dirty and clean facilities, and existing and new facilities—equally, placing them on a level playing field and sending economic signals that encourage cleaner sources of energy.

- Auctioning allowances can also generate revenue to support clean energy technologies. Studies suggest that combining a cap-and-trade program with aggressive efforts to develop clean energy technologies can allow for greater emission reductions to be achieved at lower cost.

Auctioning allowances provides important public benefits.

- Auctioning allowances will create millions or billions of dollars a year in revenue (depending on the size and scope of the cap-and-trade program) that can be used for a variety of public purposes. Among those purposes are:

    - Investments in energy efficiency, which can reduce the total cost of achieving emission reductions. An analysis of an upcoming regional cap-and-trade program in the Northeast showed that increasing energy efficiency while imposing a carbon cap can actually lead to lower energy bills for consumers.

    - Investments in clean energy research and development, as well as the deployment of renewable energy technologies. Research and development and early market support are necessary to ensure that renewable energy can play an important role in achieving the

large reductions in global warming pollution that will be needed in the coming decades to prevent dangerous global warming.

- Reducing the cost of the program to consumers by returning a portion of auction revenues in the form of an annual rebate.

Policy-makers, environmentalists, businesses and consumer advocates are increasingly supporting auctions as a fairer and less expensive way to reduce global warming emissions under cap-and-trade.

- In the Northeast, where 10 states have agreed to reduce global warming pollution from power plants through the Regional Greenhouse Gas Initiative, all of the states have committed to auctioning a significant share of allowances. At least four states have committed to auctioning 100 percent of pollution allowances, while the others are still deciding on their approach.

- The federal Safe Climate Act, introduced by Rep. Henry Waxman (CA) and now cosponsored by more than 135 Representatives, calls for the use of auctions as the primary way to distribute allowances.

- The U.S. Climate Action Partnership—a coalition of major U.S.-based businesses and several environmental organizations—supports free distribution of a "significant share" of allowances initially, but states that "free allocations to the private sector should be phased out over a reasonable period of time."

- The National Commission on Energy Policy, which originally advocated giving away nearly all allowances to polluters for free, recently urged that no more than 50 percent of allowances be allocated for free at the outset of the program, with free allocations to be gradually replaced by auctions.

Any global warming cap-and-trade program should include auctioning 100 percent of emission allowances, with the revenue from those auctions used to encourage a transition to a clean energy economy and to compensate consumers for the cost of the program.

Introduction

At long last, America appears to be getting serious about global warming.

In 2005, seven northeastern states (since expanded to 10) agreed to implement what will become the nation's first binding limits on emissions of carbon dioxide—the leading global warming pollutant—from power plants. In 2006, California adopted the nation's first cap on global warming emissions to cover a state's entire economy. Now, at the federal level, the 110th Congress is considering a wide variety of proposals to address global warming.

Serious action on climate change is long overdue. But developing an effective program to reduce global warming pollution is a difficult challenge, fraught with the potential for conflict. Billions of dollars—as well as the future of the planet—are at stake.

As individual states and the federal government begin to hammer out the details of their global warming emission-reduction strategies, it is worth keeping a few common-sense principles in mind. Any program to regulate global warming emissions should:

- Achieve real, verifiable reductions of the magnitude necessary to meaningfully address the problem.
- Be equitable.
- Be simple.
- Achieve emission reductions at the least possible long-term cost.

These principles are critically important when evaluating the details of proposed "cap-and-trade" systems for reducing global warming pollution. Cap-and-trade is among many potential tools available to governments to reduce global warming emissions. (Other tools include regulatory measures—such as mandatory energy efficiency standards for vehicles and appliances—public infrastructure investments, and taxation.)

Under cap-and-trade, a hard "cap" is established for global warming emissions from all or part of the economy. Polluters must own permits, called "allowances," for every unit of global warming pollu-

tion they emit, with the total number of allowances limited by the cap. Polluters may then buy, sell or trade allowances on the open market.

The structure of a cap-and-trade program, however, is critical to its success. One critical choice designers of cap-and-trade systems must make is how to distribute pollution allowances. While there are many subtleties involved, the central question boils down to this: should polluters be required to pay for their allowances, with the price of those allowances set through an auction, or should they receive some or all of those allowances for free?

Auctioning emission allowances to polluters is a fairer and more efficient way to distribute global warming allowances than giving them away for free. In addition, auctioning allowances creates a source of revenue that can be used for public purposes—to invest in the transition to a clean energy economy and/or to defray the cost of the program to consumers.

Several northeastern states participating in the Regional Greenhouse Gas Initiative (RGGI)—including New York, Massachusetts, Maine and Vermont—have already committed to auctioning 100 percent of their allowances. Meanwhile, decision-makers in the European Union are increasingly seeing the value of auctions as they witness billions of dollars of windfall profits flowing to the owners of electric power plants as a result of member nations' flawed allowance allocation schemes. Decision-makers in the states and at the federal level should ensure that all allowances are auctioned in any cap-and-trade program for global warming pollutants.

Principles of Cap-and-Trade

Cap-and-trade is the combination of two policy approaches to reducing pollution. Capping, or setting enforceable limits, on pollution is a bedrock of U.S. environmental policy. For example, the Clean Water Act requires setting a cap on the total amount of pollution allowed to flow into waterways that do not meet water quality standards, with the cap then divided up among the various polluters of a waterway.

Emission trading is a newer innovation, depending upon market forces to provide financial incentives that will drive pollution reductions.

It is possible to cap emissions without allowing trading, or to trade emissions without capping them. (An example of the latter is the emergence of voluntary markets in carbon dioxide "offsets" over the past several years.)

Cap-and-trade has the potential to be an efficient and effective way to reduce global warming pollution—at least for certain sectors of the economy. By combining the certainty of an emission cap with the flexibility allowed by emission trading, cap-and-trade can lead to large emission reductions at relatively low cost to society.

The structure of a cap-and-trade program, however, is critical to its success. In designing cap-and-trade systems, policymakers must make many critical decisions that can affect the programs' effectiveness at delivering pollution reductions and influence the costs and benefits of the program to various elements of society.

Moreover, cap-and-trade is not a "one-size-fits-all" solution to environmental problems. It is just one of many public policy tools the United States could use in order to reduce global warming pollution.

How Cap-and-Trade Works

In a cap-and-trade system, government first establishes an overall limit on pollutant emissions within an economic sector (the cap). This total amount of pollution is then converted into allowances to emit a given quantity of the pollutant, which are either distributed or auctioned to regulated facilities.

Facilities must surrender an allowance for each unit of pollutant they emit. The

"When people do not pay for the consequences of their actions we have market failure. [Climate change] is the greatest market failure the world has ever seen."

— Former World Bank Chief Economist Sir Nicholas Stern

price of the allowances is determined by the market and is driven by the cost of reducing emissions to the level called for by the cap. The more stringent the cap, the more expensive allowances are likely to be. Individual firms decide whether it is more economic to reduce emissions or to accept the cost of owning allowances.

The Role of Cap-and-Trade

Cap-and-trade can play an important role in efforts to reduce emissions of global warming pollutants. The primary role of cap-and-trade is to set an enforceable limit on emissions from part or all of the economy, thus guaranteeing that emission reductions actually occur. Cap-and-trade also plays a pivotal role by putting a price on pollution—thus harnessing the power of market forces to drive reductions in pollution.

Global warming pollution imposes huge costs on society—costs that are not currently paid by polluters. Conventional economic wisdom suggests that the price of a good or service should reflect its full marginal cost including *externalities*, those costs borne by society but not reflected in the price of a particular product or good. The existence of externalities causes what economists call a "market failure," leading society to make the wrong choices about what kinds of investments to make in its future.

Sir Nicholas Stern, former Chief Economist of the World Bank, who recently led a British government review of the economic impact of climate change, described the situation as follows:

> The science tells us that greenhouse gas emissions are an externality; in other words, our emissions affect the lives of others. When people do not pay for the consequences of their actions we have market failure. This [climate change] is the greatest market failure the world has ever seen.[1]

Policies that internalize the external costs of pollution are—along with measures to improve energy efficiency and spur the use of clean energy technologies—cornerstones of any effective program to reduce global warming emissions. There are a variety of ways to assign costs to polluting activities in an attempt to account for externalities. The government could slap a tax on pollution or fossil fuel use (a "carbon tax"), provide subsidies for cleaner fuels or technologies (thus evening the playing field between dirty and clean technologies), or both. Cap-and-trade has the potential to be a more flexible solution since the price of pollution is not determined arbitrarily, but is set by the market in response to the relative ease or difficulty of meeting the overall emission-reduction goal.

