

# Fair Deal for Consumers or Free Ride for Polluters?

The Case for Auctioning Pollution Permits  
in the Western Climate Initiative



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# Executive Summary

**G**lobal warming poses a serious threat to the future of the western United States. Science indicates that in order to avoid the most dangerous impacts of global warming, we must act quickly to reduce global warming pollution.

The governors of Oregon, California, Washington, New Mexico and Arizona established the Western Climate Initiative (WCI) in February 2007 to work together to reduce global warming pollution, with the goal of reducing region-wide emissions by at least 15 percent below 2005 levels by 2020, a level consistent with the total reductions embodied in states' varying goals. In order to achieve this goal, WCI is planning to cap global warming pollution from industrial sectors representing most of the major pollution sources and to allow partners to buy and sell permits that allow limited emissions. This type of system is known as "cap-and-trade" and the permits for global warming pollution emissions are called "allowances."

Under a cap-and-trade system, polluters must hold allowances for every unit of pollution they emit, and the total number of allowances is limited by the regional cap. The cap declines on a timeline to meet the

region's 2020 goal; the shrinking number of allowances results in pollution reductions consistent with the goal. Polluters may choose to reduce their pollution to lower the number of allowances they need, or can trade allowances to match their pollution levels.

The structure of a cap-and-trade program is critical to its success. One of the most important decisions WCI must make 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. This paper draws from recent studies on existing cap-and-trade programs and economic models to show the important advantages of auctioning pollution allowances under the WCI.

Auctioning all allowances under a cap-and-trade program is the fairest distribution method for the public. Auctioning allowances reduces the societal cost of achieving pollution reductions compared to giving allowances to polluters for free, encourages energy efficiency measures that can reduce energy bills for consumers and businesses, 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 is the fairest means of distributing pollution allowances.**

- The atmosphere is a public resource, and must be managed for the benefit of the public. As a result, it is fair to require polluters to pay the public for damaging that resource and to hold them responsible for the costs their pollution imposes on society. Giving away pollution allowances for free undermines that responsibility, but auctioning allowances ensures that all polluters pay based on the amount of pollution they release.
- If allowances are given to polluters for free, some companies earn windfall profits, without regard to whether they take steps to reduce pollution.
- Auctioning allowances removes the potential for political 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 and “recycling” the revenue to consumers can reduce the societal cost of achieving 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.
  - o When allowances—which are items of monetary value—are given to polluters for free, it allows

polluters to benefit financially without having to take any action to reduce their emissions, since they can increase prices to incorporate the value of the allowances.

- o 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 program. In the United Kingdom alone, windfall profits from emission trading have been estimated at nearly \$2 billion. These profits come from the pocketbooks of consumers.
- o For rate-regulated utilities in the Western states, proper regulation can prevent windfall profits from a cap-and-trade system, but auctioning allowances is still an important way to encourage smart investments in energy efficiency and clean energy technologies. Even in states with well-regulated electricity markets, businesses in other sectors of the economy may have the opportunity to obtain windfall profits if given allowances for free.
- o Auctioning allowances eliminates the potential for windfall profits and requires polluters to pay for the right to emit global warming pollution.

**Auctions can protect consumers and maximize the economic benefits of global warming solutions.**

- As demonstrated by an analysis of the regional cap-and-trade program in the Northeast, using auction revenues to increase energy efficiency while imposing a carbon cap can actually lead to lower energy bills for consumers,

even if the price per unit of energy increases.

- Auction revenues can also be invested in low-carbon transportation infrastructure such as public transportation—giving Westerners additional ways to reduce their carbon dioxide emissions and curb dependence on expensive oil.
- Consumers can be further protected from rising energy costs if a portion of auction revenues is given to low-income consumers in the form of energy bill assistance or to consumers generally in the form of a rebate.

**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 will ensure that polluters receive the proper price signals for investing in efforts to reduce their emissions and that consumers receive price signals that encourage energy conservation.
- 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.

**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 nearly or fully 100 percent of their pollution allowances.
- Most global warming bills currently in the United States Congress include an auctioning component. The strongest of those bills requires the auctioning of 94 percent of allowances initially, rising to 100 percent over time.

WCI should maximize the percentage of allowances that are auctioned as part of its global warming cap-and-trade program, with the revenue from those auctions used to protect consumers and businesses and to maximize economic benefits of a transition to a clean energy economy. WCI partners should have the flexibility to auction up to 100 percent of allowances and should commit to doing so.

# Introduction

The West is quickly realizing that it has a lot to lose from global warming. From the threat of the rising Pacific Ocean, to the worsening scourge of drought, the West will be a different place in a few decades if global warming pollution continues to rise.

