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A Market Based Solution to Acid Rain: The Case of Sulfur Dioxide (SO₂) Trading Program

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In this article, the author presents a unique market—that of sulfur dioxide (SO₂) allowances. This market aims to reduce the national level of SO₂ emissions at the lowest possible cost. The author presents and analyzes the results of this allowance program over a period of six years.

As the new millennium begins, the time is appropriate for the international community to ponder the impact of the marketing system on the environment. The rapid advances in technology spawned by the two world wars have changed the faces of industries, markets, and consumer products. Unfortunately, this development and the subsequent industrialization of the global economy have had detrimental effects on the world's ecosystem.

The results of this environmental degradation significantly reduce the quality of life. For example, a cloak of smog covers urban areas in the United States, with 60 to 70 cities failing to meet air quality standards for at least one pollutant. Forty percent of the lakes, rivers, and estuaries in the United States are so polluted from pesticides and industrial runoff that they are unsafe for fishing, swimming, or drinking. The fragile ozone layer has been seriously compromised as a result of a variety of airborne pollutants, which increases certain health risks such as skin cancer (EPA Acid Rain Program 1998b).

Total global consumption at the end of the twentieth century has reached the extraordinary level of \$24 trillion per year (United Nations Development Programme 1998). Not surprisingly, the world's dominant consumers are concentrated in the industrialized West, where high levels of consumption are matched with serious environmental damage. For example, the United States boasts one of the highest living standards in the world, as well as per capita carbon dioxide (CO₂) emissions that are uppermost across all countries. In addition, consumption in the United States alone produces more than 160 million tons of waste each year, enough to fill a convoy of ten-ton garbage trucks that could reach halfway to the moon (Muller 1991).

Policy Options for Environmental Protection

Policy options designed to reduce such environmental degradation are based on the belief that pollution is a residual *discommodity* that is created concurrently with a valued commodity. As Randall (1987, pg. 359) notes, "When residual discommodities are produced jointly with some other activity and released into the collective goods environment

without charge to their producer, too much of the other activity takes place, and the market price is too low." The three most commonly prescribed approaches to correcting this market dysfunction involve using command and control policies (CCPs), levying a tax or providing a subsidy, and employing marketable pollution permits.

Command and control policies are traditional regulatory approaches in which the quantity of resulting pollution is controlled directly. These CCPs are the most common form of environmental policy in the United States, and they come in several varieties (see Lesser, Dodds, and Zerbe 1997). For example, prescribed technology policies require polluters to adopt specific pollution control measures, often referred to as the *best available control technology*, or BACT. Emission limits, conversely, place direct controls on polluting firms, limiting emissions of certain pollutants per unit of time or output. Finally, environmental standards establish a level of concentration for particular pollutants, including, in extreme conditions, a temporary ban.

The corrective tax approach involves the levy of a tax that is set equal to the marginal damage caused by the pollution emitted by a particular firm (Baumol and Oates 1988). Known as a "Pigouvian tax" (Pigou 1920), it typically is imposed on a per unit basis for firms that pollute above a baseline standard. However, it also has been operationalized as a subsidy, whereby firms that reduce pollution below the baseline are subsidized. These subsidies can be provided either for the installation of pollution control equipment or for the amount of reduction of specific pollutants (Lesser, Dodds, and Zerbe 1997).

Marketable pollution permits require the regulatory agency to establish a level of environmental quality that caps the amount of specific pollutants within a geographic area (Dales 1968; Montgomery 1972). On the basis of this cap, a certain number of permits are issued that allow the bearer to pollute up to a prescribed limit. Initially, these permits are issued to the set of firms currently operating within the region. However, new entrants can participate by purchasing these permits from the firms or units that are in possession of the permits. The price of permits is expected to rise or fall according to the supply and demand conditions that occur over time.

Study Purpose

In the United States, the regulatory agency empowered to safeguard the ecosystem is the Environmental Protection

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Agency (EPA). One of its most recent and controversial programs is the acid rain program, which is designed specifically to reduce the emissions of sulfur dioxide (SO_2) and nitrogen oxide (NO_x) that are responsible for acid deposits (EPA 1991). For these two primary pollutants, the program employs a more traditional CCP approach for the reduction of NO_x but a market-based approach for the reduction of SO_2 , as required by Title IV of the Clean Air Act Amendments (1970b, 1990; cf. Clean Air Act 1955).

