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New Tools for Improving Government Regulation: An Assessment of Emissions Trading and Other Market-Based Regulatory Tools

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The PricewaterhouseCoopers Endowment for
The Business of Government

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Foreword

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On behalf of The PricewaterhouseCoopers Endowment for The Business of Government, we are pleased to publish what is now our sixth research grant report. This report by Gary Bryner, "New Tools for Improving Government Regulation: An Assessment of Emissions Trading and Other Market-Based Regulatory Tools," provides a comprehensive overview of this regulatory tool on the federal, state, and international level, and offers recommendations as to when and how it can be effectively used.

Market-based approaches to environmental regulation are popular tools for achieving environmental results. Emissions trading has fostered innovation, saved companies money, and reduced emissions that cause smog problems. The principle of emissions trading is to use market incentives to achieve environmental objectives at the lowest possible cost. Emissions trading programs can provide a powerful incentive for pollution sources to reduce the amount of pollutants emitted into the atmosphere, and then sell the excess allowances to others.

Although not a cure-all for the problems of environmental regulation, emissions trading programs can help the environment and the economy. If structured correctly, emissions trading programs should create a fundamental shift in practices that affect the environment, and not just a one-time decrease in emissions. The research and recommendations contained in Professor Bryner's research will shed light on how and under what circumstances a successful emissions trading program should be structured, and will further understanding of market-based regulatory tools. We hope that you find this report informative and helpful.

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Executive Summary

Critics of environmental regulation argue that current pollution control policies are inefficient, and that it is too costly to impose nationwide standards on sources of pollution that differ according to local conditions. They believe it makes little sense, from an economic perspective, to require all sources to comply with these regulations, even though the cost of compliance varies considerably across sources. Regulations that mandate specific control technologies lock industries into existing equipment and processes, and fail to create incentives for industries to develop new, cleaner, more efficient technologies.

One of the most important and popular remedies for the ills that many believe plague environmental regulation is the use of market-based approaches to regulation. The purpose of this report is to examine the use of emissions trading in air pollution regulation, the most widely used market-based regulatory tool, discuss its strengths and limitations in regulatory programs, and suggest when and how emissions trading might best be employed in environmental regulation.

Market-based regulatory tools, particularly emissions trading programs, promise to dramatically reduce the cost of achieving environmental goals, while giving regulated industries more flexibility, and to streamline the tasks of regulatory agencies. In emissions trading, polluters are allocated a limited number of allowances, or units, of emissions for release into the environment. Companies can either make the changes necessary to stay within the limits or buy allowances from others. Tradable emission permits can be saved or banked for future use, or sold by polluting companies as long as limits on total emissions are not exceeded. Polluters have an incentive to reduce their emissions beyond their allowances so that they can generate revenues through the sale of their excess allowances. Total emissions can be reduced over time by decreasing the number of allowances distributed to pollution sources.

Emissions trading programs were the basis of the national acid rain program that reduced emissions from coal-fired power plants, and are part of many state programs to achieve national air quality standards and other environmental goals. Emissions trading and other market incentives will continue to play a central role in dealing with problems such as acid rain and ozone depletion, and are expected by many to be a central element of whatever efforts the United States and other countries undertake to achieve the goals agreed to under the Kyoto Protocol for climate change.

Emissions trading makes sense in addressing some regulatory tasks, such as giving sources more flexibility by allowing them to meet facility-wide emission limits rather than imposing standards on each source. Emissions trading may be a critical element in generating political support for new regulatory initiatives.

However, the popularity of emissions trading poses a risk: It may be seen as a panacea for the problems of regulation and be used in situations where its disadvantages outweigh its advantages. Emissions

trading, if not carefully designed and integrated with other regulatory requirements, can create problems such as high concentrations of pollutants in some areas, particularly those where low-income residents live. Trading may undermine the power of moral arguments that pollution should be reduced and challenges the principle that all sources of pollution should reduce emissions. It may fail to create incentives for the development or dissemination of new control technologies. Trading requires emissions monitoring equipment and processes that may simply not be in place. It requires regulatory officials and managers of regulated facilities to take risks with new approaches to regulation.

Experience suggests that emissions trading programs work best when they are based on accurate emissions information, are built on emission limits that give adequate protection to environmental quality and natural resources, are stable, predictable, and rigorously enforced, and are combined with requirements that sources make some minimum emissions reductions. In addition, emissions trading programs need to be seen as a stepping-stone to other policies that increase the extent to which the true costs of production are included in the prices charged, and they need to create more effective incentives to reduce pollution and encourage economic activities that are ecologically sustainable.

Introduction*

Environmental policy in the United States is a study in paradox. Public opinion polls and other measures of public sentiment show strong support for environmental regulation.[1] Recent reports have found that significant progress has been made towards improving environmental quality; the nation's air and water is cleaner; national programs are helping implement new international agreements to reduce global environmental risks; threats to children's health posed by lead in the environment have diminished; farmers are reducing soil erosion and pesticide runoff into streams; and industries are reducing their release of toxic pollutants.[2]

Despite this progress, reforming environmental law and regulation has become a regular refrain of American politics and policy-making. As soon as the ink was dry on the first modern federal environmental laws, critics began questioning whether they were too expensive and intrusive. As the framework of environmental law developed into a complex maze of statutes, rules, and agencies, a growing number of voices from a variety of perspectives have called for changes in the way in which we regulate pollution and pursue environmental quality.

One of the most important and popular remedies for the ills that many believe plague environmental regulation is the use of market-based approaches to regulation. In the conventional, or command-and-control, approach to regulation, federal agencies issue national standards that apply to all sources in all areas, and agency officials mandate specific technologies and compliance actions. Market-based regulatory tools seek to create incentives for companies to find the most cost-effective ways of reducing emissions. This gives companies the flexibility to devise their own methods for achieving the reductions required of them.