In much of the West, global warming is expected to bring hotter, drier summers, making the weather more uncomfortable, agricultural crops thirstier, and underground water sources slower to refill. Natural disasters such as droughts, floods and wildfires will become more common in some areas. Ecosystems will be forced to deal with myriad rapid changes as species' ranges shift, which is expected to result in a loss of biodiversity and could damage the tourism, hunting, fishing, birding and wildlife viewing industries.

Pacific communities will face the direct threat of rising sea levels, harsher storms and the loss of beaches that draw major tourism dollars. Agriculture will be forced to switch crops and techniques to stay competitive in a turbulent global food market as everything from weather to pests changes the way farmers do business.

The West has also begun to realize that there is a lot that can and should be done to prevent the worst effects of global warming. Time is of the essence. In the absence of national action to curb global warming pollution, many states have begun setting their own targets for reducing global warming pollution and implementing programs to meet their targets.

By coming together in the Western Climate Initiative (WCI), Western states have joined with Canadian provinces to develop a joint regional program to meet their pollution reduction goals. The combined regional goal is to reduce emissions by at least 15 percent below 2005 levels by 2020, a level consistent with the total reductions embodied in states' varying goals. In order to achieve this goal, WCI is planning to cap global warming pollution from industrial sectors representing most of the major pollution sources in the region.

The WCI cap-and-trade program should be a great boon to the states' efforts to cut global warming pollution quickly and efficiently. But the details of the program matter—not only to the environment, but also to consumers and residents throughout

the West. In order to preserve the price signals that make it work, promote the transition to the new energy economy, and

protect consumers, all allowances should be auctioned off rather than given away to polluters for free.

# Principles of Cap-and-Trade

Cap-and-trade is the combination of two policy approaches to reducing pollution. Limiting pollution with enforceable caps is a bedrock of modern 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. The Clean Air Act relies on setting caps on pollution for individual facilities and entire regions.

Emission trading is a newer innovation, relying on 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. 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, WCI partners must make many critical decisions that can affect the program’s effectiveness at delivering pollution reductions and influence the costs and benefits of the program to various elements of society.

## How the WCI Cap-and-Trade System Will Work

WCI is currently designing a cap-and-trade system to help reduce global warming pollution within certain economic sectors of partner states and provinces to 15 percent below 2005 levels by 2020. Under the program, polluters must hold allowances for every unit of pollution they emit, and the total number of allowances is set by the overall emissions limit, or cap. WCI will set the cap, which is then converted into allowances to be distributed to WCI partners. Each year, the cap is automati-

cally tightened so that it achieves the target reductions by 2020.

Polluters may choose to curb their pollution to reduce the number of allowances they must hold, or to buy additional allowances from others, so that at the end of each compliance period they turn in as many allowances as they have emitted units of pollution.

The 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. Individual firms decide whether it is more economic to reduce emissions or to accept the cost of acquiring allowances.

## The Role of Cap-and-Trade in the West

Cap-and-trade can play an important role in efforts to reduce emissions of global warming pollutants in the West. The primary role of cap-and-trade is to set an enforceable limit on emissions from specific sources of global warming pollution, 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 at minimal societal cost. If one company can reduce pollution more cheaply than another, it can sell its allowances to another company with higher pollution-control costs. Regional cap-and-trade programs such as WCI also allow for trading of emission allowances among states, enabling emission reductions to occur in the places where they are least expensive and most readily available.

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. The existence of externalities causes what economists call a “market failure,” leading markets to make poor choices about what kinds of investments to make.

Sir Nicholas Stern, former Chief Economist of the World Bank, who 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.<sup>1</sup>

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 pollution. There are a variety of ways to assign costs to polluting activities in an attempt to account for externalities. Governments

“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

could tax pollution or fossil fuel consumption (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 pollution-reduction goal. Additionally, cap-and-trade has the advantage of providing increased certainty that necessary pollution reductions will be met on a specific timeline.

However, cap-and-trade is not a “silver bullet” solution to environmental problems. Cap-and-trade programs can be inappropriate for dealing with certain types of environmental problems—particularly those in which emissions have a disproportionate local impact. In such a situation, the trading system must include measures that avoid the creation of localized pollution “hot spots.” Most of the global warming pollutants to be regulated by WCI, on the other hand, appear to be well-suited for control through cap-and-trade since they have an equivalent global warming effect regardless of where they are emitted.

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.<sup>2</sup> Energy markets are littered with market barriers that prevent individuals from acting in ways that maximize economic benefits to themselves and society.<sup>3</sup> 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, WCI partners should pair cap-and-trade 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.

The design of a cap-and-trade program itself can also help to remove market barriers and help consumers and businesses contribute to pollution reductions in a cost-effective manner.