The purpose of this article is to evaluate the operation of the SO_2 trading program that essentially employs the market to reduce the emissions of SO_2 . In the next section, a brief discussion of the acid rain program is presented, followed by a detailed section on the design, features, and implementation of the SO_2 trading program. This section also evaluates the program along the signals obtained from the market in terms of trading volumes and the permit prices. The article closes with recommendations for the use of market-based approaches to environmental protection.

The Case of Acid Rain

The acid rain program is aimed at reducing emissions of SO_2 and NO_x . The program employs two different approaches for emission abatement: a market-based approach for SO_2 and a CCP approach for NO_x .

The acid rain program was created as a part of Title IV of the Clean Air Act Amendments (EPA 1991). The main goal of Title IV was to reduce the annual emissions of SO_2 by 10 million tons below 1980 levels. To achieve these reductions, the Act calls for two phases targeted at restricting the emissions by fossil fuel-fired power plants (EPA 1998e).

In 1995, Phase I was started, and initially, it affected 263 polluting units, 110 of which were coal-burning electric utility plants. One hundred eighty-two additional units eventually joined Phase I, bringing the total number of units to 445. In 2000, Phase II is scheduled to begin, and it will attempt to restrict the annual emissions of larger, more polluting plants and set restrictions on smaller, cleaner plants (EPA 1998e).

The Clean Air Act also targets the emissions of NO_x by calling for a 2-million-ton reduction by 2000. Most of these reductions will be achieved by requiring the coal-fired plants to install low NO_x burner technologies to meet the emission standards (EPA 1998e).

The SO_2 Emissions Trading Program

The emissions trading program represents the market-based SO_2 allowance trading component of the acid rain program. The allowances in this program can be viewed as bankable currency that helps achieve the annual compliance of SO_2 . However, the utilities or companies are the ones that determine which approach is most cost effective for their operations. If a utility is able to reduce the emissions below the number of allowances they are in possession of, then this extra number of allowances can be sold in the open market, sold at an EPA auction, or banked for future needs. The unique feature of this program is that it relies on the market to reduce emissions of SO_2 in a cost-effective manner and, at the same time, incorporates economic incentives to encourage firms to develop new and innovative technology (EPA 1998a).

Design of the Program

Most of the existing regulations in the United States are CCP in nature; they require the installation of specific control technology or define a performance standard in terms of emission rates, for example, pound of pollutant per million British thermal unit of heat input (lb/mmBtu) or pollutant concentrations in terms of parts per million (ppm) (McLean 1997).

A trading program that, in theory, would be built on this infrastructure would require the conversion of all these requirements into a tradeable unit, such as tons of pollutant emitted. Furthermore, this would entail that all the parties involved, such as the emissions credit generator, consumer, and regulatory agency, agree on various issues ranging from the rates of utilization to time validity of trade to emissions quantification. Needless to say, this process could be exhausting in terms of both resource and time consumption. In addition, transaction costs could be large enough to limit the number of trades, which would undermine the whole program (McLean 1997).

The SO_2 allowance program created by the EPA aims to maximize the economic advantages of emission trading by minimizing the transaction costs while holding sources accountable for every ton of emissions and, in concurrence, by establishing "environmental credibility" by reducing and capping the total amount of emissions (McLean 1997).

Goals

The emission reduction goal is to reduce emission from 17.5 million tons (1980 levels) to 8.5 million tons. This goal serves as a cap of emissions; thus, all the sources are required to hold allowances in amounts that are less than or equal to this cap.

Allowance Allocation and Obtainment

An *allowance* is defined (cf. EPA 1998f) as that which "authorizes a unit within a utility or industrial source to emit one ton of SO_2 during the given year or any year thereafter." These allowances are fully marketable commodities because they can be purchased, traded, sold, or banked for use at a future date. However, the allowances cannot be used for compliance purposes for a previous year (EPA 1998f).