There are several kinds of market-like mechanisms that might be employed in environmental regulation:

- monetary incentives, including taxes, fees, subsidies, and tax incentives;
- government-created markets for buying, selling, saving, and trading emissions;
- deposit/refund systems that discourage disposal and encourage collection or recycling of pollution-producing materials;

** I am pleased to acknowledge the many colleagues, scholars, government officials, and activists with whom I have discussed, over the past decade, market-based regulatory tools and other ideas for improving environmental regulation. I have received helpful comments and suggestions in exchanges with discussants and other participants at conferences of the American Political Science Association, Western Political Science Association, and the Association for Policy Analysis and Management; reviewers for and editors of books I have written on environmental policy with CQ Press, St. Martin's Press, and W.W. Norton and Company; policy analysts at the Office of Technology Assessment; members of the Clean Air Network; and Sheldon Kamieniecki, George A. Gonzalez, and Robert O. Vos, editors of* Flashpoints in Environmental Policymaking*, State University of New York Press, 1997. I wish to thank Mark A. Abramson for his interest in and support of the project, Susan Mitchell for the many improvements she made to the paper, Stuart Fribush and Barry Korb for many helpful comments and suggestions, and The PricewaterhouseCoopers Endowment for The Business of Government for its interest in and commitment to improving the effectiveness of government.*

- disclosure of information to consumers;
- environmental auditing and releasing public data on kinds and levels of emissions;
- government procurement policies.[3]

The two most controversial instruments are pollution charges and emissions trading. Pollution charges, or taxes, are levied on emissions of pollutants or on input to activities producing pollutants. Polluters are charged a fee for each unit of pollution they emit. A pollution tax or fee, if it is high enough, can provide a strong incentive for companies to reduce their emissions in whatever way is most efficient for them, such as closing down some operations, using cleaner fuels, investing in control technologies, or changing work practices. It also provides a clear incentive for reducing emissions below permitted levels.

In emissions trading, polluters are allocated a limited number of allowances or units of emissions for release into the environment. Companies can either make the changes necessary to stay within the limits, or they can buy allowances from others. Tradable emission permits can be saved or banked for future use, or sold by polluting companies as long as limits on total emissions are not exceeded. Polluters have an incentive to reduce their emissions beyond the allowances given to them so that they can generate revenues through the sale of excess allowances.[4] Over time, decreasing the number of allowances distributed to pollution sources can reduce total emissions further.

The use of market-based regulatory tools raises three primary questions, which are addressed in this report.

1. **How well do market-based approaches help achieve their goal of reducing the costs of compliance and making regulation more cost effective?**

   Given the billions of dollars spent on pollution control and cleanup ($140 billion a year according to some estimates) there are strong expectations that market-based tools can significantly reduce the cost of environmental regulation.

Market-Based Tools for Environmental Regulation[5]

Deposit/Refund Systems	Payments required when purchasing products or containers that are refunded when products/ containers are returned
Emissions Trading	Sources are allocated emission permits that can be bought, sold, or traded in order to meet levels of emissions permitted
Fees	Payments for services provided, such as monitoring of emissions or treatment of pollutants
Government Procurement	Purchases by governments of products that have desirable impacts on environmental quality
Reporting Requirements	Sources of emissions are required to disclose to the public information on the kinds and quantities of pollutants released
Subsidies	Direct payments to encourage or discourage emissions production, conservation, or other behavior
Tax Incentives	Reductions or increases in taxes to encourage or discourage behavior
Taxes (Pollution Charges)	Mandatory payments for the release of pollutants and wastes based on the quantity of discharges

2. **To what extent do these regulatory tools contribute to the achievement of environmental quality goals?**

   No matter how well market instruments reduce the costs of spending on pollution control, the primary question is whether environmental problems have been effectively remedied and natural resources protected.

3. **How do market-based instruments facilitate the efficient and effective functioning of regulatory agencies, and contribute to the capacity of governments at all levels to achieve their policy goals?**

   The successes and failures of every major policy effort accumulate in ways that, over time, strengthen or weaken our ability to collectively solve common problems.

Emissions trading programs are the most popular market-based regulatory tools that the United States government is experimenting with, because of their promise to reduce compliance costs, increase the flexibility given regulated industries, improve the efficiency and effectiveness of regulatory agencies, and achieve environmental and public health goals. It is for these reasons that they are the primary focus of this paper.

Emissions trading programs have been enthusiastically embraced by both regulated industries and policy makers, and have become part of virtually every policy proposal currently before Congress and state and federal environmental protection agencies. It is difficult to imagine a new regulatory program being proposed that does not include at least some form of emissions trading.

This study focuses on three categories of trading programs and proposals:

1. federal emissions trading programs under the federal Clean Air Act, including sulfur dioxide emissions in the acid rain program, and other national efforts, which were the earliest efforts to devise emissions trading programs;
2. state innovations, such as Southern California's South Coast Air Quality Management District's RECLAIM program for trading sulfur and nitrogen oxide emissions;
3. trading programs in other advanced industrialized democracies.

This mix of regulatory innovations at different levels of government, for different environmental problems, and for different countries provides a broad base for examining the advantages and disadvantages of market-based regulatory tools and their implications for improving the management of regulatory agencies.

Emissions trading programs are also being used to deal with other environmental problems, such as reducing water pollution and the generation and storage of hazardous wastes, but space does not permit a discussion of all trading programs here.[6] The experience of emissions trading in air pollution programs can provide important lessons for its use in addressing other pollution problems.

Emissions trading programs are quite new, so definitive studies of their costs and benefits will come in the future. But given the tremendous interest in them, this study seeks to assess the strengths and weaknesses of trading programs, based on the limited experience with them, and suggests questions that policy makers and others should ask before they embrace market-based tools, particularly emissions trading, as a way to improve the effectiveness of existing regulatory programs and design the next generation of environmental laws and policies.

Study Findings

Emissions Trading Programs in Place

Federal Government Emissions Trading Programs
The U.S. Environmental Protection Agency (EPA) has experimented with a number of emissions trading programs. Beginning in 1974, the agency instituted the first trading program, the Offset Program. The Offset Program required that new sources beginning operation in areas that have not met national air quality standards must buy enough emission reductions to offset their projected emissions, plus purchase an additional percentage of reductions in order to contribute to the attainment of the air quality standards. Most of the credits purchased for offsets have come from the closing of existing facilities. One study estimated that more than 10,000 tons of pollutants have been bought and sold through offsets for more than $2 billion, but it is difficult to gain information because these trades are private transactions.[7]

If new emissions come from an expansion of an existing source, the increase can be offset from internal sources through a process called "netting." Netting has become the most commonly used trading program, because it has fewer restrictions than offsets. Owners of existing facilities frequently construct new sources, and they can use the netting process to avoid the costs and delays associated with obtaining permits to operate new sources of pollution. One of the EPA's most recent innovations, the Environmental Excellence and Leadership Program, or "XL" program, includes pilot projects that allow facilities to alter their mix of emissions without having to obtain a new operating permit as long as total emissions do not exceed the facility's cap.[8]

The second EPA trading program, proposed in 1979 and put in place in 1986, was the bubble policy. This policy allowed companies to receive credit for emissions reductions in a specified area, as opposed to an individual location. Total emissions from each facility could be viewed as encapsulated within a large "bubble," rather than from individual smokestacks. Or two new adjoining power plants could use the bubble concept to combine their emissions. Regulatory officials established maximum total allowable emissions and left managers free to determine optimal emissions from individual sources, so that total compliance costs could be minimized. By the mid-1980s, the EPA had approved some 50 bubbles, and states had approved many more under their authority. Bubbles are still used to give facilities some flexibility in meeting emission limits.[9]

A third experiment with trading began with the phase out of lead in gasoline in 1979, when the EPA limited the average lead content permitted for large refiners. These refiners could average the content of leaded and unleaded gasoline in order to show compliance. In order to meet reduction goals required by 1982 and beyond, the EPA allowed refiners and importers of fuels who reduced the lead content of their fuel below the new EPA standards to sell earned credits to other refiners or importers. This was done by allowing them to average the lead content of leaded and unleaded fuel.