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

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

The strength of the cap, which WCI partners have already set at a 15 percent reduction below 2005 levels by 2020, is critically important. 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.<sup>4</sup> To have a reasonable chance of stabilizing global temperatures at levels no more than 2° Celsius increase in temperatures above pre-industrial levels,

the world will have to stabilize concentrations of global warming pollutants in the atmosphere at approximately 450 parts per million (carbon dioxide equivalent).<sup>5</sup> And to achieve that target, industrialized nations should aim to reduce their global warming emissions by at least 80 percent below 2000 levels by mid-century.<sup>6</sup> WCI's 2020 goal is a good start towards a regional 80 percent reduction by 2050, although a stronger cap, such as the targets adopted by Oregon and California, would be better.

As new scientific knowledge of global warming accumulates, scientists may discover that faster reductions are necessary. To account for such a possibility, WCI should include a provision allowing periodic review of the cap and how it compares to the most up-to-date science on global warming. The cap should always be set in line with the emission reductions necessary

to prevent the worst consequences of global warming.

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 and circuit breakers—that either suspend compliance with 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. WCI partners 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 the same integrity as those achieved by regulated facilities.<sup>7</sup> Similarly, cap-and-trade programs should include provisions to minimize “leakage” of emission reductions outside the boundaries

## Finding the Right Point of Regulation in the Electric Power Sector

**E**lectric power plants produce one third of America's global warming pollution.<sup>8</sup> Therefore, reducing carbon dioxide emissions from electric power plants is a critical part of WCI's effort to reduce global warming pollution in the West.

However, the electric power sector is complex. As a result, the electric sector poses some special issues in the design of WCI's cap-and-trade program. Among those issues is deciding who should have the responsibility of holding allowances for the pollution emitted during electricity production. Possibilities range from the generators themselves to the entities that sell the electricity to consumers.

WCI's primary concern should be to prevent “leakage”—that is, to ensure that there is no incentive for replacing electricity generated within WCI with high-emission electricity generated outside the cap-and-trade region and sold back to WCI partners. Leakage erodes the emission reductions achieved through the region's cap-and-trade program by merely shifting the pollution outside the region.

To address this concern, WCI has moved towards giving the responsibility for holding allowances to the “first jurisdictional deliverer.” Under this approach, generators within WCI's jurisdiction (the partner states and provinces) would be required to hold allowances to cover their emissions, but if electricity is generated outside WCI's jurisdiction, then the utilities or other entities importing that electricity would be required to hold the allowances, even if they didn't produce the global warming pollution themselves.

of the cap. Without these provisions, the ability of WCI to reach its fundamental goal could be undermined.

A third set of decisions relate to which entities in the supply chain for fossil fuels must hold allowances. Any entity in the supply chain—companies involved in extraction, processing (e.g. refining), or delivery of fossil fuels; companies involved in converting fossil fuels to electricity; or even end-use consumers—can theoretically be held accountable for the global warming emissions produced by the fuel, and therefore required to hold allowances for each unit of pollution generated. 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 “Finding the Right Point of Regulation in the Electric Power Sector,” Page 9.)

Finally, WCI must decide how and to whom partner states can distribute their allotted pollution allowances. This paper focuses on this very important issue.

## Options for Distributing Pollution Allowances

WCI can choose among many methods for distributing pollution allowances under its cap-and-trade program, but there are really just 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 price the market will support. As

a result, the question of how to distribute allowances is primarily 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 to be freely 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,” since it implicitly establishes a right to pollute close to the regulated company’s pollution level at the time the program starts. Grandfathering is often criticized for rewarding polluters who have failed to reduce their pollution in the absence of government mandates and for failing to reward companies who have invested in pollution reductions.
- **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.

Input- or output-based allocations have the advantage of not rewarding polluters based on their level of past pollution. But they also ignore other environmental protection objectives. It is well known that all zero-carbon forms of electricity production—including those with significant environmental or public safety impacts such as large-scale hydropower and nuclear power—will benefit from “putting a price on carbon.” In an auction-based system, owners of carbon-emitting forms of power generation will need to buy allowances, while owners of zero-carbon forms of energy will not. However, an output-based free distribution system would further reward owners of zero-carbon forms of generation by providing them with allowances based on the amount of electricity they generate—allowances that they would be able to sell on the open market. Since hydropower investments, in particular, were made long before global warming became a concern, and because there is limited further capacity for large-scale hydropower in the West, these windfalls would serve little public policy purpose. (By contrast, strategic investments in new renewable forms of generation may serve a public purpose and can be encouraged through the use of auction revenue—see “Auctions Can Protect Consumers and Businesses and Maximize Economic Benefits Of Global Warming Solutions,” page 18.)

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, if WCI were to allocate free allowances it would have to decide whether to alter the underlying assumptions for allowance distribution in order to support a preferred technology or social aim. These deviations 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. Both the setting of baselines and creation of set-asides can be subject to political influence.

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, to give away some allowances in the near term, but to phase out free allocations and shift to auctions over time.