However, cap-and-trade is not a "silver bullet" solution to environmental problems. Cap-and-trade programs are wholly

inappropriate for dealing with certain types of environmental problems—particularly those in which emissions have a disproportionate local impact. In such a situation, the ability to trade allowances could lead to the creation of localized pollution "hot spots." Carbon dioxide, on the other hand, appears to be well-suited for control through cap-and-trade since it is a global, rather than a local, pollutant.

Even with regard to carbon dioxide emissions and emissions of other global warming pollutants, however, cap-and-trade is only one among many policies that will be needed to reduce global warming pollution in the most efficient, inexpensive and fair way possible.

The theory behind cap-and-trade is that, by placing a price on pollution, market forces will send signals encouraging producers and consumers to take rational actions to minimize their costs. However, markets don't always act rationally—as illustrated by the current underinvestment in energy efficiency, vast quantities of which are available at relatively low cost.[2] Energy markets are littered with market barriers that prevent individuals from acting in ways that maximize economic benefits to themselves and society.[3] The addition of cap-and-trade will not make those barriers disappear overnight.

As a result, to truly minimize the cost of reducing global warming emissions, cap-and-trade should be paired with complementary policies designed to eliminate or reduce barriers to the spread of clean energy technologies and practices. Such policies should include minimum energy efficiency standards for vehicles, buildings and equipment; the elimination of bureaucratic barriers to the deployment of energy efficient and renewable energy technologies; targeted incentives and portfolio standards to spur the market for emerging technologies; and enhanced investment in research and development of the next wave of clean energy technologies.

Key Issues in the Design of Cap-and-Trade Programs

A cap-and-trade program is only as effective as its design. Decision-makers must deal with many thorny issues in the design of any cap-and-trade program.

The most important decisions revolve around the strength and integrity of the cap. A cap on global warming emissions must be set at levels that are consistent with the prevention of dangerous, human-caused global warming. The European Union and others have adopted a 2° Celsius (3.6° Fahrenheit) rise in global average temperatures above pre-industrial levels as a rough threshold beyond which "dangerous" impacts from global warming would become inevitable.[4] To have a reasonable chance of preventing a 2° Celsius increase in temperatures, the world will have to stabilize concentrations of global warming pollutants in the atmosphere at approximately 450 parts per billion (carbon dioxide equivalent).[5] And to achieve that target, the world will need to reduce global warming emissions by 50 to 85 percent below 2000 levels by mid-century.[6]

In the United States, on an economy-wide basis, that means halting the growth in global warming emissions more or less immediately, reducing emissions by at least 15 to 20 percent below today's levels by 2020, and achieving reductions of at least 80 percent by 2050. Different states and sectors of the economy might set caps at differing levels of reductions, but they must be consistent with these overall targets.

The integrity of the cap is also critically important. Cap-and-trade systems can include a variety of so-called "flexibility mechanisms"—such as offsets, safety valves and circuit breakers—that either ease the cap under certain conditions or allow emission reductions achieved outside the boundaries of the cap-and-trade system to be substituted for emission reductions achieved at regulated facilities. Designers

Electric Power Sector Note: Generator-Based versus Load-Based Cap-and-Trade

Electric power plants produce one third of America's global warming pollution.[8] Therefore, reducing carbon dioxide emissions from electric power plants is a critical part of America's effort to reduce its impact on the global climate.

However, the electric power sector is complex. The industry is subject to rate regulation in some states, but not others. In some states, the same utilities own power plants and transmission wires and also deliver electricity to consumers. In other states, these functions are carried out by different companies. In addition, electric power grids often transcend state boundaries.

As a result, the electric sector poses some special issues in the design of cap-and-trade programs, particularly those that are implemented at the state or regional level. Among those issues is the question of whether allowances should be held by the entities that generate electricity or those who sell it to consumers.

In a generator-based system, power plant owners must hold allowances for the emissions they produce. By contrast, in load-based system, utilities must hold allowances based on the electricity they sell to consumers, regardless of whether they generate the electricity themselves or purchase it from another entity.

The main advantage of a load-based system at the state or regional level is that "leakage" of emission reductions is less likely to occur. In any cap-and-trade system, there is the potential for emission reductions achieved inside the area covered by the system to be offset by increases in emissions elsewhere. (For example, leakage occurs if a polluting factory moves from the area covered by an emissions cap to an area with no limits on global warming pollution.) This phenomenon is called "leakage" and it is a particularly big problem for state and regional caps on power plant pollution. Since regional electricity grids cross state lines, it is possible for polluting power plants to open up (or increase production) across state lines and sell power back into the area with the emissions cap.

Under a load-based system, allowances would have to be held for each unit of electricity sold, *regardless of where that electricity is produced*.[9] Thus, there is less potential for power producers to evade the cap-and-trade system by selling high-carbon power produced in neighboring states into the area covered by the emissions cap.[10]

Under either system, auctioning is the preferred method for distributing allowances. Since there is little trade in electricity across national borders (and, therefore, little prospect of leakage), there is less difference between a generator-based and load-based system at the national level. But states or regions considering power sector carbon caps should strongly consider the benefits of a load-based system when designing their cap-and-trade programs.

of cap-and-trade programs should insist that flexibility mechanisms do not allow overall emissions to increase above levels established by the cap, and that any emission reductions achieved through offsets are of integrity equal to or greater than those achieved by regulated facilities.[7] Similarly, cap-and-trade programs should include provisions to minimize "leakage" of emission reductions outside the boundaries of the cap.

A third set of decisions relate to which entities in the supply chain for fossil fuels must hold carbon allowances. Any entity in the supply chain—including companies involved in extraction, processing (e.g., refining), or delivery of fossil fuels, as well as end-use consumers—can theoretically be held accountable for the global warming emissions produced by the fuel. Systems in which an entity closer to the point of extraction is required to hold allowances are called "upstream" systems. Systems in which consumers or entities closer to the consumer end of the supply chain are required to hold allowances are called "downstream" systems. (For more on the point of regulation in electric sector cap-and-trade programs, see "Electric Power Sector Note: Generator-Based versus Load-Based Cap-and Trade," page 13.)

Finally, designers of cap-and-trade programs must decide how and to whom pollution allowances are distributed. In this paper, we focus on this very important issue. However, it is just one of many important issues that are vital to the integrity and success of cap-and-trade programs.

Options for Distributing Pollution Allowances

There are many ways to distribute pollution allowances under a cap-and-trade program, but they all boil down to three fundamental options: give allowances away to polluters for free, sell them, or employ a combination of the two approaches.

The important point to remember about these options is that pollution allowances are items of monetary value. They can be bought, sold or traded on open markets at whatever prices the market will support. As a result, the question of how to distribute allowances is essentially a question of how to distribute money.

Free Distribution to Polluters

In a free distribution scheme, allowances are given away to polluters and other entities according to a formula decided by policy-makers. There are several possible ways to determine how pollution allowances are allocated:

- **Emissions-based:** Under this system, allowances are granted to polluters for free based on the amount of pollution they released historically. This system is also known as "grandfathering."

- **Input or output-based:** An input or output-based system determines the amount of allowances to be allocated based on the amount of energy used or quantity of product produced. Electric power plants provide the clearest example of how this works in practice. An input-based system might allocate allowances based on the heat value of the fuels used to generate electricity at a plant. An output-based system would allocate allowances based on the amount of power produced. Low-emitting and non-emitting power plants would receive more allowances under these mechanisms because they produce less pollution per unit of energy consumed or produced. Conversely, high-emitting sources would receive fewer allowances.

At least two other important issues arise in the development of a free distribution

scheme. The first is the question of where the "baseline" for calculating the number of allowances will be set. The baseline can be based on average emissions or energy consumption/production for a series of recent years. Or it can be set based on projected emissions or energy data for a future year, based on "business-as-usual" assumptions.

The setting of baselines is inherently subjective and can be easily "gamed" to provide unjustified amounts of allowances to some polluters.

Second, designers of a free distribution scheme must decide whether to alter the underlying assumptions for allowance distribution in order to give additional allowances to support a preferred technology or social aim. These allocations are called *set asides*. For example, designers of a cap-and-trade program based on historical emissions might distribute a certain number of allowances to owners of nuclear power plants, renewable energy facilities, or particular segments of consumers. These non-carbon emitting entities would then be able to sell off their allowances to emitters and pocket the revenues. Designers of a program might also create set asides so that a pool of free allowances remains available to be distributed to new emitters.

It is possible to combine free distribution with an auction program. For example, policy-makers could opt to sell half of the allowances and give the other half away for free. It is also possible for policy-makers to change the proportion of allowances given away for free over time. Policy-makers might decide, for example, that it is justified to give away some allowances in the near term to ease the transition to cap-and-trade, but to phase out free allocations over time once polluters have had time to adjust their practices.

Auctioning Allowances

The alternative to giving allowances away to polluters for free is to auction allowances. In an auction-based system, market forces—rather than policy-makers—determine who receives allowances.