Banking was discontinued in 1987, when all fuels were required to meet the standard, and the program was terminated in 1996 when all leaded gasoline for highway use was banned.

Other national programs authorized in the 1990 Clean Air Act Amendments have used trading mechanisms or variations. The Stratospheric Ozone Protection Program established a marketable permit system for producers and importers of chlorofluorocarbons (CFCs). Under this program, the EPA allows manufacturers of heavy-duty engines to meet emission standards by averaging emissions across their entire production and allows averaging between manufacturers. The Air Toxics Early Reduction Program allows sources of toxic pollutants that reduce emissions by 90 percent before national emission standards for hazardous air pollutants are proposed, to be able to delay their compliance with those standards when they are eventually issued.[10]

The EPA has also mandated emission limits for nitrogen oxide emissions (NOx) from electric utilities in the 12 Northeastern states and the District of Columbia in an effort to reduce ozone pollution. The Ozone Transportation Commission's (OTC) NOx Budget Program is in effect from May to November of each year, beginning in 1999. NOx allowances are allocated to sources in each of the states and the District of Columbia. These units may set up trading systems to implement the program and achieve the emissions goals. The emissions trading program will spread to 22 states in 2003. Interstate emissions trading for the OTC states, and an additional 24 Eastern states, is also being developed.[11]

One of the most important innovations of the Clean Air Act of 1990 was the market-based incentive system to reduce acid-rain-producing emissions from coal-fired power plants through a nationwide cap and trade system. The first set of major rules to implement the sulfur dioxide (SO_2) allowance trading program was issued in 1993 and took effect in 1995. The heart of the acid rain emissions trading system is a cap on total emissions projected by the year 2010, which will result in a reduction of sulfur dioxide emissions of 10 million tons from 1980 levels. The plan is implemented in two phases. In phase one, 110 plants in 21 Midwestern and Eastern states were

Emissions Trading in Federal Government Program

Offsets	New sources beginning operation in areas that have not met national air quality standards buy enough emission reductions to offset the new source's projected emissions, plus an additional percentage of reductions so that the new source helps contribute to the attainment of the air quality standards.
Netting	If new emissions come from expansion of an existing source, the increase can be offset from internal sources, through netting, so that the facility's owners can avoid the costs and delays associated with obtaining permits to operate new sources of pollution.
Bubbles	Companies can receive credit for emissions reductions in some areas for higher emissions elsewhere; total emissions from each facility are viewed as encapsulated within a large "bubble," rather than from individual smokestacks.
Averaging	Producers of products being phased out, such as leaded gasoline and heavy-duty engines, have been allowed to show compliance by using an average of their products, rather than being required to show that every product complies with the standard.
Early Reduction	Sources of pollutants can gain credits or delay compliance with future standards if they reduce emissions before reductions are required.
Cap and Trade	Allowances are allocated to sources; a cap on total allowances is set and ratcheted down to meet environmental goals; sources can buy, sell, or trade allowances in order to meet their emission limits.

given allowances in the 1990 act. An allowance is a permit to emit one ton of sulfur dioxide. Allowances have been allocated for the years 1995 through 2030 (they cannot be used for compliance until the years for which they are designated). In phase two, the number of sources included in the program will be greatly expanded. The allowances for these sources are allocated by a formula based on the amount of fuel the plants used during a base-year period. The number of allowances will be capped at 8.95 million tons per year by 2010, when the program is fully implemented. Plants that are able to control emissions below the levels allocated to them can save them for future use, or trade or sell their excess emission permits to others who exceed their allowance. Transactions do not need to be approved by the EPA.

The first trade of acid rain allowances occurred in 1992. The EPA also auctions a small fraction of the total allowances allocated each year at an annual auction. The first auction of SO_2 allowances took place in 1993. Anyone can bid for allowances, and all allowances are sold each year. The proceeds of the auction are distributed to the sources from which the allowances were withheld. Auctions include spot allowances, which are only valid for the immediate year, and advance allowances, which are valid for future years. Participating sources must meet stringent monitoring requirements, usually through continuous emissions monitoring.

Emissions trading is also central to the developing U.S. policy for climate change. In October 1997, the Clinton administration proposed a five-year, $5 billion program of tax incentives and research and development aimed at reducing carbon dioxide emissions that included an emissions trading scheme for greenhouse gases that would cut emissions by 30 percent from projected levels in 2008. Sources that moved early to reduce emissions would get credits that they could use later when and if allowances are issued. The trading system would eventually expand internationally, and U.S. companies could buy and sell their allowances to emit greenhouse gases and encourage the most cost-effective ways of reducing emissions.[12] A 1998 Clinton plan called for achieving up to 75 percent of the reductions by purchasing allowances from Eastern Europe.[13]

A bipartisan group of senators has recently introduced legislation that would amend the Clean Air Act to allow the president to make binding agreements with U.S. businesses that reduce their greenhouse gas emissions to get credit for those reductions if and when a mandatory program is devised. The legislation's future is uncertain. Industry groups have sent conflicting signals to Congress. Some have opposed the early credit scheme because it may encourage the ratification of the Kyoto Protocol. Others favor it as a useful protection for companies that make early reductions voluntarily in case binding reductions are later mandated.[14]

State and Local Government Emissions Trading Programs

There is considerable variety across the states in terms of the specific elements of emissions trading programs. (See page 12).[15] As of early 1999, 14 states have developed air pollution reduction programs that include some variation on the idea of emissions trading.[16] The programs were created between 1994 and 1998. The purpose of state-level programs is primarily to help bring the areas into attainment of national ambient air quality standards. The pollutants are particulate matter (PM), ozone, sulfur dioxide, nitrogen oxide, lead, and carbon monoxide. (Emissions of lead, the other pollutant regulated through national air quality standards, have fallen so dramatically, as a result of unleaded fuel, that lead is no longer a major concern of air pollution regulation.)