## **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 WCI or partner governments—determine who receives allowances.

Under an auction system, WCI partners—either separately or together—would hold a periodic auction to sell pollution allowances. Would-be emitters (and possibly other entities) would then bid for the initial allotment of allowances, with the final settlement price set by the auc-

tion. 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 questions facing WCI in an auction-based system are how to design a fair and transparent auction system and how to distribute the revenues from the auction. An auction-based system would represent a significant transfer of money from emitters to the government entity running the auction. WCI partners could then distribute

those proceeds for programs that help meet the program's pollution reduction goals by investing in energy efficiency and renewable energy technologies, provide energy cost relief to consumers and taxpayers, or help communities adjust to the impacts of global warming.

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

Several cap-and-trade programs already exist in the United States and Europe. However, significant problems in some programs (specifically the European Union's Emission Trading Scheme) have created new momentum behind auctions.

**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.<sup>9</sup> In its initial test phase, 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).<sup>10</sup> The ETS has experienced serious problems stemming from free allocation. First, the ETS allocated too many allowances in the first trading period, which simultaneously caused a collapse in the allowance market and undermined the environmental goals of the program. Second, power plant owners have reaped enormous windfall profits at consumer expense through the allowance allocation scheme. (See "Windfall Profits in the European Union Emission Trading Scheme," page 17.)

**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."<sup>11</sup> All 10 participating states have committed to auctioning 100 percent or nearly 100 percent of their allowances.<sup>12</sup>

# The Case for Auctioning WCI Pollution Allowances

There are many reasons why the auctioning of pollution allowances under WCI’s 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, to offset the costs of the program to consumers and to accelerate the transition to a clean energy economy.

## Auctioning Allowances Is Fair

### **The Atmosphere Is a Public Resource**

No one owns the atmosphere. Or rather, we all have a stake in the atmosphere as a public resource—one that plays a critical life-sustaining role in protecting us from solar radiation and managing temperature and weather—a resource that should be managed for the benefit of the public.

If the atmosphere 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 U.S. 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.<sup>13</sup>

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 general public, should pay the costs imposed by their pollution on society. This principle has been long established in U.S. environmental law, from the Clean Air Act to the Superfund toxic waste cleanup program.

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 appropriately discourage pollution.

All cap-and-trade programs—regardless of how allowances are distributed—internalize at least some of the cost of pollution. 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 may 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 15.)

Auctioning allowances ensures that all polluters pay for the authorization to emit global warming pollutants. Bigger polluters pay more, smaller polluters pay less. The cost of those allowances is also passed down, to a greater or lesser 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 advantages 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, WCI and its partner governments would be responsible for distributing 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 simply on the willingness of polluters to pay for them. Government’s role would be limited to setting up a transparent and fair

mechanism for conducting the auction.

In an auction system, WCI partner 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 each 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, and government policy-makers could decide to change those uses over time as the program evolves. (See “Auctions Can Protect Consumers and Businesses and Maximize Economic Benefits of Global Warming Solutions,” page 18.)

## Auctioning Allowances Is Less Costly to Society

Economic research shows that auctioning allowances, along with “recycling” the revenue back to consumers, 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.<sup>14</sup>
- 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.<sup>15</sup>

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 the burden across society would be lighter.

That reaction, however, is rooted in a common misunderstanding of the difference between *costs* and *prices*. The price of a given item is determined not by the cost of producing it, but rather by the interplay of supply and demand. Professor Kristen Sheeran of St. Mary’s College of Maryland illustrates the difference this way:

Try buying World Series tickets from a scalper. Would he charge you any less if he found the tickets on the ground or got them free from a friend inside the ticket office? Of course he wouldn’t. Like energy, the street price of World Series tickets is based on supply and demand. The supply and demand for tickets is the same no matter how much the scalper paid for them, and so the price he charges you will also be the same no matter how he got them.

Of course, the scalper would much rather get his tickets for free—and that’s precisely the point. Polluters are financially much better off if permits are given away instead of auctioned, but the cost of cutting emissions and the resulting effect on energy prices will be the same no matter how the permits are delivered. Giving permits away allows polluters to raise their prices without raising their costs.<sup>16</sup>

There is, however, one very important exception in which the price of energy is directly related to the cost of producing it: the regulated Western electricity market. The following two sections describe the impact of auctioning allowances in both unregulated and regulated markets.

### **Auctioning Allowances in an Unregulated Market**

If WCI were to distribute the allowances to polluters for free, it would not bring down the price of the end products, but it would bring windfall profits to the polluters at public expense.

Practical experience and economic models show that manufacturers or energy companies would capture the value of emission allowances through higher prices whether they must pay for those allowances or not. In other words, prices rise to an equal degree regardless of whether allowances are given away or sold. When allowances are given away, polluters can raise their prices and pocket the value of the allowance, leading to windfall profits.