Under an auction system, a government entity would hold a periodic auction to sell pollution allowances. Would-be emitters (or possibly other entities) would then bid for the initial allotment of allowances, with the final settlement price set by the auction. Those who buy too few or too many allowances could then buy, sell or trade in a secondary market, just as they could in a free distribution scheme.

The main questions facing policy-makers in an auction-based system are how to design a fair and transparent auction system and how to spend the proceeds from the auction. An auction-based system would represent a significant transfer of money from emitters to the government entity running the auction. Those proceeds could be redistributed in a number of ways through rebates to consumers, offsets of taxes, targeted government spending on energy efficiency and low-carbon energy technologies, or other initiatives.

Auctioning allowances is a fairer, less costly, and more effective way to distribute allowances than free allocation to polluters. The next section describes the many advantages of auctioning allowances.

How Allowances Are Distributed in Existing Cap-and-Trade Programs

There are several existing cap-and-trade programs for various pollutants in the United States and abroad. None of these programs currently uses a broad-based allowance auction like the one described in this report. However, significant problems in some programs (specifically the European Union's Emission Trading Scheme) have created new momentum behind auctions.

- **U.S. Acid Rain Program** – The first major cap-and-trade effort in the United States, launched by the 1990 Clean Air Act amendments, the Acid Rain Program primarily seeks to reduce emissions of sulfur dioxide. The vast majority of allowances are allocated to power plants for free on an input basis. A small percentage of allowances (about 2.8 percent of the total) are auctioned off annually.[11] The U.S. Environmental Protection Agency (EPA) also issues some "bonus" allowances that are used to reward energy efficiency or renewable energy investments made prior to the start of the cap-and-trade program.[12]
- **U.S. Nitrogen Oxide (NOx) Budget Program** – The NOx Budget Program is an outgrowth of a regional nitrogen oxide trading program that began in the eastern United States in 1999. In 2003, the program was expanded to include sources of NOx in 20 states.[13] The program includes fossil fuel-fired electric power plants and large industrial boilers. The EPA has established emission budgets for each state, which are then converted to allowances. States may then allocate allowances as they see fit; to date, states have opted to distribute allowances for free.[14]
- **European Emission Trading Scheme (ETS)** – The European Union's ETS is designed to help European countries meet their obligations to reduce carbon dioxide emissions under the Kyoto Protocol. Under the system, each member country sets a total carbon dioxide budget for its power plants and large emitters, and distributes allowances to those facilities based on a National Allocation Plan that must be approved by the European Commission.[15] Member countries were prohibited from auctioning more than 5 percent of their emission allowances in the first trading period (2005-2007) and are barred from auctioning more than 10 percent of their emission allowances in the second trading period (2008-2012).[16] The ETS has experienced serious problems with over-allocation of allowances (which has caused allowance prices to plummet) and with power plant owners gaining windfall profits through the allowance allocation scheme. (See "Windfall Profits in the European Union Emission Trading Scheme," page 22.)
- **Regional Greenhouse Gas Initiative (RGGI)** – RGGI is a power-sector carbon dioxide cap-and-trade program that is scheduled to begin in the northeastern United States in 2009. States joining the program agree to an emission budget for their state, and may distribute pollution allowances as they please, provided that at least 25 percent of the allowances are auctioned for a "consumer benefit or strategic energy purpose."[17] Several states, including New York, Massachusetts, Maine and Vermont, have committed to auctioning 100 percent of their allowances, and others appear likely to do so as well.

The Case for Auctioning Pollution Allowances Under Cap-and-Trade

There are many reasons why the auctioning of pollution allowances under a global warming cap-and-trade program is superior to giving allowances away to polluters for free. Auctioning allowances is fair, cost-effective and capable of generating revenues that can be used to reduce the cost of complying with the program and/or to offset the costs of the program to consumers.

Auctioning Allowances Is Fair

The Air Is a Public Resource

No one owns the sky. Or rather, we all own the sky as a public resource—one that should be managed for the benefit of the public.

If the air is a public resource, then the public has the right to determine how and under what conditions it can be used. No one has a "right" to pollute the air. U.S. environmental law is clear on the principle that government-issued permits or allowances to pollute do not convey property rights. The Clean Air Act, for example, in describing the sulfur dioxide trading program, makes the following stipulation:

> An allowance allocated under this title is a limited authorization to emit sulfur dioxide in accordance with the provisions of this title. Such allowance does not constitute a property right.[18]

The public has many options for how to manage common resources. It can allow them to be used by private individuals under certain conditions (for example, under pollution permits issued by government entities or through public-interest licensing of broadcasters). Or it can lease or rent those resources, as is the case with fossil fuel extraction leases on government lands or the auctioning of pollution allowances. It can even opt to sell the resource permanently (though this is easier to conceive of with a tangible resource such as publicly owned land or water rights than with air.)

In other words, the public has a right to demand that polluters pay for their use of

common resources. The case for doing so with global warming pollution is based on the "polluter pays" principle.

The "Polluter Pays" Principle

The "polluter pays" principle holds that polluters, rather than the public, should pay the costs imposed by their pollution on society.

The polluter pays principle has both economic and ethical justifications. The economic justification is that making polluters pay internalizes the costs imposed by pollution on society, thus sending economic signals to producers and consumers that discourage pollution.

All cap-and-trade programs—regardless of how allowances are distributed—internalize at least some of the cost of pollution. But the polluter pays principle also has an ethical justification: it is simply fair to require those who benefit from polluting activity to pay the costs that result from that behavior.

Giving allowances to polluters for free, particularly if done on the basis of historical emissions, violates the polluter pays principle. In the worst case scenario, polluters receive higher prices for their goods and services than prior to cap-and-trade but are required to spend little or nothing on allowances or on efforts to reduce pollution—thereby generating "windfall" profits. (See "Auctioning Allowances Is Less Costly to Society," page 19.)

Auctioning allowances ensures that all polluters pay for the right to emit global warming pollutants. Bigger polluters pay more, smaller polluters pay less. The cost of those allowances is also passed down, to some extent, in the price of goods and services, encouraging consumers to make more climate-friendly choices. Auctioning allowances is therefore consistent with the polluter pays principle and ensures that the costs of reducing global warming emissions are spread fairly through the economy and society.

Market Forces Decide How Allowances Are Distributed

Those who advocate for market-based approaches to environmental problems frequently do so on the grounds that the market will do a better job of achieving environmental results at lower cost than government "command-and-control" policies. In reality, the choice between market-based policies and regulatory requirements is not an either/or decision—both will be needed if the United States is to achieve significant global warming emission reductions.

Free distribution of allowances, however, erodes the market-based nature of a cap-and-trade system by putting government in the position of picking winners and losers in any distribution scheme. Recall that allowances are items of monetary value—they can be bought, sold or traded. Under any free distribution scheme, the government would be responsible for distributing millions—if not billions—of dollars worth of pollution allowances.

Any free distribution scheme creates winners and losers. Giving out allowances based on historical emissions rewards those entities that emitted the most pollution in the past. Basing the distribution on power output rewards those entities that produce the most electricity while producing the least pollution. Creating "set asides" for preferred technologies gives those technologies a leg up on their competitors in the marketplace.

By contrast, a well-designed auction system would distribute allowances based on the willingness of polluters to pay for them. The government's role would be limited to setting up a transparent and fair mechanism for conducting the auction. There would still be winners and losers, but they would not be selected by the government.

In an auction system, government would have a different responsibility—distributing the revenue from the allowance auction. Inevitably, government would face

a host of interests competing for a slice of the revenue pie. But, as opposed to the free allocation system, in which government divides costs and benefits among a relatively small set of private actors (i.e., those that emit carbon dioxide or those deemed worthy of receiving a set-aside), auction revenues could legitimately be used for a wide variety of public purposes. (See "Auctioning Allowances Benefits the Public," page 26.)

Auctioning Allowances Is Less Costly to Society

Economic research shows that auctioning allowances (along with "recycling" some or all of the revenue from the auction back to the public) is a less expensive way to achieve emission reductions through cap-and-trade than a free distribution system.

For example:

- A study by Resources for the Future estimated that an auction and revenue recycling approach was roughly half as expensive to society as an allocation system based on "grandfathering" of existing emitters. Total savings under the auction approach increase as emission-reduction targets become more stringent.[19]

- These results are supported by evidence from other economic modeling efforts suggesting that allowance auctions, combined with recycling of auction revenues, can allow for emission reductions at lower overall cost and possibly promote more innovation and better investments in technology.[20]

The conclusion that auctioning allowances is less costly to society than giving them away seems to defy common sense. After all, consumers will mainly see the impact of a cap-and-trade system in higher prices for energy and some products. If polluters are given allowances for free, one might think that they would not need to pass the cost of compliance down to consumers, thus saving consumers money.