During Phase I, the EPA allocated allowances to each unit at an emission rate of 2.5 pounds of SO_2 /mmBtu of heat input multiplied by the unit's baseline mmBtu. Additional allowances are made for various units that will be allocated a pro rata share of 200,000 additional allowances each year from 1995 to 1999. In Phase II, beginning in 2000, the limits will be tightened further, and emission limits are to be imposed on smaller, cleaner units. The allowance to each unit will be made at an emission rate of 1.2 pounds of SO_2 /mmBtu of heat input multiplied by the unit's baseline. In addition, the Act places a cap of 8.95 million on the number of allowances issued each year, which, in effect, will limit the SO_2 emissions to 8.95 millions tons annually (EPA 1998c).

Allowances also can be obtained by applying to three EPA reserves. In the first reserve, units have the option to install technology that can remove 90% of SO_2 emissions or reallocate reduction requirements among other units by employing similar technology. In the second reserve, allowances are allocated as incentives for those units that

have engaged in conservation measures or renewable energy generation programs. The third reserve contains allowances marked for auctions sponsored on an annual basis by EPA. Allowances also are given as incentives to those utilities that replace old boilers with new, cleaner, and more efficient technologies and to small refineries that have removed sulfur from fuels. In these reserves, early entrants were preferred, because units that started operation after 1996 were not allocated any allowances (EPA 1998d).

Trading

Each *trading unit* is defined as an allowance that is one ton of allowable emission. The initial allocation to allowances was made before the trading of allowances began and was based on historical use and desired emission rates. The new sources that enter the market after the program began require allowances to cover their level of emissions. These can be acquired in two ways: existing allowance holders or EPA auctions. These allowances can be traded to any party and may be banked for use in subsequent years but cannot be brought forward for use in a previous year (McLean 1997).

Participation and Tracking of Allowances

Any individual, corporation, or governing body, such as brokers, environmental groups, or municipalities, can trade allowances (EPA 1998h). The role of EPA is to keep a record of all allowance transfers to ensure that a unit's annual emissions do not exceed the number of allowances in its possession. For this purpose, EPA has a system called the allowance tracking system (ATS), and every affected utility unit, company, or individual in possession of allowances is required to have an account in ATS. For tracking and recording purposes, an identification and serial number is assigned to each account and allowance (EPA 1998g).

Emissions Measurement

In addition, EPA created a continuous emissions monitoring system (CEMS) that reports hourly emissions. At the end of each year, the total number of tons of SO₂ emissions by each source is deducted from its account, and the excess allowances are rolled over to the next year's account (McLean 1997).

Noncompliance Penalties

There is a mandated and immediate penalty for noncompliance. If the annual SO₂ emissions exceed the number of allowances held at the end of each year, the statutory penalty of \$2,000 per ton exceeded is applied. Moreover, an offset of one allowance per excess ton is assessed automatically (McLean 1997).

The Environmental Appeals Board reviews any appeals on the grounds of allowance, transfer, or deduction decision. If EPA makes an error in the recording process, the account representative may file a claim requesting to correct the mistake. The final agency actions can be appealed in a federal court (EPA 1998b).

Allowance Auctions

New entrants or polluting units need some allowances to participate in the permit market. For this purpose, EPA is

required to hold auctions on an annual basis. These auctions account for 2.8% of the total allowances allocated each year. During Phase I, the allocated allowances total 5.7 million tons per annum, hence, 15,000 allowances per annum are available for auctions. In Phase II, the allowances will go up to 8.95 million allowances per annum, hence, 250,000 allowances per annum will be set aside for auctions. These auctions also assist in signaling price information to the allowance market (EPA 1999a).

The auctions are conducted by the Chicago Board of Trade (CBOT), which is "delegated" the administrative functions of the auction program. However, CBOT is not allowed to charge fees, nor is it compensated for its services. In addition, CBOT is not allowed to bid for allowances (EPA 1999e).

There have been some concerns that flaws in the design of the auctions might affect the performance of the market adversely. But the assumption was that the trade could only occur at auction, when in reality, auctions account for a small portion of the trade. In an empirical analysis, Joskow, Schmalensee, and Bailey (1996) illustrate that these auctions are but a small part of a relatively efficient market and that the design challenges had no effect on the actual market prices.