Windfall profits are a real and significant concern for all unregulated markets in activities that cause global warming pollution, including transportation, building operations and industrial processes. In the United Kingdom, where the electricity market is not regulated the way it is in the West, electricity producers have netted an estimated £1 billion (about \$1.9 billion) in windfall profits through participation in the European Union's Emission Trading Scheme.<sup>17</sup> 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.

In reality, companies vary in their ability to reap windfall profits from free allocation of allowances. In many cases, companies may be unable to pass through 100 percent of the value of allowances to their customers. But auctioning allowances can

## **“Whatever happened to the principle of ‘polluter pays’?”**

– The investment bank, UBS, on the European Emission Trading Scheme, in which the vast majority of allowances are given away to polluters for free

eliminate the potential for windfall profits in a cap-and-trade system.

### **Auctioning Allowances in a Regulated Electricity Market**

Regulated utility markets operate much differently than unregulated markets. In regulated markets, such as those common in western states, a regulatory commission reviews a utility's costs of producing electricity and then allows it to pass approved costs directly on to electricity consumers. In other words, prices and costs are linked. Because giving away an allowance to a utility does not increase that utility's cost of producing power, the price to consumers should—given the presence of an effective regulatory commission—remain the same, thereby preventing the utility from reaping a windfall profit.

Requiring a utility to pay for an allowance, on the other hand, would increase its cost of producing power and those costs would presumably be passed on directly to electricity ratepayers. But there remain good reasons to auction allowances, even in a regulated electricity market.

First, auctions ensure that any and all global warming pollution emitted by a utility is incorporated in investment decisions that affect the level of pollution, such as whether to retire an old coal-fired power plant. Most state regulatory commissions, in addition to determining rates, also require utilities to pursue investment strategies that minimize the cost of power to consumers over time. Auctioning allowances ensures that the cost of carbon

## 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'?"<sup>18</sup>

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.<sup>19</sup> Similar windfall profit gains are likely to have occurred in other European countries as well.<sup>20</sup> World Wildlife Fund, 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.<sup>21</sup>

dioxide is factored into utility investment decisions at every level.

Similarly, the increase in electricity prices that results from auctioning allowances sends price signals to consumers to encourage more efficient use of energy. Shielding consumers from the higher cost of power by giving allowances away to utilities might seem like a good idea. Unfortunately, it also encourages consumers to use more electricity, thereby requiring utilities to make additional investments (the cost of which is eventually passed on to ratepayers) to reduce the amount of pollution they produce per unit of power they supply. Auctioning allowances, and incorporating the cost of those allowances in rates, encourages consumers to use less energy—reducing the need for costly utility investments in the future.

There are ways to protect consumers from the impact of higher energy prices while maintaining the price signals that

encourage energy conservation. One way to do so is to help consumers save power by investing some auction revenues in energy efficiency programs. Another way is to return some of the proceeds from an allowance auction to consumers on a flat, per-capita basis. Such a system would help the families that would be most affected by the increase in electricity prices, while still preserving the economic incentive for everyone to conserve energy and demand cleaner electricity.

In the long term, all consumers will be better off if a cap-and-trade program provides the right incentives to invest in clean and efficient technologies. Whether looking at the transportation market or the regulated electricity market, auctioning 100 percent of emission allowances reduces the societal cost of achieving a given level of emission reductions and prevents polluters from receiving unjustified windfall profits.

# Auctions Can Protect Consumers and Businesses and Maximize Economic Benefits of Global Warming Solutions

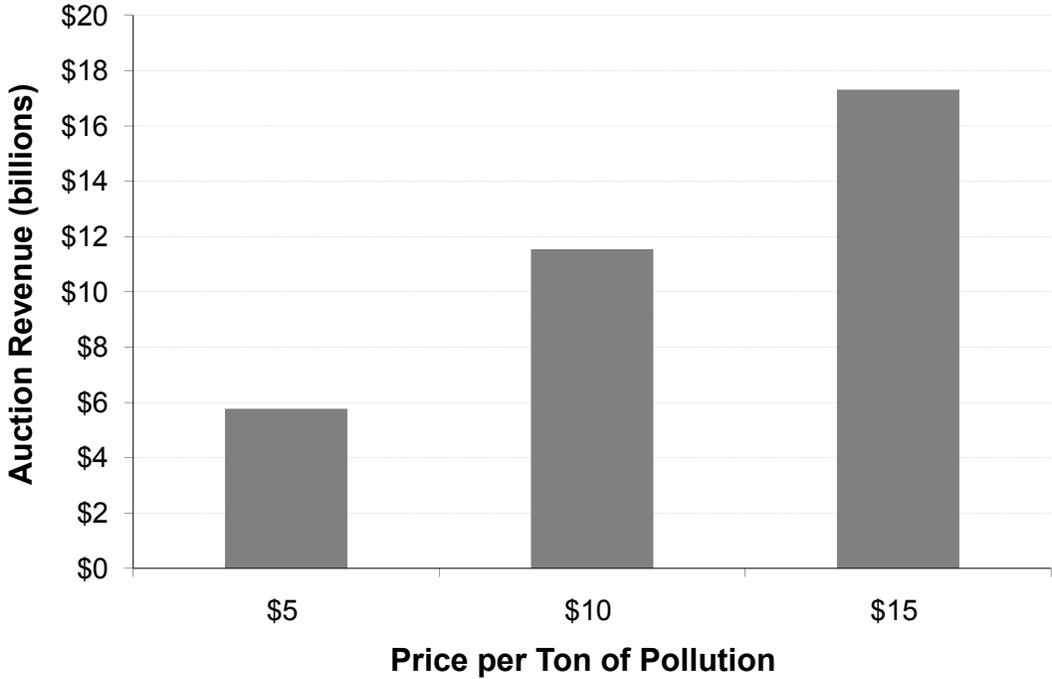
Opponents of auctioning pollution permits have argued that doing so would be too expensive for energy consumers. Such critiques, however, miss two important points. First, consumers already “pay” the cost of global warming pollution in the form of drought, fire and other impacts of climate change. Addressing global warming will reduce these costs. Second, reducing the price of electricity is not the only way to reduce the amount that consumers spend on energy.