However, economic research and practical experience show that giving away allowances to polluters represents the worst of both worlds. Consumers pay more for energy or products as the cost of those products comes to reflect the cost of global warming pollution—just as they would under a system in which allowances are auctioned. But instead of government gaining revenues from allowance auctions, which could then be used in a variety of ways to reduce the cost of the program, polluters could benefit by receiving unjustified "windfall" profits—even if they take no action at all to reduce their global warming emissions.

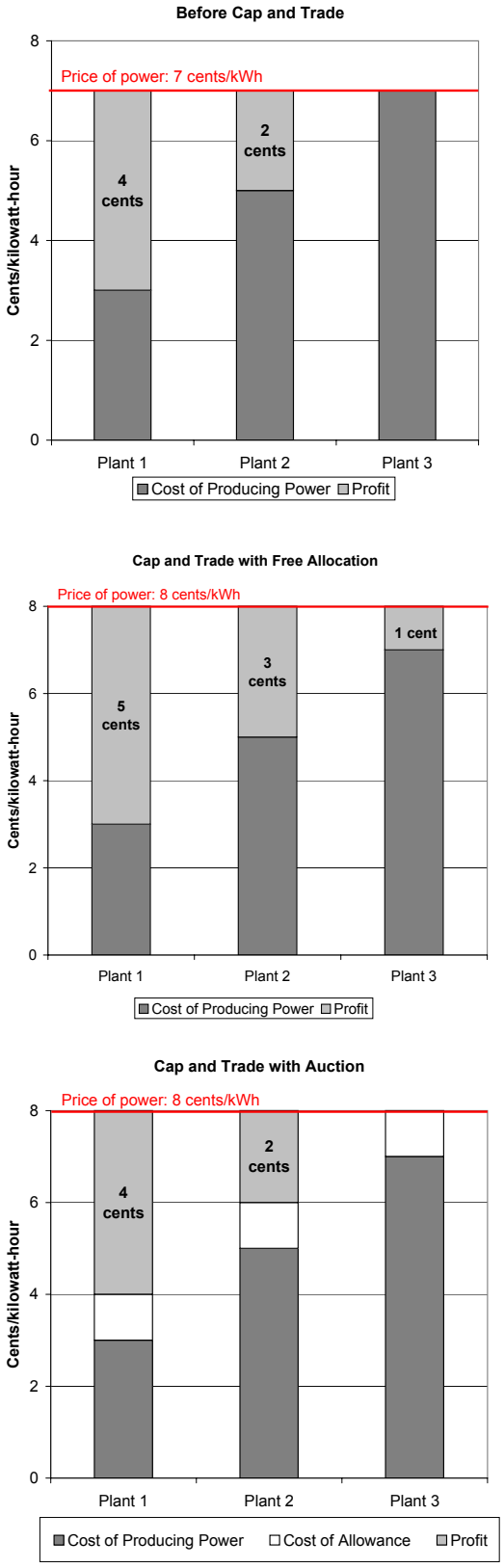
How can this be? Consider the following illustration of the electricity industry:

In competitive markets for electricity, the price of electricity is set by the "marginal cost" of producing the last unit of power to meet demand. In other words, if a utility needs to buy 10 megawatts of power at a particular moment to satisfy demand, the cost of producing the 10th megawatt of power becomes the price received by all the generators supplying energy to the system—regardless of how much it costs them to actually produce the electricity.

For example, let's assume that there is a power market with four power plants—Plant 1 produces power at 3 cents per kilowatt-hour (kWh), Plant 2 produces power at 5 cents/kWh, Plant 3 produces power at 7 cents/kWh, and Plant 4 produces power at 8 cents/kWh. Let's also assume that there is enough demand for electricity to consume the output of three of the four power plants.

Before cap-and-trade, the first three plants would all sell electricity into the grid at 7 cents/kilowatt-hour—the marginal

Figure 1. Windfall Profits Under Cap-and-Trade: An Illustration



cost of Plant 3, which is the last power plant needed to meet demand. Plant 1 and Plant 2 would make profits of 4 cents and 2 cents, respectively.

Now, let's assume that we impose a cap-and-trade system in which all four power plants must hold allowances worth 1 cent/kWh in order to operate. Let's also assume that those allowances are distributed to the power plants for free.

Plant 3, our marginal plant, now faces a different choice than it did before. If the plant chooses not to supply power to the market, it will save 8 cents/kWh—the 7 cents/kWh it costs to generate the power and the 1 cent value of the emission allowance, which it will not need to use and could therefore sell on the open market. As a result, it would make no sense for Plant 3 to sell its power into the market for anything less than 8 cents/kWh. Assuming that Plant 4 must also hold an allowance to pollute, Plant 3 will remain the marginal plant, only now the price of electricity will increase from 7 cents/kWh to 8 cents/kWh.

The choices made by Plant 3 have ripple effects on Plants 1 and 2. Both plants now receive the higher price of power—8 cents/kWh—even though their actual cost of producing power remains the same as before. As a result, all three plants receive an extra penny per kWh in profit than they had received prior to cap-and-trade. These are "windfall profits"—they do not result from any action undertaken by the plants, much less efforts to reduce their emissions.

Auctioning allowances eliminates unjustified windfall profits. Under an auction, all three plants must pay 1 cent/kWh for their allowances. The price of power still goes up to 8 cents/kWh, but all three plants receive the same amount of profit as they had prior to cap-and-trade. Moreover, the entire value of the allowances auctioned to the three plants goes into the public treasury, where it can be used in a variety

of ways to reduce the cost of the program to consumers.

The illustration above is an over-simplification of competitive power markets, but windfall profits are a real and significant concern. In the United Kingdom, for example, power producers have netted an estimated £1 billion (about $1.9 billion) in windfall profits through participation in the European Union's Emission Trading Scheme.[21] These windfall profits not only take money out of the pockets of ordinary homeowners, but they also hit large power consumers, such as industries and owners of commercial buildings, very hard.

Not every industry has the same potential to extract windfall profits from free allowance distribution as the competitive electric industry. Even within the electric industry, states that retain traditional cost-based regulation could experience fewer windfall profits, depending on the degree to which power is generated by regulated utilities or purchased on the competitive wholesale market. (See "Electric Power Sector Note: Cost-Based Utility Regulation," below.)

In any case, auctioning 100 percent of emission allowances prevents polluters from receiving unjustified windfall profits, thus reducing the societal cost of achieving a given level of emission reductions.

Electric Power Sector Note: Cost-Based Utility Regulation

The example in this section describes how windfall profits are obtained in a competitive electricity market. However, not all electricity markets are competitive. In most of the United States, state regulators continue to set electricity rates based on utilities' cost of producing power (although, even in those states, utilities may purchase some of their power from competitive wholesale markets).

Cost-based regulation reduces the potential for windfall profits under cap-and-trade. If allowances are given away for free, the cost of generating electricity will remain the same and rates (at least theoretically) will remain the same.[22] If utilities are required to buy allowances in an auction, the cost of those purchases would be rolled into the cost of producing electricity and passed on, dollar for dollar, to consumers.

Nonetheless, auctioning of allowances remains important. Regulated utilities are frequently called upon to justify their decisions against the yardstick of providing power at the least cost to consumers. Requiring utilities to pay for allowances will ensure that those costs are considered when they plan for future capacity additions, helping to shape the types of power plants that are built and future investments in energy efficiency improvements.

Windfall Profits in the European Union Emission Trading Scheme

The European Union's Emission Trading Scheme (ETS) is the first significant effort to use cap-and-trade to reduce global warming pollution. As such, the system, which began operation in 2005, has many lessons in store for others who are considering similar programs.

One lesson is that giving allowances away to polluters for free can lead to significant windfall profits for utilities and other firms. Prior to implementation of ETS, researchers with the investment bank, UBS, warned that the program would result in a windfall of €27.6 billion (approximately $36 billion at today's exchange rates) to a select set of companies, prompting the authors of the report to ask, "Whatever happened to the principle of 'polluter pays'?"[23]

Those predictions of large windfall profits have come true. As noted above, estimates of windfall profits for power generators in the United Kingdom top $1.9 billion.[24] Similar windfall profit gains are likely to have occurred in other European countries as well.[25] WWF, for example, estimates that the largest German utilities will accrue windfall profits of between €31 billion and €64 billion ($41 billion to $84 billion) by the time the second phase of the emission trading program is complete in 2012.[26]

A second lesson, unrelated to how emission allowances are distributed, is that the over-allocation of emission allowances can erode the environmental and market integrity of a cap-and-trade program. Because member states controlled the number of allowances that were allocated under the system, some countries adopted tougher targets and others weaker ones. As a result, emission reductions under the program are well short of those needed to meet the European Union's goals under the Kyoto Protocol.[27]

Auctioning Allowances Promotes Clean Technologies

Achieving significant reductions in global warming emissions will require a shift from old, dirty technologies to new, clean ones. Any cap-and-trade system that seeks to reduce global warming emissions at the lowest possible long-term cost must encourage that transition. Auctioning allowances supports the goals of a clean energy transition in two key ways: by ensuring that dirty and clean technologies occupy a level playing field and by generating auction revenue that can be used to promote clean technologies.