Most state programs are voluntary; regulated sources need not bank or sell or otherwise trade in emission allowances. If sources do choose to participate, they typically must demonstrate that reductions used to claim credits are quantifiable, real reductions in emissions, subject to enforceable requirements, surplus, and represent permanent reductions. Credits usually have a 10-year life. Some programs are limited to stationary sources, such as power plants and factories, while others include the creation of credits through vehicle scrappage programs, and some include reductions from area sources such as off-road equipment, consumer products, small commercial facilities, and other dispersed sources. Some states allow sources themselves to verify the creation of surplus allowances, while others require independent

State Emissions Trading Programs

California allows sources that exceed emissions of volatile organic compounds (VOCs) for one product to offset them by "overcomplying" with the standards for other products. Regulations issued in 1997 provide guidelines for interchangeable air pollution emission reduction credits for local air pollution control districts. They establish a uniform credit currency, expressed in pounds of pollutant in the year generated, for trades between stationary, mobile, and area sources for all the criteria pollutants except lead. The state also has in place several market-based measures to encourage the early retirement of motor vehicles and the use of cleaner fuels.[17]

Colorado's generic emissions trading and banking program, adopted in 1996, allows sources to generate emission reduction credits by shutting down or curtailing production or by changing processes or materials. Mobile credits can be generated by scrapping high-emitting vehicles and replacing them with lower-emitting ones, switching to cleaner fuels, and trip reduction plans. One city, Telluride, requires residents who seek a permit to install new fireplaces or wood-burning stoves to turn into the city two existing fireplace/stove permits for every new permit granted.[18]

Connecticut began allowing trading and banking of nitrogen oxide emissions for both stationary and mobile sources in 1995. Credits generated outside of the summer ozone season cannot be used within the season. Mobile source credits are discounted by 10 percent.

Delaware's trading and banking program, adopted in 1996, includes NOx and VOCs; the state discounts credits by 10 percent in order to improve air quality. Reductions occurring after January 1, 1991, are eligible. Trading between mobile and stationary sources is permitted, as is trading with sources outside of the state and within the Northeast Ozone Transport Region.

Georgia, in a program approved in 1998, allows owners of vehicle fleets to earn credits for their vehicles that exceed federal clean-fueled fleet requirements; they can bank them for future use or sell them to other fleet owners. Fleets include 10 or more vehicles that are centrally fueled. Owners can earn credit by purchasing clean-fueled vehicles earlier than required, purchasing more than is required, or purchasing those with emissions cleaner than required by federal standards.

Illinois instituted a pilot program in 1993 of buying and scrapping pre-1980 automobiles. The state purchased vehicles for between $600 and $1,000 and measures the tailpipe emissions and fuel evaporation before destroying them.[19] The program now permits "allotment trading units" to be earned by scrapping vehicles. Stationary sources operating in areas that violate national air quality standards may buy these allotments and use them to meet emission limits.

A **Louisiana** trading program, promulgated in 1994, is in effect only in areas with current or past ozone pollution problems, and includes sources of NOx and VOCs. Stationary sources may obtain allowances by scrapping vehicles; motorists are paid the fair market value of their vehicles.

Maine approved in 1998 a trading program for stationary sources of NOx and VOCs. Credits can be generated by any permanent change in emissions and have an unlimited life — they can be banked and used anytime in the future. Credits obtained from another New England state require a 15 percent surcharge (if a source needing 100 tons of credits buys them from outside the state, it must purchase 115 tons of credit; if the source is outside of New England but still within the Northeast Ozone Transport Region, it must buy two times the required credits). NOx credits can be used to offset VOC emissions and vice versa.[20]

Massachusetts' Innovative Market Program for Air Credit Trading, for NOx, VOCs, and carbon monoxide (CO), was placed in operation in 1994 and is in effect statewide. Credits can be generated through implementing more stringent controls, source reduction, fuel switching, energy conservation, fleet conversions, lawn and garden equipment trade-in, vehicle scrappage, or ride sharing. Inter-pollutant trading is not allowed. Massachusetts was the first state to have its economic incentives program approved by the EPA; since October 1996, the state has not been required to gain EPA approval of each credit generated and used.[21]

Michigan's Emission Trading Program, established in 1996, applies to all criteria pollutants and is available to all stationary, mobile, and area sources. Credits are discounted by 10 percent in order to contribute to improved air quality and can be used for up to five years.

New Hampshire adopted an Emissions Reduction Credits Training Program in 1997 to reduce NOx, VOC, and CO emissions from stationary, mobile, and area sources. The goal of the program is not to reduce emissions but to give sources subject to control requirements flexibility and opportunities to reduce compliance costs. Credits generated by facility shutdowns cannot be traded; if the source does not use them, they become public credits that state officials can use to create or retain jobs in the state. Credits cannot be banked for future use.

New Jersey's Open Market Emissions Trading program, established in 1996, authorizes the creation, use, and trading of emissions reductions from stationary or mobile sources for NOx and VOCs. Credits must be verified by an independent party, such as a licensed professional engineer or certified public accountant. Interpollutant trades are not allowed. Credits are discounted by 10 percent. Sources may also purchase credits from sources in other states to the west or south.

New York's New Source Review Offset Program, promulgated in 1994, allows credits only to be used to offset the introduction of new sources. Credits are not discounted and have unlimited life. All types of emission reductions are allowed, including shutdowns.

Pennsylvania's Nitrogen Oxide Allowance Requirements Program, approved in 1997, operates during the summer ozone season. It is a mandatory cap-and-trade program: fossil-fuel-powered electric-generating plants are allocated a certain number of allowances each season; sources may trade allowances in demonstrating that their emissions are within the allowances allocated. Other kinds of sources may voluntarily opt-in the program.

verification. Different states allow or prohibit interpollutant trading. Many states build into their trading program a requirement that the value of credits be reduced or discounted in order to decrease emissions over time and ensure that air quality improves.[22]

One of the most ambitious emissions trading schemes has been developed in southern California. The South Coast Air Quality Management District (SCAQMD), the agency responsible for addressing the greater Los Angeles area's air pollution problems, put in place an emissions trading program called the Regional Clean Air Incentives Market, or RECLAIM, in 1994. RECLAIM affects some 350 sources in the Los Angeles area that produce at least four tons of nitrogen or sulfur oxide emissions a year. These sources are required to reduce their emissions by a fixed percentage each year for the regulated pollutants. They are given an annual allocation of allowances and are free to find the most cost-effective means to reduce emissions. Sources that reduce emissions of nitrogen and sulfur oxide beyond the caps imposed on them may sell their excess credits, called Regional Trading Credits, to companies that have exceeded their limits.[23]