A thoughtfully designed cap-and-trade

program can achieve the goal of reducing global warming pollution while potentially saving consumers money on energy. Throughout the United States, ratepayer-funded energy efficiency programs have charged consumers slightly higher *rates* in order to finance efficiency programs that reduce energy *bills*. Thoughtful investments in low-carbon transportation infrastructure, such as more fuel-efficient cars and trucks, and expanded public transportation, can achieve the same goals.

By designing a cap-and-trade program to promote efficiency, WCI can naturally encourage improvements in energy efficiency and renewable energy that will pay dividends in financial savings and a cleaner and healthier environment for decades to come. Auctioning is a crucial mechanism for encouraging efficiency and funding efficiency programs in WCI.

Figure 1. Illustration of Potential Annual Revenues from WCI Allowance Auctions<sup>23</sup>



## **Auctioning Allowances Will Generate Billions of Dollars to Reinvest in Global Warming Solutions and Measures to Lower Energy Costs**

It is difficult to estimate the amount of revenue that would be generated by a WCI allowance auction. Much depends on the scope of the cap-and-trade system (what set of emitters is covered) and the price of emission allowances.

Economy-wide, WCI partners emitted about 1,154 million metric tons of carbon dioxide-equivalent in 2005, the baseline year for the program.<sup>22</sup> (This figure includes all global warming pollution from the Canadian partners and energy-related carbon dioxide emissions from the U.S. partners.) If the initial market price for allowances were to be \$5, and that emissions were initially frozen at 2005 levels, an auction of all allowances would generate \$5.7 billion, although the actual cap level could be greater or less than that. Allowance tightening in later years would raise the price of allowances, likely resulting in even higher revenues.

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

- To promote energy efficiency in homes, businesses, industry and transportation, 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 Promotes Clean Technologies that Lower Costs in the Long Run,” page 23.)
- To invest in programs that reduce vehicle-miles traveled by providing

alternatives to driving single-occupancy vehicles, a key strategy for reducing global warming pollution from the transportation sector and a primary means of helping consumers avoid high gas prices.

- To return some of the proceeds of the program to consumers hit hardest by high energy prices, both through targeted energy efficiency investments and direct ratepayer assistance.

Each of these investments serves 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.

## **Auctioning Allowances Can Be Used to Promote Energy Efficiency, Reducing the Near-Term Cost To Consumers and Businesses**

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 bills by 18 percent (*including* the cost of allowances), and reduce U.S. carbon emissions by 30 percent by 2020, bringing emissions back to 1990 levels.<sup>24</sup> Recent analyses confirm that efficiency alone could reduce American energy usage across the economy by 20 percent or more while saving more money in energy costs than would need to be spent on the requisite programs.<sup>25</sup>

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.”<sup>26</sup>

Well-designed, adequately 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 by states have posted impressive results in saving energy. West Coast states, for example, have long prioritized energy efficiency, both through regulation (e.g., building codes and 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. Efficiency

improvements installed by the major utilities in California since 2006 alone are saving the equivalent of 7 percent of the electricity generated by utilities in the state and 1 percent of the natural gas delivered to buildings.<sup>27</sup>

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.<sup>28</sup> 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 (RGGI) found that pairing the cap-and-trade program with strong energy efficiency efforts resulted in an overall reduction in consumers’ household energy bills.<sup>29</sup> Increased energy efficiency investment also reduces the cost of global warming emission allowances under the cap-and-trade program.<sup>30</sup>

Auctioning allowances and devoting a significant share of revenues to 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 is not 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. 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.

Auctioning allowances, and returning some of the auction revenue directly to consumers—particularly low-income consumers—can alleviate some of these price impacts.