Auctioning Allowances Puts Clean Technologies on a Level Playing Field

At the very least, any cap-and-trade system should put all technologies—old and new,

dirty and clean—on a level playing field, where they can compete in the marketplace on the basis of costs that reflect the very real social costs of global warming pollution. The free distribution of allowances to polluters on the basis of historic emissions ("grandfathering") can tip the playing field to benefit highly polluting technologies such as old coal-fired power plants by insulating them from the cost of their polluting behavior (and, in some cases, creating the opportunity for plant owners to receive windfall profits). These are precisely the technologies we need to replace in order to stave off dangerous global warming.

A good example of the perverse incentives that result from "grandfathering" polluters under environmental regulation is the federal Clean Air Act. In negotiations over the Clean Air Act, Congress decided to exempt aging power plants from the requirement that they immediately install modern pollution control equipment on the assumption that many of those older plants would soon be retired anyway. Instead, weak emission rules (coupled with lax enforcement of those rules) gave those older plants a competitive advantage against newer, cleaner facilities, ensuring that they would remain in operation for a long time to come. Today, these old plants are responsible for the lion's share of smog and soot pollution from power plants.[28]

Auctioning allowances puts all emitters—dirty and clean sources, old and new facilities—on the same playing field. The largest polluters pay the highest cost for their emissions, while newer market entrants are not forced to subsidize existing facilities. As a result, auctions are consistent with the goal of encouraging a transition to cleaner, low-carbon technologies.

"Whatever happened to the principle of 'polluter pays'?"

— The investment bank, UBS, on the European Emission Trading Scheme

The "Coal Rush" and Grandfathering of Power Plants

As of June 2006, 150 new coal-fired power plants were proposed for construction in the United States. If all of those plants are built, U.S. carbon dioxide emissions would increase by 10 percent—making it much more difficult and costly to achieve the emission reductions needed to prevent dangerous, human-caused global warming.[30]

Why is the "coal rush" happening now? While there are many reasons (including increased natural gas prices and surging demand for electricity), the coal rush may be motivated in part by a desire to ensure that any new plants are grandfathered under future limits on global warming pollution.

As long as there is ambiguity about how allowances will be distributed to plants currently under construction, the incentive to sneak construction of new coal-fired power plants "under the wire" will persist. Policy-makers at all levels must *immediately* make clear that new coal-fired power plants will not be grandfathered under any allowance allocation scheme.

"The percentage of all U.S. R&D invested in the energy sector has declined from 10 percent in the 1980s to 2 percent today."[33]

Economic research conducted by Resources for the Future illustrates how auctioning allowances boosts the value of clean technologies. Auctioning allowances, according to the study, increases the asset value of existing—and especially new—non-emitting sources of energy like renewable power. At the same time, auctions reduce the value of existing coal-fired power plants. On the other hand, free distribution of allowances based on grandfathering actually *boosts* the value of existing coal-fired power plants, while reducing the value of all new fossil fuel-fired plants.[29]

In other words, auctioning allowances encourages a shift to cleaner technologies—technologies that will be needed if we are to reach the more aggressive emission-reduction targets required in future years. By contrast, grandfathering existing polluters can actually encourage the continued use of outdated, polluting technology, making it harder and more expensive to achieve greater emission reductions in the future.

Auctioning Allowances Can Provide Funding to Develop Clean Energy Technologies

Cap-and-trade with allowance auctions can encourage a shift to cleaner technologies by placing all technologies on a level economic playing field. But it makes economic and environmental sense to go even farther to promote clean energy technologies. By investing now in the development of the next wave of clean energy technologies, we can ensure that those technologies are available when we need them to achieve the steep reductions in global warming emissions America and other nations must make in the decades to come.

Revenues from an allowance auction can play an important role in advancing new technologies. Auction revenues could be used to fund research and development and to provide incentives to speed the introduction of new technologies in the marketplace.

Research conducted for the Pew Center on Climate Change illustrates the role of technology promotion in reducing the cost of a global warming cap-and-trade program. According to a report written for the center, combining emission reduction policies (like cap-and-trade) with "technology-push" policies (such as research and development funding and financial awards to inventors of ground-breaking technologies) can achieve emission reductions at lower cost than pursuing either strategy alone.[31]

The Pew Center report identified two ways in which public policy can induce technological change: through research and development and through "learning by doing." Research and development can achieve technological breakthroughs that reduce the cost of achieving a given level of emission reductions. For example, federal research and development efforts beginning in the 1970s brought about dramatic improvements in energy efficiency for several key consumer products, including refrigerators. Today's refrigerators use approximately two-thirds less electricity than those built in 1974, even though today's models are, on average, bigger, have more features, and do not include ozone-depleting substances. Federal energy research and development has paid big dividends to Americans; R&D efforts on just six energy efficient technologies were estimated to have returned $30 billion in economic

benefits on an investment of just $400 million—a return on investment of 75-to-1.[32]

Unfortunately, public and private investment in energy R&D has nosedived since the energy crises of the 1970s. After reaching a high point of $8 billion in 1980, the United States now spends, on average, less than half that amount (only $3 billion per year) on all energy R&D programs in both the public and private sectors.[34] In addition, much of that research and development funding is directed toward traditional forms of energy, such as coal and nuclear power, rather than innovative renewable energy and energy efficiency technologies.

Public support for energy R&D is critical, since private-sector R&D often suffers from under-investment as a result of market failures. For example, inventors of clean energy technologies cannot always claim all of the benefits of their R&D investment, since competitors have the ability to learn from the new product and use those lessons to field competing products. Thus, firms may be reluctant to invest in R&D for fear that their discoveries may end up benefiting their competitors as much as themselves. Public sector R&D spending is intended, in part, to compensate for this market failure.

"Learning-by-doing" is the simple notion that, as producers gain experience with new technologies and new practices, they get better and more efficient. Whether the product is computers, hybrid vehicles, or solar panels, producers' "cumulative experience" (which tracks cumulative sales of the product over time) leads to innovations that reduce the cost of production—thus making the product available to more consumers and creating further opportunities for innovation and cost reductions.

The Pew Center report notes that, for new technologies, costs decline by 20 percent for every doubling of cumulative experience.[35] In other words, every time the cumulative production of relatively new products like solar panels doubles, costs can be expected to decline by about 20 percent. As a result, it makes sense for government to invest in deploying new clean energy technologies—even though they are not cost-effective at the moment—in order to encourage cost reductions that will lead to greater penetration of the technology in the future.

Solar photovoltaic panels represent a prime example of how learning-by-doing can work. Experts believe that, with consistent public policy support, the cost of solar panels can fall dramatically in coming years as manufacturers and installers of solar panels get better at what they do, develop new technologies, and achieve mass production.[36] Unfortunately, solar PV currently remains out of the price range of most homeowners and businesses in much of the country. If we rely on market forces alone to bring solar PV to market readiness, we may have to wait a long time. By contrast, using public incentives to spur the development of PV now could hasten the technology along the "experience curve," causing prices to fall faster and bringing the technology to the point where it can make a large contribution to global warming emission reduction efforts in the decades ahead.

Revenues from allowance auctions can be used to support both of these sources of technological change. Some revenues could be devoted to bolstering government research and development programs—helping to develop the technologies that will be required for us to achieve the far more dramatic reductions in global warming emissions that will be required in future years. In addition, some revenues could be used to promote the deployment of new energy efficient and renewable energy technologies, thus helping these technologies to achieve cost competitiveness quickly.

It is important that financial support for clean energy technology development be focused where it is likely to do the most

good. Research and development investments are, by nature, speculative and likely to result in as many dead ends as cutting-edge products. R&D investments should be aligned to promote research into those technologies with the greatest potential to reduce global warming emissions—and particularly technologies related to energy efficiency and renewable energy. Incentives for early market development of zero- or low-emission technologies should be prioritized on a least-cost basis considering full life-cycle emissions and other environmental impacts.

Auctioning Allowances Benefits the Public

Achieving dramatic reductions in global warming pollution in the United States is going to cost money. If we design climate policy correctly, most of that money will go toward solid, long-term investments in energy efficiency and renewable energy that will pay dividends in financial savings and create a cleaner and healthier environment for decades to come. But in the short term, the cost to many Americans will be very real. Auctioning allowances can generate revenue that can be used in a variety of ways to reduce the impact of the program to consumers while providing important public benefits.