A brief mention should be made of a number of other market-based incentive programs that states have devised that do not involve trading systems, but are reflective of the range of possibilities for making environmental regulation more efficient. Maryland, for instance, was the first state to institute a "gas guzzler" law that imposes a surcharge on the sale of cars that consume high levels of fuel and gives a rebate to buyers of fuel-efficient automobiles.[24] Florida and California have developed congestion pricing programs that vary the price of traffic on toll roads, depending on the time of day and level of congestion. Since 1994, Maricopa County, Arizona, has had in place a trip reduction program that includes several market-based incentives such as parking charges, preferential parking for carpool vehicles, and subsidies and prize drawings to encourage the use of alternative modes of transportation.[25]

Other Countries' Experience with Emissions Trading Programs

As is true in the United States, European countries primarily rely on traditional, or command-and-control, approaches to environmental regulation. Most of the advanced industrialized democracies of Western Europe — countries that are members of the Organisation for Economic Co-operation and Development (Canada, Japan, and the United States are also members of OECD) — have increasingly devised and implemented market-based innovations to regulation, but have selected approaches much different from the emissions trading programs that have been employed in the U.S.

In the 1970s and 1980s, a number of these countries instituted emissions taxes and charges. By 1987, approximately 80 different environmental taxes and charges were in place in 14 OECD countries. Between 1987 and 1993, the number of economic instruments used in environmental regulation increased by 50 percent. In the 1990s, OECD countries increasingly turned to "green" taxes to create financial incentives for environmental protection. The initial policy debate focused on whether countries should embrace traditional command-and-control regulation or market-based instruments. That question is now largely obsolete, as virtually every OECD country relies on a mix of both approaches, with market-based programs typically used as adjuncts to traditional regulatory schemes to create additional incentives for reducing emissions and/or to generate resources for other environmental protection efforts.[26]

Few European countries have followed the United States' lead in developing tradable emissions permit systems. German air pollution law allows sources to transfer emission reduction obligations, but that rarely occurs. The Netherlands has a bubble policy for power plants that allows facilities to treat all emissions from one facility as one source. Australia, Canada, and the United Kingdom have considered pollution trading policies, but no country has embraced the idea of emissions trading except the United States.

Europeans have chosen, instead, to focus on green taxes. Denmark, Finland, Norway, Sweden, and the Netherlands, for example, have all introduced carbon taxes. Many countries have imposed ecotaxes on leaded gasoline, pesticides, fertilizers, chemicals, batteries, lubricants, and packaging.

Europeans also have in place high energy taxes that lend themselves to restructuring for environmental purposes. They are also becoming increasingly interested in identifying tax and spending subsidies that result in environmental harm, such as free

Examples of Market-Based Instruments in European Environmental Regulation

Water Effluent Charges	France and other countries use these charges to finance pollution control facilities.
Ecotaxes	Sweden uses taxes to encourage reduction of sulfur content of fuels. Norway taxes carbon dioxide emissions from stationary sources and motor vehicles. Denmark has increased taxes on non-hazardous wastes to encourage recycling. Most countries impose high taxes on gasoline to encourage conservation.
Deposit/Refund Systems	Several countries in Europe require deposits for aluminum cans, plastic containers, and glass beverage bottles.
Emissions Trading	Rarely used; the Netherlands has a bubble policy in place.

parking and company vehicles for employees, which encourages driving; reduced taxes for diesel fuels; subsidies for coal and water development; and agricultural payments.

Some countries, particularly the Scandinavian nations, are transforming their entire tax system to be more environmentally friendly. Sweden's 1991 tax reform law reduced income taxes and replaced the lost revenue with new taxes on carbon, sulfur, and nitrogen oxides. Denmark has shifted taxes from labor and income to pollution and scarce natural resources. The Netherlands has a number of ecotaxes that generate about 2.5 percent of the nation's total tax revenue.[27]

Results of Emissions Trading Programs

Emissions trading is an important and useful innovation in environmental regulation in the United States. As the experience with this regulatory tool in federal and state environmental programs shows, pollution trading can reduce the compliance costs of regulated industries and give them more flexibility to meet emission goals, and can also help generate political support for new regulatory programs and serve as the basis for fashioning compromises acceptable to a wide range of interests. Carefully designed programs can simplify some of the regulatory tasks for government agencies and reduce compliance burdens that fall on regulated sources.

Trading programs may reduce the cost of achieving expensive environmental goals to acceptable levels, and may make it possible to take on environmental problems that otherwise are not addressed. They may encourage the diffusion of relatively inexpensive control technologies that reduce emissions enough to achieve environmental standards when combined with the purchase of emission credits. Most importantly, emissions trading can serve as a transition to a more effective set of market-based regulatory instruments.

However, trading should be used with caution. Emissions trading, if not carefully designed and integrated with minimum standards, can result in problems such as high concentrations of pollutants in some areas. Enthusiasm for its use may divert attention from decisions about what is required to achieve environmental goals. Trading may undermine the power of moral arguments that pollution should be reduced and conflicts with the expectation that all sources of pollution should take action to reduce emissions. It may fail to create incentives for continued technological innovation if pollution sources buy emission credits rather than invest in control equipment. Trading requires emissions monitoring capacity that may simply not exist. Some pollutants, particularly those where the total volume of pollution is the concern, are better suited for trading programs than pollutants posing localized health and environment threats. Introducing an emissions trading program, like any other policy change, creates some uncertainties and risks that regulatory officials and regulated industries may both resist.

Trading is not a panacea for all the difficulties posed by environmental regulation. It is not suitable for use in every regulatory program. The challenge is to determine when it should be used, and, when it is appropriate, how to design and implement trading in ways that ensure environmental protection and economic efficiency goals are achieved.