There are several schools of thought on the best way to return allowance revenue to consumers.

One 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 that are not devoted to other purposes, such as energy efficiency and renewable energy, on an equal per-capita basis. Distributing the auction revenues equally would ensure that everyone, regardless of their income or energy usage patterns, receives the same share of benefits from the auction. 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 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. Every 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.<sup>31</sup>

An equal, per-capita rebate of a portion of auction revenues would ensure that low-income households are adequately protected from any increase in the price of energy or products that results 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.<sup>32</sup> (See Figure 2.)

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 for the entire United States. 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

Figure 2. Share of Household Income Spent on Energy, 2004<sup>33</sup>

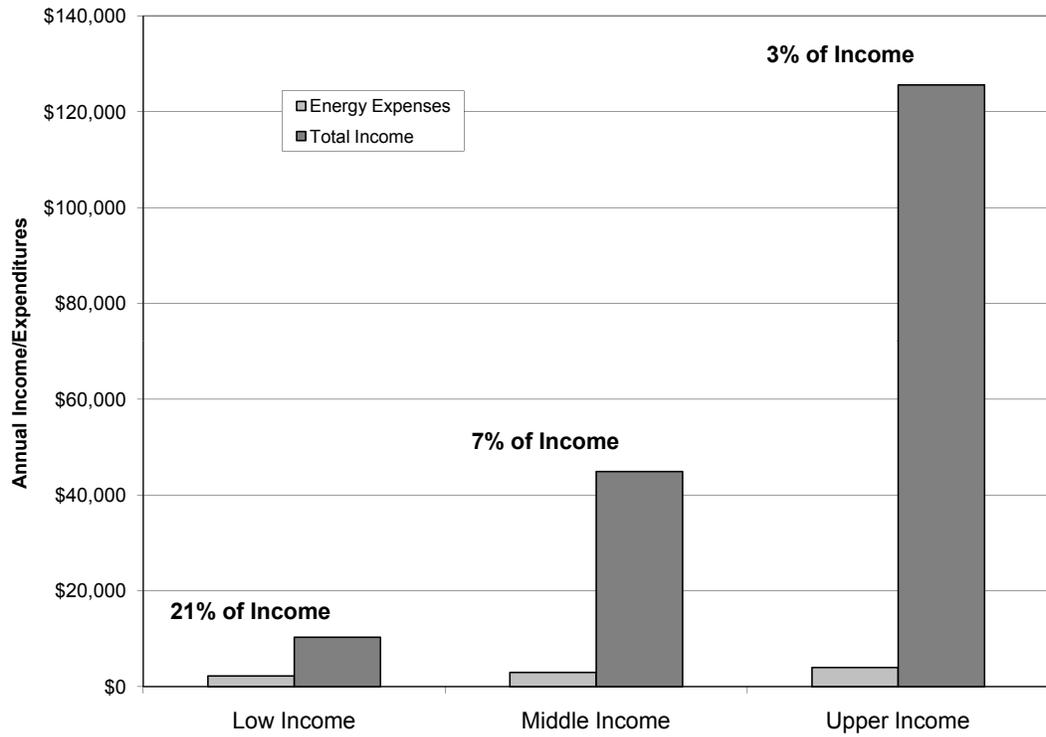
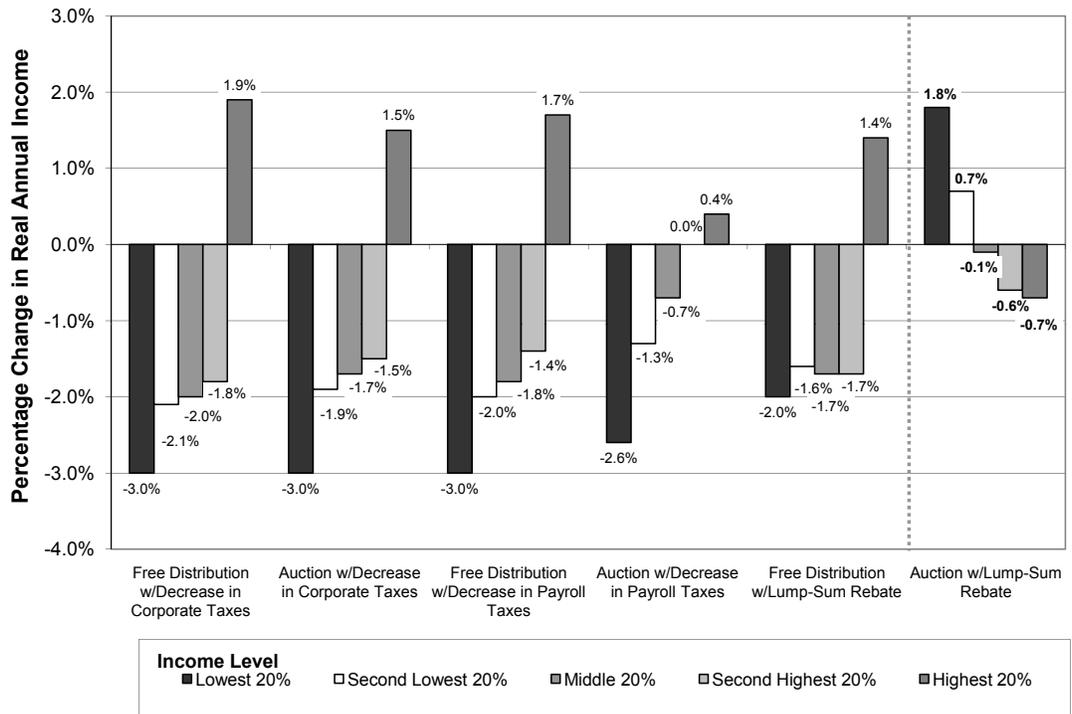