Auctioning Allowances Will Generate Millions or Billions of Dollars for Public Purposes

It is difficult to estimate the amount of revenue that would be generated by an allowance auction, either at the state, regional or federal level. Much depends on the scope of the cap-and-trade system (what set of emitters is covered) and the price of emission allowances.

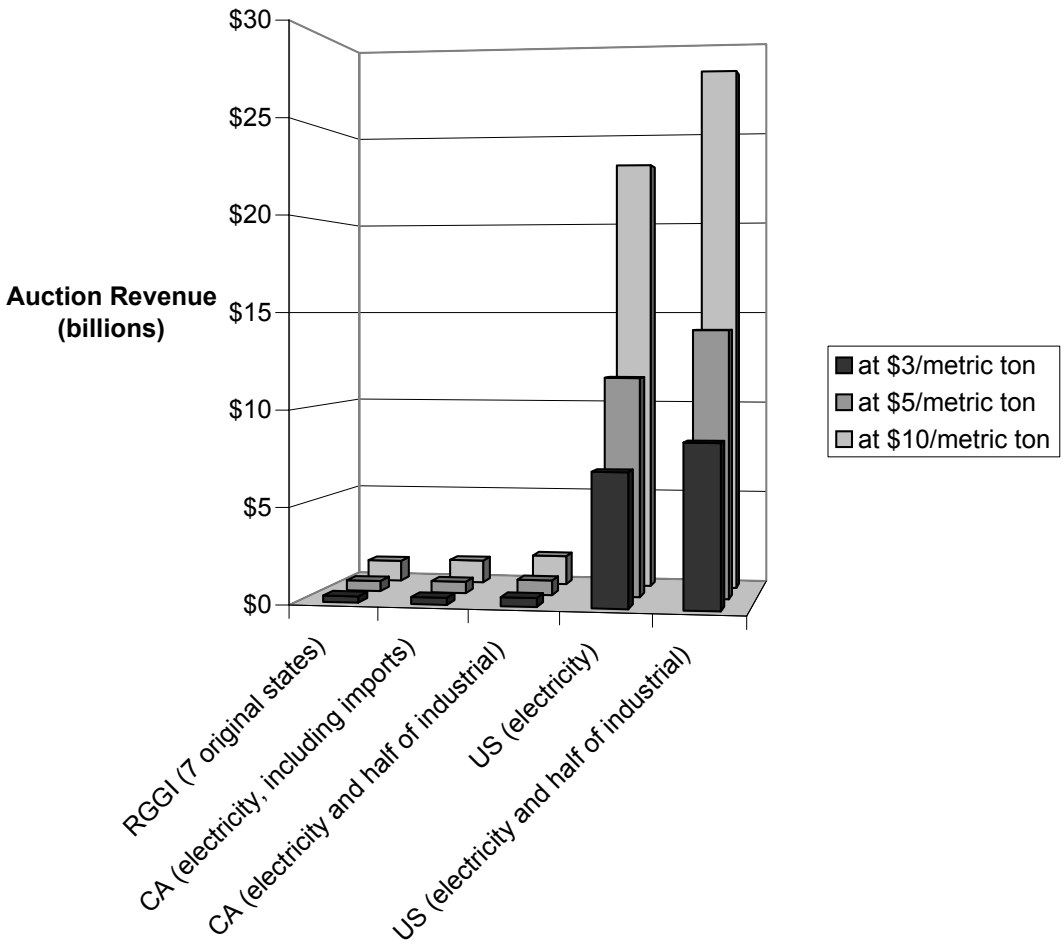
For example, in the seven initial states to join the northeast Regional Greenhouse Gas Initiative (RGGI), which covers electric power plants, the initial allowance allocation in 2009 amounts to 121 million tons of carbon dioxide.[37] Were RGGI to be implemented alongside a federal cap-and-trade program (thus preventing "leakage" of emissions from RGGI states to states not covered by the program), prices for allowances would begin at approximately $3/ton and increase to $12/ton as the program becomes more stringent.[38] At these prices, RGGI would generate between $360 million and $1.4 billion per year if all of the emission allowances were auctioned.

A national power-sector program would generate even more revenue. The seven original signers of RGGI (CT, DE, ME, NH, NJ, NY, and VT) produced approximately 4 percent of U.S. electric sector carbon dioxide emissions in 2004.[39] A nationwide program, therefore, could produce as much as 25 times the amount of auction revenue as RGGI. And that is only for one slice of the American economy—including large industrial emitters (or, eventually, other sectors of the economy) would increase revenues even further.

Figure 2 (next page) provides an illustrative example of the potential revenues that could result from allowance auctions. The figure assumes a global warming emission "cap" set at 2004 emission levels (or, in the case of RGGI, the baseline emission level established in the regional agreement). A cap-and-trade program that significantly reduced emissions could produce higher allowance prices than shown on this graph, but auction revenues would not increase at the same rate, since fewer allowances would be issued.

Even a relatively modest and geographically limited cap-and-trade program with a relatively low price for allowances can generate significant revenue to be used for public purposes. In the case of RGGI, auctioning allowances at $3 per metric ton of carbon dioxide would generate approxi-

Figure 2 and Table 1. Illustration of Potential Annual Revenues from Allowance Auctions (First Year of Program)[40]



		Annual Auction Revenue at Start of Program (millions)		
	Emissions (2004 or baseline year, million metric tons)	**at $3 per metric ton**	**at $5 per metric ton**	**at $10 per metric ton**
RGGI (7 original states)	110	$330	$550	$1,100
CA (electricity, including imports)	121	$362	$603	$1,205
CA (electricity and half of industrial)	154	$462	$771	$1,541
US (electricity)	2309	$6,927	$11,545	$23,090
US (electricity and half of industrial)	2817	$8,450	$14,083	$28,165

mately $330 million per year that could be used for public purposes. In the case of a California program that included electricity and large industrial polluters, a similar allowance price would generate revenues of more than $460 million per year. A federal program that auctioned allowances at just $3 per metric ton of carbon dioxide and that covered emissions from electric power plants and large industrial polluters could generate annual revenues of more than $8 billion, with the total rising over time. At $10 per metric ton of carbon dioxide, the federal program could generate initial annual revenues of more than $28 billion. (See Figure 2 and Table 1.)

These estimates are illustrative of allowance prices that would likely prevail in the first year or two of a cap-and-trade program when the amount of emission reductions required is small. It is likely that allowance prices would increase in future years of the program, thus generating additional revenue that could be used for public purposes.

There are three important classes of public benefits for which auction revenues should be used:

- To promote energy efficiency, thus reducing the near-term costs of the program.
- To encourage the development and deployment of renewable energy and advanced energy efficiency technologies, which reduce the long-term costs of the program. (See "Auctioning Allowances Can Provide Funding to Develop Clean Energy Technologies," page 24.)
- To return some of the proceeds of the program to consumers.

Each of these investments serve to reduce the cost of the program to consumers—immediately through direct rebates to consumers, in the short run through investments in energy efficiency, and in the long run through the development of the next wave of clean energy technologies.

Allowance Proceeds Can Be Used to Promote Energy Efficiency, Reducing the Near-Term Cost of the Program

Energy efficiency is generally the least expensive way to meet increased demand for energy. And the potential for savings is enormous—a 2000 study by five national laboratories estimated that an advanced energy efficiency scenario (coupled with a carbon dioxide trading program) could reduce U.S. energy consumption by 20 percent versus business as usual, cut America's energy bill by 18 percent (*including* the cost of emission allowances), and reduce U.S. carbon emissions by 30 percent by 2020, bringing emissions back to 1990 levels.[41]

Yet, many barriers—ranging from high up-front costs to lack of consumer awareness—keep energy efficiency from playing an even more important role in America's energy picture. For example, the recent report of the Intergovernmental Panel on Climate Change (IPCC) notes that "multiple barriers" exist to emission reductions in existing buildings worldwide, including "availability of technology, financing, poverty, higher costs of reliable information, limitations inherent in building designs and an appropriate portfolio of policies and programs."[42]

Well-designed, well-funded energy efficiency programs can help individuals and businesses surmount these barriers and reduce their energy consumption. Among the ways energy efficiency programs can help are:

- By providing rebates on the purchase of energy-efficient equipment.
- By providing rebates on purchase of clean, efficient distributed generation technologies like combined heat-and-power.

- By providing low-interest loans and grants to install energy efficient technologies.

- By providing free energy audits and technical assistance to households and businesses.

- By offering weatherization assistance for low-income households.