Reducing Regulatory Costs

Emissions trading programs generally reduce the cost of compliance for regulated industries. The acid rain control program is widely viewed as resulting in a significant reduction in the cost of pollution controls. The initial projections for meeting the goals of the acid rain program estimated compliance costs of $4.9 billion a year by 2010. The U.S. General Accounting Office's most recent estimate of those costs is now less than $2 billion a year in 2010.[28]

Industry groups estimated that the cost of reducing a ton of emissions under the traditional regulatory approach at about $1,500/ton; the EPA's estimate, about $650/ton. The actual prices of allowances available for purchase between 1993 and 1996 at the Chicago Board of Trade (where allowances are traded like other commodities) fell from $122 to $66. Transactions for more than 36 million allowances have been recorded, 25 million of which have been traded between different companies. Trades within companies are believed to be more numerous than those between firms (trades

Strengths and Weaknesses of Emissions Trading

Strengths	Weaknesses
Usually reduces the cost of achieving regulatory goals	May result in hot spots — areas of concentrated emissions where sources buy permits from others instead of reducing emissions — if it is not carefully integrated with ambient air quality standards and if monitoring of these areas is inadequate
Usually gives regulated sources more flexibility and discretion in meeting the emission goals given them	May not require all sources to make at least some emissions reductions
Helps generate broad political support for new regulatory programs by promising to reduce the cost of meeting new environmental goals	Requires accurate monitoring data for emissions, but monitoring data or instruments may not exist; also requires aggressive enforcement of monitoring and reporting requirements
Reinforces the idea that regulation can help prices approximate true costs, including the environmental costs associated with producing goods and services	May fail to encourage the development and dissemination of new technologies and processes to reduce or eliminate emissions if companies simply choose to buy credits rather than invest in pollution control
Can simplify some administrative tasks of regulatory agencies by focusing on outputs rather than on mandates for control technologies and processes	May be opposed by agency and industry officials who fear the uncertainties and risks of failure associated with policy changes and the possibility that trading may not achieve the environmental goals in place
May encourage the development and broader use of control technologies that are cost-effective and might not otherwise be used because they don't produce compliance with emission standards	

within firms are not yet required to be reported). The EPA has also auctioned over 500,000 allowances since 1993.[29]

According to a 1998 study by the president's National Science and Technology Council, the costs of administering the acid rain trading program are lower than traditional regulatory schemes because it "eliminates the need to devise source-specific emission limits and to review control technologies and detailed compliance schedules."[30] The EPA's decision to eliminate its case-by-case review and approval of each trade has also reduced the administrative and transaction costs. The program costs about $12 million a year to operate, which translates into an administrative cost of $1.50/ton of pollution reduced. Lower costs are attributed to "cost reduction efforts and improved performance

of scrubbers and changes in fuel markets;" it is difficult to estimate "future technological improvements, the more efficient use of existing technologies, and future economic conditions," but technological innovation, prompted by competition, seems to have fueled cost savings.[31]

Southern California's emissions trading program also seems to have been successful in achieving its goal of decreasing the cost of reducing air pollution. A 1996 audit by the South Coast Air Quality Management District found that during its first two years, more than 100,000 tons of nitrogen and sulfur oxides had been traded for more than $10 million. The trading program was on track to meet its goal of reducing NOx emissions by 77 tons/day and SOx emissions by 15 tons/day by 2003. The price of NOx credits in 1994 was $24/ton and $132/ton for SOx, well under the $15,000/ton level that is the state of California's trigger point for reviewing the program's cost effectiveness.[32] During the following 15 months (1996 and the first quarter of 1997), more than $20 million worth of credits were traded.

However, emissions trading may not reduce compliance costs in every case. Not all emissions trading programs are simple. The EPA's bubble program is a complicated system that requires the agency to review each transaction. Transaction costs are relatively high — often $10,000 according to one estimate — which may be counterproductive for small trades.[33] It requires extensive emissions modeling, assessments of alternative control technologies, and compliance schedules, and is part of a complicated system of command-and-control emission limits and technological controls. What seems to work best is allowing trading within a facility, so that plant managers do not need to obtain new operating permits when production processes change, as long as the total emissions from the facility do not exceed its cap.

Achieving Environmental Goals

Emissions trading programs can be effective tools for improving environmental quality and preserving natural resources if sufficient information is available to policy designers to ensure that the emission targets they set will accomplish the environmental goals. If the targets are sound and the trading program is effectively monitored and enforced, the goals will likely be achieved. However, the national and state trading programs in place have not yet resolved the problems at which they were aimed. While it is too early to judge emissions trading definitively, there are some troubling indicators.

Under the acid rain program, sulfur dioxide emissions from the power plants in phase I of the program (1995-1999) were to decline each year for a total reduction of 3.5 million tons; during phase II (2000-2010), emissions are to fall another 5 million tons. Emissions in 1996 were 35 percent below the cap for that year. The program has reduced emissions and may prevent future damage, but emission reductions do not appear to be sufficient to restore lakes in the Adirondacks and elsewhere that are highly acidified. Lakes vary in their susceptibility to acid deposition, and some lakes are more damaged than others. The program's goal of reducing total emissions does not appear to be sufficient to provide protection for all lakes. Legislation before Congress in 1999 calls for a study to assess whether emissions reductions projected under the current acid rain program are sufficient to protect lakes in the Adirondacks and elsewhere.[34]

Despite the RECLAIM program, it is not clear that the Los Angeles area will ever achieve current air quality standards. At the start of the RECLAIM program, some critics argued that the initial allowances were too generous and that actual emissions could initially increase. Emissions did increase in 1995 over the 1993 baseline year, but District officials concluded that the increased trading in 1996 and 1997 was evidence that the surplus allowances built into the first years of the program were disappearing.[35]

More controversial was a proposal in 1995 to expand the RECLAIM program to include volatile organic compounds, pollutants that are precursors of ground-level ozone pollution. The proposal required all sources of VOCs emitting at least four tons a year to keep their emissions under an assigned cap that would decline each year. In response to complaints by both industry and environmental groups, the District's board of directors rejected the proposal and in 1996 ordered the agency to institute technology-based standards for individual industries that use large amounts of

chemicals that produce VOC fumes. Sources would be allowed to earn credits by reducing emissions from motor vehicles and area sources. Board members feared that the earlier proposal would limit economic growth in the area.

In August 1997, the California Air Resources Board, a state agency, suspended all rules that permitted the trading of VOC emissions because of complaints that the trading program had violated federal civil rights laws. The complaint argued that emissions trading in the Los Angeles area between stationary sources and motor vehicles resulted in disproportionately higher air pollution levels in minority communities near the facilities that purchased the credits.[36]

In theory, such problems should not be possible, since the Clean Air Act requires monitors to be located throughout airsheds and compels state officials to show attainment of the national standards at all monitors. But many people believe that national standards for pollutants like particulate matter and ozone are not sufficiently strong to protect humans from adverse health effects, so higher concentrations in minority communities, even if national standards are not exceeded, can be unfair.[37]

Emissions trading programs are a cost-effective means to accomplish the goals of environmental policies, but the goals themselves may not be sufficient to remedy the problems at which the policies are aimed. This is not the fault of emissions trading programs. They are policy tools that are neutral in terms of policy goals. If regulatory programs are not carefully designed to ensure that all areas meet minimum air quality standards, trading systems may not produce the environmental and health benefits expected of them.