Figure 3. Impacts on Real Annual Income for Households from 15 Percent Cut in Carbon Dioxide Emissions by 2010, by Income<sup>35</sup>



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.<sup>34</sup> Middle income households also fare better under lump-sum rebates than under either tax reduction scenario. (See Figure 3.)

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.

A portion of the auction revenue should be used for low-income energy bill assistance programs. These programs already exist to help consumers with electricity and heating bills. A portion of revenues from an auction could augment these already under-funded programs to help low-income consumers deal with rising energy costs.

## Auctioning Allowances Promotes Clean Technologies that Lower Costs in the Long Run

Achieving significant reductions in global warming emissions will require a shift from old, polluting technologies to new,

clean ones. WCI’s cap-and-trade system must encourage that transition if it seeks to reduce global warming emissions at the lowest possible long-term cost. Auctioning allowances supports the goals of a clean energy transition in two key ways: by ensuring that dirty and clean technologies compete on 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

WCI’s 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 the case of competitive markets, creating the opportunity for polluters 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.<sup>36</sup>

Auctioning allowances puts all emitters—dirty and clean, old and new—on a level 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 encourage a transition to cleaner, low-carbon 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 Promote Clean Energy Technologies and Efficient Infrastructure**

As noted above, auctions inherently help reduce global warming pollution by putting 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 deploying current renewable energy technologies, we can accelerate the pace of global warming pollution reductions. And by investing in the development of the next wave of such technologies, we can ensure that technologies are available when we need them to achieve the steep reductions in global warming emissions the West 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.<sup>37</sup>

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.<sup>38</sup>

“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.”<sup>39</sup>

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.<sup>40</sup> 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.<sup>41</sup> 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 if 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.<sup>42</sup> Unfortunately, solar photovoltaic (PV) power, or electricity generation from solar panels, 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. With this phenomenon in mind, California has already started to push solar PV with its Million Solar Roofs initiative, which prompted the addition of more solar PV capacity in its first full year of operation than the state had seen in the previous decade.<sup>43</sup> Oregon recently increased its residential and business energy tax credits for solar PV systems. As a result, the rate of growth in solar PV capacity has increased significantly.<sup>44</sup>

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.

In addition to R&D and deployment of available clean technologies, auction revenue could be used to develop infrastructure that is more energy-efficient and helps reduce global warming pollution, such as improved public transit service and transit-oriented development. By improving public transit options and lowering fares, WCI partners can decrease global warming pollution from transportation by offering more people alternatives to driving. Transit-oriented developments are compactly developed areas adjacent to transit stops that are designed to take full advantage of the asset by bringing people closer to transit and transit users closer to destinations. Expanding usage of public transit also brings large benefits beyond lowering global warming pollution directly, including providing an alternative to expensive highway expansion projects.

# Conclusion and Recommendations

Cap-and-trade promises to be one of the most important tools used to achieve the dramatic reductions in global warming emissions our society must achieve to prevent the worst impacts of global warming. But its success depends critically on the details of how the cap-and-trade system is designed and implemented.

By auctioning global warming pollution allowances, WCI 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, WCI and its partners should adopt the following recommendations:

- Auction 100 percent of emission allowances.
- Use the revenues from auctions to:
  - o Support clean energy technological development, including research and development funding and early market support for clean technologies.
  - o Invest in energy efficiency improvements to reduce energy and transportation costs to consumers.
  - o Invest in low-carbon transportation infrastructure such as public transit to provide driving alternatives to more people.
  - o 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, targets for reducing vehicle-miles traveled, 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. Also see Jon Creyts, et al., U.S. Greenhouse Gas Abatement Mapping Initiative, *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?*, December 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 Schnellhuber, ed., *Avoiding Dangerous Climate Change*, Cambridge University Press, 2006.
5. Intergovernmental Panel on Climate Change, *Climate Change 2007: Mitigation of Climate Change*, May 2007.
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