Energy efficiency efforts in the states have posted impressive results in saving energy. California, for example, has long prioritized energy efficiency, both through regulation (e.g., building codes, appliance standards) and through efforts such as rebate programs for efficient products, energy audits, and technical assistance to homeowners and businesses seeking to reduce their energy consumption. Through those efforts, California now saves 40,000 gigawatt-hours of electricity per year, or about 15 percent of the state's electricity consumption in 2005.[43]

Improving the energy efficiency of the economy is a "win-win" on many levels: it reduces demand for imported fossil fuels, keeping money within the American economy, and it creates domestic jobs.[44] Just as importantly, energy efficiency makes it less expensive to achieve emission reductions under a cap-and-trade program.

Economic modeling conducted for the Regional Greenhouse Gas Initiative found that pairing the RGGI emission cap with strong energy efficiency efforts resulted in an overall *reduction* in consumers' household energy bills.[45] Increased energy efficiency investment also reduces the cost of global warming emission allowances under the cap-and-trade program.[46]

Devoting a significant share of auction revenues to support energy efficiency programs, therefore, can reduce the cost of achieving a given level of emission reductions while saving money for consumers and delivering a variety of economic benefits. But investing auction revenues isn't the only way to spur greater energy efficiency. A cap-and-trade program should also be combined with other public policies to improve energy efficiency, including:

- Strong energy efficiency standards for vehicles, appliances and equipment.

- Strong building energy codes and incentives for the construction of low-energy and zero-energy buildings.

- Requirements that utilities take advantage of all cost-effective energy efficiency opportunities before building new power plants.

In addition, while energy efficiency is an important way to reduce the cost of curbing global warming emissions in the short term, investing in renewable energy and advanced energy-saving technologies is also important for reducing the cost of global warming emissions in the long run. As noted above (See "Auctioning Allowances Can Provide Funding to Develop Clean Energy Technologies," page 24), investing in clean energy research and development and early market deployment would also be a beneficial use of revenue from allowance auctions.

Auctioning Allowances Can Reduce the Cost of Cap-and-Trade for Consumers

Even with aggressive investments in energy efficiency, achieving large reductions in global warming pollution through cap-and-trade could result in price increases for some forms of energy and some consumer products. The more stringent the cap on emissions, the more likely there will be some increase in energy prices.

Auctioning allowances, and returning some of the auction revenue directly to consumers, can alleviate some of these

price impacts—particularly for low-income consumers—while providing all Americans with a tangible benefit from the cap-and-trade program.

There are several schools of thought on the best way to return allowance revenue to consumers. One option is to use auction revenues to reduce other taxes. This is frequently referred to as "tax shifting"—using taxes or fees on social "bads," such as pollution, to reduce taxes on labor, income or capital.

Some economists believe that using auction revenue to reduce other taxes is the most economically efficient option, since it reduces inherent disincentives to work or invest. However, unless the tax reductions are very carefully structured, they may fail to adequately compensate all consumers affected by the program. For example, many low-income households earn too little to pay federal income tax and even fewer pay taxes on investments—for example, capital gains. A fair system for redistributing auction revenue would ensure that all consumers, including low-income consumers, receive their "fair share" of the proceeds.

A second option is to return auction revenues through a periodic rebate (or dividend) check sent out in the mail. The size of the check could be determined by dividing auction revenues on an equal per-capita basis. Distributing the auction revenues equally would ensure that low- and moderate-income households receive the same share of benefits from the auction as upper income individuals. It could also help maintain public awareness of and support for the cap-and-trade program, since it would represent a tangible benefit of the program. The rebate check could also be packaged with educational materials updating the public on the progress of the program in reducing emissions and reminding consumers that they can save

Figure 3. Share of Household Income Spent on Energy, 2004[49]

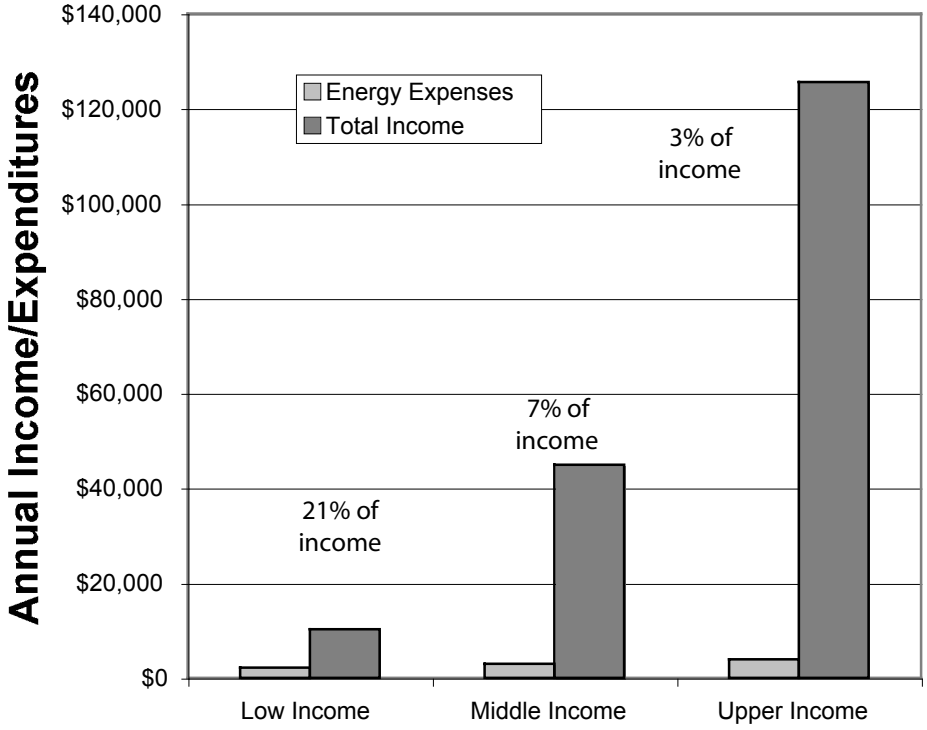
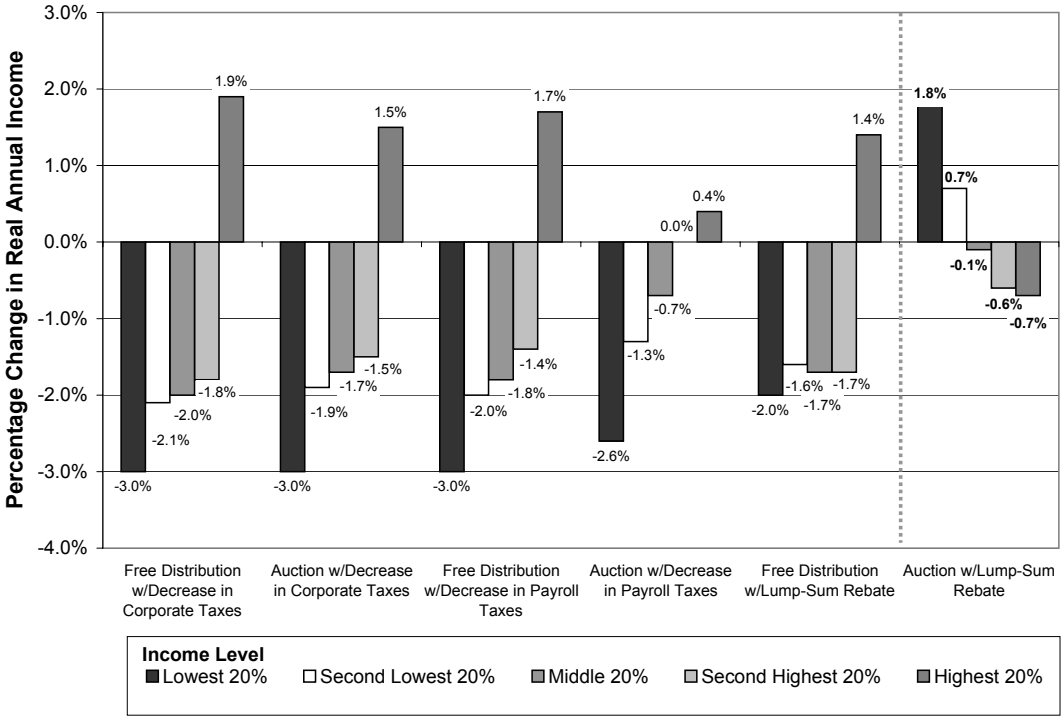


Figure 4. Impacts on Real Annual Income for Households from 15 Percent Cut in Carbon Dioxide Emissions by 2010, by Income[51]



money by using energy more efficiently.