Trading programs also clash with some important expectations held for environmental policy. In one sense, trading schemes are inconsistent with the "polluter pays" principle that is one of the key values underlying environmental regulation. Trading tends to distribute equally the cost of pollution controls across all sources, rather than imposing the greatest control costs on the sources that produce the greatest emissions. Some firms are able to externalize costs of production to other sources, rather than ensuring they account for all of those costs.[38] Trading programs may not reward sources that have reduced emissions voluntarily. If allowances are distributed based on past emission levels, high polluters will, in effect, be rewarded for their recalcitrance, while innovators who have already invested in emissions reductions will have fewer allowances to work with.

One of the underpinnings of environmental policy has been to encourage or force the development of cleaner, less polluting technologies. Despite the flaws in the conventional approach to regulation, it has often served to expand the use of cleaner technologies and to encourage the development of new technologies. This momentum can be lost if firms find emission credits available at a lower price than investing in newer, cleaner technologies. However, trading gives sources more flexibility in meeting standards, and they may be able to make more use of cheaper technologies. For example, trading encourages washing coal to reduce its sulfur content, a technology that alone will not lead to the achievement of emissions standards, but can be combined with other actions, such as purchasing credits, at a fraction of the cost of other control technologies.[39]

In contrast to emissions trading, pollution taxes provide a continuous incentive to devise new processes and technologies, since every time reductions are made, lower taxes result. Emissions trading programs, unless aggressively structured, may reduce the pressure for developments in technology. Trading programs, unlike pollution prevention efforts, may simply move pollution from one location to another rather than provide clear incentives to reduce emission levels. Credits earned by plant shutdowns may create incentives for regulated industries to close existing facilities and move to new, less regulated areas. Accurate past emissions from these sources may be difficult to obtain.

As the Los Angeles case shows, emissions trading programs may not adequately remedy the public health threats posed by pollution. They assume that there are safe levels of pollution for human health and ecosystems, but those estimates of safe thresholds of exposure are often difficult to make. They may result in increased exposures to some groups, particularly minority communities, who live near

areas where sources find it cheaper to buy credits from others rather than reduce their emissions. Residents who are poor or lack the political clout to demand pollution reductions may be exposed to higher levels of toxic pollutants than their wealthier neighbors, and higher levels than before trading programs were instituted.[40]

Despite these shortcomings, emissions trading programs can contribute to broader shifts in policy towards true cost accounting. In a political economy fundamentally committed to market exchanges, regulatory strategies that help ensure that the real costs of production are included in the prices charged can make a critical contribution to achieving environmental protection goals and a sustainable economy. Economic goals of efficient use of resources are similarly fostered as prices are adjusted to reflect more accurately the real costs of production. No policy innovation will likely have a more significant impact on environmental quality and protection of natural resources than to move towards a system where the impacts on environmental factors are fully represented in prices paid.

Ending subsidies and reforming price structures are the key to a more effective regulatory system, and, ultimately, more effective environmental protection. Emissions trading programs are an incremental step toward that goal. The real importance of trading programs lies in their ability to help generate support for the idea of market-based incentives, generate some data on ecological costs and benefits, and pave the way for more fundamental policy reforms that will lead to ecologically sustainable economies.

The idea of ecological sustainability requires that renewable resources should be used only as fast as they can be renewed by natural resources. Nonrenewable resources should be used only as fast as renewable substitutes can be developed. Sustainability implies that public policies should encourage pollution prevention, reduced consumption of nonrenewable resources, increased reliance on alternative energy sources, and consumption of renewable resources that match renewal rates.[41]

These goals can be achieved through traditional regulation and economic incentives, ending subsidies that encourage the use of nonrenewable resources or consumption levels beyond sustainable yield levels, and other policies. Pollution prevention and waste reduction are the most important ways of protecting the health of the ecosphere, and the most effective ways of reducing emissions and wastes are to increase production costs to include all of the present and future costs of production including pollution, environmental degradation, and other effects.[42] Emissions trading programs can make an important contribution in facilitating the transition to the next generation of environmental policies.[43]

Enhancing Governmental Capacity

While there is little agreement over what environmental goals should be, once they are established, market-based regulatory tools can help generate support for these proposals. The debate over environmental goals is often extremely contentious. Conflicts could be softened if the costs of achieving those goals were reduced. The acid rain program is a classic example of how emissions trading made possible a new regulatory program with aggressive environmental goals.

If economic instruments can be devised to achieve environmental goals at lower cost than conventional command-and-control regulation, they will become one of the most important developments in public policy and will play a major role in the move toward more ecologically sustainable societies. They can help make possible the pursuit of environmental goals that appeared too expensive to achieve with conventional regulatory approaches.

Emissions trading programs can facilitate public debate by focusing discussion on overall environmental quality goals and total levels of emissions to be reduced, rather than embroiling interested parties in debates over what constitutes the best available control technologies and other bureaucratic rules and regulations. Economist Herman Daly has characterized the advantages of emissions trading programs this way. Emissions trading clarifies three fundamental economic problems. First, communities must decide how much pollution is to be tolerated, how much damage to be permitted. Second, they must decide how the ownership of rights to pollute will be distributed, who will be responsible for reducing emissions. The first two problems are addressed through political choices. The third prob-

lem, making reductions the most economically efficient way, then becomes a function of markets.[44]

Proposals for market instruments, while based on the virtue of the simplicity of the market, are often complex. Discussion about the details of trading plans may obscure broader questions about the amount of required emissions reductions and how much should be spent to improve environmental quality. Regulatory goals that are poorly designed or misdirected are not salvaged, because the cost of complying with them is reduced through trading programs. Trading schemes may become the focus of attention, as interests jockey over the specific provisions and mechanisms to be used. The environmental goals may be slighted or ignored, and discussions and analyses may turn to how the trading will work rather than whether it will actually reduce emissions and achieve environmental protection goals. A study of the Los Angeles RECLAIM program concluded that trading programs are inconsistent with democratic values since trading decisions are largely beyond public scrutiny.[45]

There are other political risks in using emissions trading and other market-based tools. The kind of regulatory instrument selected may have an impact on the political system and the policy-making process as well as on environmental quality.[46] The idea of buying permits to pollute may threaten the moral, symbolic power and appeal of pollution control. Environmental regulation is no longer seen as a moral imperative in protecting human health and those innocent third parties who enjoy few of the benefits of pollution-producing activity yet take on most of the burdens. Pollution simply becomes another cost of doing business. The efficiency promised by emissions trading might unwittingly produce equity problems. For instance, trading may result in increased pollution levels in areas where residents are poor or lack the political clout to demand pollution reductions instead of purchases of more pollution allowances. Some policy makers and environmental advocates are skeptical of emission trading policies, warning that they have been oriented more toward "regulatory relief than regulatory reform," and that these policies often lack "equivalency in accountability, enforceability, and environmental progress."[47] The changes involved in moving to a trading system raise risks for regulatory officials, who may be criticized for devising new approaches that may not work.