Other Protections

Because emissions trading is flexible in terms of spatial patterns, a concern is that a "hot spot" of emissions might emerge that would impair local health or welfare conditions. However, all the sources that participate in the allowance trading program are required to comply with the other requirements of the Clean Air Act, such as the health-based national ambient air quality standards, new source performance standards, and prevention of significant deterioration provisions. These requirements are independent of the allowance trading program and cannot be waived (McLean 1997).

Monthly Average Prices of SO₂ Allowances

Although EPA does not track allowance prices, the monthly average prices, as reported by Fieldston Publications' market survey and two brokerage firms, Cantor Fitzgerald and Emissions Exchange, appear in Figure 1 (EPA 1999c).

Implementation of the SO₂ Emissions Trading Program

The EPA had issued all of the rules necessary to implement the SO₂ allowance program as of March 1993. It issued rules that allowed industrial boilers and small utility units to enter the allowance trading program voluntarily in April 1995. On several aspects of the rule, litigation occurred, but settlements were reached through rule revisions. After the rules were completed, the program implementation began (McLean 1997).

The SO₂ allowance program includes more than 2000 existing boilers and turbines that serve electric generators throughout the United States (Alaska and Hawaii are not included) that range in size from 25 megawatts (MWe) to 1300 MWe. Approximately half these units burn coal, and the other half use oil and/or natural gas (McLean 1997).

The 44 units in the utility industry met all the deadlines, and EPA reviewed the plans and issued all the permits by the

Figure 1. SO₂ Allowance Price Chart

end of 1994. The CEMS were installed at the affected units, and EPA certified them by the end of 1996. Allowance trading began in 1992, and the ATS that records all the trades was operational in March 1994 (U.S. EPA 1994).

The allowance trading was observed at two different levels. Most utility units were observed to perform internal trades of allowances among the boilers within their specific systems to achieve the lowest cost of compliance. The other level is the external trade among utilities and other parties.

As of December 1998, more than 4900 transfers, moving 62.8 million allowances, were reported to the ATS. Approximately 60% of these allowances (38.1 million) were transferred within organizations, and the remaining 24.7 million allowances took place between organizations. Updated figures at the EPA's official Web site display the breakdown of these transfers between distinct entities, which represent true market activity to most observers of the program. The figures also track the growing magnitude of trades among organizations (EPA 1999d). The submission of trades for record purposes is voluntary, and it is speculated that significantly more allowances are being traded than are being recorded in ATS (McLean 1997).

Allowance auctions began in 1993, and EPA conducts these auctions with the help of CBOT. At the program's inception, these auctions were useful in getting the market started and in helping reveal market prices. However, as private trading increases, the auctions have become a smaller part of the allowance market, and private services are providing more frequent information on allowance prices (McLean 1997).

In 1994, Phase I units began reporting hourly emissions of SO₂, NO_x, and CO₂ to the EPA, and in April 1995, Phase II units began reporting hourly emissions. The EPA has

developed the Emissions Tracking System to process the data, and the plant-by-plant emissions of SO₂, NO_x, and CO₂ are reported periodically (U.S. EPA 1995).

As of July 1996, EPA completed the first annual reconciliation process, in which each unit's annual emissions are compared with its allowance holdings to determine compliance. All 445 units participating in the program in 1995 were in compliance, and no penalties were assessed (McLean 1997).

Evaluation of the Program

Currently, the program is nearly at the end of Phase I. Several observations can be made with regard to the results over the four-year period. The successes of the program shall be noted first, followed by the concerns.

Growth of the Market

The allowances traded among organizations or units have increased dramatically. In 1984, the number of allowances traded was approximately 1,000,000, and this number has increased roughly 9.5 times to 9,500,000 in 1998 (EPA 1999d). The major volume of this trade is among brokers and utilities, which account for more than 60% of the total. More than 25% of all utilities and 50% of the utilities covered under Phase I have entered into a trade agreement with a broker, another utility, or another company. The numbers of both allowance brokers and traders are rising: The flow of brokers or traders to utilities increased sixfold, and the flow of allowances from utilities to brokers increased threefold from 1995 to 1996 (Kruger and Dean 1997). The participants in the market are not limited to brokers or utilities. Some new entrants to the market are environmental, non-profit, or student organizations that purchase allowances for

retirement, whereby each retired unit translates into one less ton of pollution in the air for a given year. The figures state that almost 20 varied groups have purchased and retired approximately 1400 allowances, and utilities have retired 35,000 allowances (Kruger and Dean 1997). This aspect of the permit market has important welfare implications; the pollution abatement can be viewed as a democratic process in which citizens and grassroots organizations are allowed to take direct and progressive action.