Such a program is not unprecedented. The state of Alaska has long used a similar system to redistribute a share of revenues from investment of oil, gas and mineral royalties. Each year, each Alaska resident receives a dividend check based on an equal per-capita share of the investment revenue. In 2006, the per-capita dividend was just over $1,100.[47]

An equal, per-capita rebate of a portion of auction revenues would ensure that low-income households are adequately protected from any increases in the price of energy or products that result from a cap on global warming emissions. Low-income households use less energy than their wealthier counterparts, but energy expenditures represent a disproportionately large share of their incomes. In 2004, a low-income household making $15,000 per year would have spent more than 20 percent of its income on energy. By contrast, an upper-income household making more than $74,500 per year would have spent nearly twice as much on energy as a low-income household, but those expenditures would have represented only about 3 percent of total income.[48] (See Figure 3.)

Returning some auction revenues directly to consumers, therefore, can alleviate the likely impact of higher energy prices, particularly for low-income consumers.

A recent Congressional Budget Office

(CBO) study looked at six scenarios for distributing allowances and revenues under a global warming cap-and-trade system. The CBO contrasted auctions with free distribution, along with three different ways of returning revenue to consumers under each system—lump-sum rebates, reductions in corporate taxes, and reductions in payroll taxes. The study found that low-income households would lose—and high-income households would gain—under all free distribution scenarios, as well as under auction scenarios in which revenues were returned through reductions in corporate or payroll taxes. By contrast, low-income households actually *benefit* from a system that combines allowance auctions with a lump-sum rebate in that their real annual incomes increase under the program.[50] Middle income households also fare better under lump-sum rebates than under either tax reduction scenario. (See Figure 4, page 31.)

As noted above, auction revenues could also be used to reduce the cost impact of the program in other ways—by encouraging energy efficiency improvements that reduce energy demand and by investing in research, development and deployment of clean energy technologies—so the CBO's estimates should be seen as merely illustrative. But the point they illustrate is an important one: returning a share of auction revenues directly to consumers on an equal, per-capita basis can cushion any price impacts from the effort to cap global warming emissions while also giving individual households a direct and tangible benefit from the program.

Conclusion and Recommendations

Cap-and-trade could be one of the tools used to achieve the dramatic reductions in global warming emissions our society must achieve to prevent the worst impacts of global warming. But it is not a panacea. And its success depends critically on the details of how the cap-and-trade system is designed and implemented.

By auctioning global warming pollution allowances, governments that adopt cap-and-trade systems can reduce the cost of achieving emission reductions, both now and in the future, and ensure the basic fairness of the program.

To achieve those benefits, the United States and any state or region contemplating a cap-and-trade program should adopt the following recommendations:

- Auction 100 percent of emission allowances.
- Use the revenues from auctions to:
  - Support clean energy technological development, including research and development funding and early market support for clean technologies.
  - Invest in energy efficiency improvements to reduce the cost of the program to consumers.
  - Provide direct consumer rebates to alleviate any increases in energy costs that result from the program.
- Adopt complementary policies that further reduce emissions, reduce the cost of the program, and help achieve the goal of transitioning America to a clean energy economy. Among those policies are stronger energy efficiency standards for vehicles and equipment, enhanced building energy codes, renewable energy standards for electricity generation, global warming performance standards for electricity generation and transportation fuels, and incentives for deployment of promising new technologies, such as solar power and extremely efficient "zero-energy" homes.

Notes

1 Sir Nicholas Stern, *Speaking Notes for Launch Presentation: Stern Review: The Economics of Climate Change*, 30 October 2006.

2 A variety of studies have concluded that cost-effective improvements in energy efficiency of 20 percent or more are possible in the American economy, and that energy efficiency investments can generate large economic benefits. For a summary, see American Council for an Energy-Efficient Economy, *The Twin Pillars of Sustainable Energy: Synergies Between Energy Efficiency and Renewable Energy Technology and Policy*, May 2007.

3 For example, consumers may lack knowledge about the availability of energy efficiency opportunities; they may place greater emphasis on up-front costs than long-term savings; they may suffer from split incentives (such as when landlords are responsible for the cost of capital improvements to a building but the tenants would receive any savings in utility bills); or they may be inadequately compensated for the benefits that accrue to society from their individual behavior.

4 Malte Meinshausen, "What Does a 2° C Target Mean for Greenhouse Gas Concentrations? A Brief Analysis Based on Multi-Gas Emission Pathways and Several Climate Sensitivity Uncertainty Estimates," in Hans Joachim Schnellnhuber, ed., *Avoiding Dangerous Climate Change*, Cambridge University Press, 2006.

5 Intergovernmental Panel on Climate Change, *Climate Change 2007: Mitigation of Climate Change*, May 2007.

6 Ibid.

7 For more on offsets, see Travis Madsen, Tony Dutzik, et al., *Cracks in the Cap: How the "Offsets" Loophole Undermines the Control of Global Warming Pollution from Power Plants*, September 2005; and National Association of State PIRGs, *Stopping Global Warming Begins at Home: The Case Against the Use of Offsets in a Regional Power Sector Cap-and-Trade Program*, September 2004.

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9 Note that a utility-based system could be plagued by "reverse leakage"—that is, the potential for polluting power plants to set up shop *inside* a state with a load-based cap, but sell their power to *other states* that do not have an emission cap. Such a problem is far more easily controlled, however, than the problem of leakage in a generator-based system. States have authority over what types of generating facilities are permitted to be built and operated in their states. They have less authority over power imports from other states.

10 Accounting for the global warming emissions of out-of-state generation is not always straightforward, however.

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Acid Rain Allowance Auction Fact Sheet, downloaded from www.epa.gov/airmarkets/trading/factsheet-auction.html, 16 March 2007.

12 U.S. Environmental Protection Agency, *Conservation and Renewable Energy Reserve*, downloaded from www.epa.gov/airmarkets/progsregs/arp/conserve.html, 16 March 2007.

13 U.S. Environmental Protection Agency, *NOx Trading Program*, downloaded from www.epa.gov/airmarkets/progsregs/nox/index.html, 16 March 2007.

14 Andrew Aulisi, Alexander E. Farrell, et al., World Resources Institute, *Greenhouse Gas Emissions Trading in U.S. States: Observations and Lessons from the OTC NOx Budget Program*, 2005.

15 European Commission, *Emissions Trading—National Allocation Plans*, downloaded from ec.europa.eu/environment/climat/emission_plans.htm, 16 March 2007.

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17 Regional Greenhouse Gas Initiative, *Memorandum of Understanding*, 20 December 2005.

18 42 USC §7651b(f) (Clean Air Act, section 403(f))

19 Dallas Burtraw, Resources for the Future, "Carbon Emission Trading Costs and Allowance Allocations: Evaluating the Options," *Resources*, Fall 2001.

20 See Jonathan Pershing, World Resources Institute, *Submission to the U.S. Senate Energy and Natural Resources Committee Climate Conference: Responses to Questions on Design Elements of a Mandatory Market-Based Greenhouse Gas Regulatory System*, 13 March 2006.

21 House of Commons (United Kingdom), Environmental Audit Committee, *The EU Emissions Trading Scheme: Lessons for the Future*, 20 February 2007.

22 This, however, depends upon regulatory treatment of the "opportunity cost" utilities incur in using free allowances.

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26 WWF, *WWF's Assessment: Key National Allocation Plans for Phase II of the EU Emissions Trading Scheme*, 9 November 2006.

27 Eric Heymann, Deutsche Bank Research, *EU Emission Trading: Allocation Battles Intensifying*, 6 March 2007.

28 See U.S. PIRG Education Fund, *Lethal Legacy: A Comprehensive Look at America's Dirtiest Power Plants*, October 2003.

29 See note 19.

30 U.S. PIRG Education Fund, *Making Sense of the "Coal Rush": The Consequences of Expanding America's Dependence on Coal*, July 2006.

31 Lawrence H. Golder, Pew Center on Global Climate Change, *Induced Technological Change and Climate Policy*, October 2004.

32 American Council for an Energy-Efficient Economy, *Energy Efficiency Research, Development, and Deployment: Why Is Federal Support Necessary?*, downloaded from www.aceee.org/energy/rdd.pdf, 10 October 2006.

33 Gregory F. Nemet and Daniel M. Kammen, "U.S. Energy Research and Development: Declining Investment, Increasing Need, and the Feasibility of Expansion," *Energy Policy*, 35: 746-755, 2007.

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35 A. McDonald and L. Schrattenholzer, "Learning Rates for Energy Technologies," *Energy Policy*, 29:255-261, 2001, cited in Lawrence H. Golder, Pew Center on Global Climate Change, *Induced Technological Change and Climate Policy*, October 2004.

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38 ICF Consulting, *RGGI Electric Sector Modeling Results: Updated Reference, RGGI Package and Sensitivities*, 21 September 2005.

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ary 2007. Carbon dioxide emissions estimated based on methodology described in U.S. PIRG Education Fund, *The Carbon Boom: State and National Trends in Carbon Dioxide Emissions Since 1990*, April 2007.

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51 Ibid.