Reliance on pollution taxes and fees may also serve to weaken public commitment to a shared environmental ethic. As decisions are left to the marketplace, there is less need for educational and other collective efforts to foster public awareness of and concern for the environment. If trading systems are used to create property rights in pollution emissions, communities may have less opportunity to make decisions about what level of air pollution they are willing to accept. Market-like incentives may send the wrong signal that pollution is acceptable if the polluter is wealthy enough to pay for it.

The creation of a free market in pollution simply allows companies to buy permits when they choose not to install control measures or otherwise prevent pollution. Proponents of environmental regulation have long rested their arguments on the belief that individuals have the right to breathe clean, healthy air, and that public health and natural resource goals should be pursued independent of cost calculations. Clean air, clean water, national parks, and the environment in general are all part of a shared common endowment. Placing all of these values in a market may ultimately result in their unequal distribution and eventual devaluation.[48]

Conclusions and Recommendations

Emissions trading and other market incentives in regulation will likely become increasingly important in U.S. environmental policy making. Not only will they continue to play a central role in dealing with some problems like acid rain and ozone, but they are expected by many to be a central element of whatever efforts the United States and at least some other countries undertake to achieve the goals agreed to under the Framework Convention on Climate Change and the Kyoto Protocol. Emissions trading has two important advantages: It can lead to reduced compliance costs, and it can be the basis of broadening support for a new regulatory program.

The acid rain program of tradable permits is the most successful example of emissions trading reducing compliance costs. Several features have contributed to its success:

- The total level of emissions, rather than the location of sources, is critical. This characteristic facilitates trading.
- The time frame in which emissions occur is not critical, another factor that facilitates trading opportunities. The EPA does not need to be concerned with when exactly the allowances are used.
- Monitoring of emissions is critical. There is already in place a fairly extensive system of continuous emissions monitors for sulfur dioxide.
- The trading program was not transplanted onto a command-and-control system that complicated trading; it is a relatively simple system.
- The cap on total emissions and the allocation of allowances to each source is simpler than other regulatory programs. The EPA is required only to keep track of the allowances for each source and is not required to approve each transaction.
- The policy is seen by many as the result of a partnership between government and industry.
- The statutory authority for the acid rain emissions trading program is clear. Congress provided stringent default provisions in the event that the EPA failed to issue regulations on schedule. This gave regulated industries an incentive to support rather than fight EPA rule making. Congress also made adjustments in the allocation of allowances, rather than leaving that difficult task to the administrative process. This was done for political and distributional reasons.
- The allocation of extra allowances in the cap and trade system allowed policy makers to deal with distributional issues related to who would be responsible for making the reductions. This also helped to overcome resistance from political leaders representing areas responsible for cleanup costs.
- The trading system was so effective in reducing cost estimates that achieving the reductions in acid rain levels became politically feasible.[49]

Although the acid rain program has significantly reduced regulatory costs, it may still fail to resolve the problem of acid rain in many areas.

Despite their current popularity and potential for broadening political support for environmental regulation, emissions trading is a limited policy tool. The conclusions below suggest those tradable permits be used only in limited circumstances and not be used in many others. If they are to be used, emissions trading programs should be accompanied by several conditions. It is critical that the ground rules surrounding their creation, regulation, and eventual elimination are clearly understood. Finally, emissions trading programs should be seen as a temporary policy intervention that leads to the use of other policy tools that more effectively create incentives to reduce pollution and encourage more ecologically sustainable activity.

1. **Emissions trading is a useful regulatory tool that can be used at all levels of government under the following circumstances:**

   - the same emissions have the same effect throughout the area in which they occur;
   - minimum ambient concentrations are satisfied throughout the affected areas;
   - emissions are quantifiable (emissions reductions can be determined and calculations replicated) and permanent;[50]
   - emissions are relatively easy to measure and monitoring systems are in place so that emissions can be accurately measured;
   - a limited number of major sources that can afford the transaction costs are involved (trading schemes do not work well when there are a large number of small sources, because the transaction costs will be too high);
   - aggressively enforced penalties are in place for excess emissions, including fines and reductions in allowances for subsequent years;
   - emission limits can be ratcheted down over time to ensure environmental quality goals are achieved;
   - regulated industries see the trading system as stable and predictable;
   - trading is combined with a requirement that each source make some minimum reduction in emissions, so that no source is seen as escaping at least some obligation to help solve the pollution problem; and
   - there is clear understanding that allowances are only temporary permits to pollute; they are not permanent rights that can be changed as environmental conditions change.

2. **Before employing an emissions trading program, policy makers should be able to answer affirmatively the following questions:**

   - Is there an accurate emissions inventory in place for determining the allocation of allowances? Will all sources be treated fairly?
   - Is an appropriate baseline used? Does it fairly reflect economic ups and downs, breakdowns and other problems with maintenance and operation, investments in and performance of pollution control equipment, and a host of other factors?
   - How are allowances allocated? Are sources that have already reduced their emissions treated fairly?
   - Are there sufficient authority and resources for effective monitoring and enforcement? Can regulatory officials ensure that quantifiable emissions reductions can be determined and that reductions are surplus, quantifiable, permanent, and enforceable?
   - Is trading among pollutants that pose different health and environmental risks prohibited?
   - Are all sources required to make at least some reductions in emissions?
   - Will trading programs encourage the development and diffusion of new control technologies?
   - Will environmental quality be significantly improved? Will caps on emissions be sufficient to achieve environmental quality goals?

3. **Emissions trading programs should lead to other, more powerful regulatory innovations that will more effectively encourage ecologically sustainable activities.**

   Emissions trading programs should be designed as a transition to a system of emissions fees or taxes and other efforts to reflect true costs in prices and to create more powerful incentives to reduce and prevent pollution. The ultimate test of an emissions trading program is its contribution to a more fundamental shift in practices aimed at reducing pollution, improving efficiency, and conserving resources.

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