Low Transaction Costs

When an allowance transaction takes place, EPA simply records the transaction; it does not go through a case-by-case review or approval. Moreover, the allowance market contains many participants in the form of brokers, traders, and allowance holders. Also, annual allowance auctions are conducted by CBOT for the EPA at no charge. All these factors lead to lower transaction costs in the allowance market, which is noted in the literature (Conrad and Kohn 1996). High transaction costs are known to be impediments in a market; therefore, low transaction costs are desirable in the operation of any market (Nagurney and Dhanda 1999).

Flexibility of the Program and Low Compliance Costs

The units are granted complete freedom in determining the methods by which to reduce emissions. This flexibility leads to several opportunities in the form of operational modifications, by means of which units have achieved lower compliance costs and saved money. A popular response for utilities has been to switch from high-sulfur coal to low-sulfur coal fuel blending. The cost of low-sulfur Western coal has gone down, due in part to investment and innovation in the rail industry and in part to a surge in demand for low-sulfur coal (Swift 1997). The program also allows for intrautility trading, whereby allowances can be shifted among various generating units of the same utility. This flexibility enables the utilities to shift power to low-polluting plants for the baseline loads and switch on high-polluting plants for the incremental loads, which thereby reduces the SO₂ emissions (Swift 1997).

Low Administrative Costs

The traditional CCPs usually carried enormous administrative costs because source-specific emission limits needed to be determined, compliance schedules had to be laid out, control technologies were reviewed, and programs were reviewed on a case-by-case basis. In contrast to the SO₂ program is the NO_x program, which has been delayed since its inception. The technological standards of the program are caught in legal wrangles, which has exacerbated the initial delays. The cost effectiveness of the program seems dismal (Strauss 1995). Even if the program is enforced and compliance is ensured, it still might lead to nonattainment of the environmental goal. In contrast, in the allowance trading program, EPA focuses on tracking emissions and allowances, and the polluting units are free to choose the methods of compliance. The administrative costs of the program are approximately \$12 million per year, which translates into approximately \$1.50 per ton of pollution reduced. A large majority of these costs go into the monitoring and reporting of emissions. In the first five years of the program,

the cost was less than \$60 million of the \$3.5 billion estimated for air pollution control (McLean 1997). Therefore, the program is achieving 40% of the emissions reductions with approximately 2% of the resources (Kruger and Dean 1997).

Drop in Emissions

The best environmental results can be inferred from the actual drop in SO₂ emissions. In 1995, the first year of the program, the largest drop in SO₂ emissions in the United States took place (Kruger and Dean 1997). The electric utilities in the program dropped emissions by 40% below the level actually required (U.S. EPA 1996a). A 10% to 25% reduction in acid rain deposition accompanied these emissions reductions in large areas of the eastern United States in 1995 (U.S. Geological Survey 1996), and acid rain has decreased by 30% in the eastern United States between 1989 and 1995 (U.S. EPA 1997b). Ambient concentration of SO₂ emissions also declined by 17% between 1995 and 1996 (U.S. EPA 1996b). Significant emissions reductions were observed in some of the highest emitting areas of the country; for example, Ohio and Indiana reduced 1995 SO₂ emissions by 46% and 37%, respectively, from 1990 levels (U.S. EPA 1997a). This is particularly noteworthy because a market approach states that the highest emitting plants have a higher incentive to reduce emissions substantially because these plants face lower cost per ton to reduce SO₂ emissions (Kruger and Dean 1997).

Actual Compliance

If a unit emits more than the number of allowances in its account, it faces a penalty of \$2,000 per ton, plus the inflation rate, which put the penalty at \$2,454 in 1996. Also, the unit must offset the excess SO₂ emissions with allowances in the excess amount (Kruger and Dean 1997). These penalties led to 100% compliance in the first two years of the program (McLean 1997). Kruger and Dean (1997) further ask why a company would pay a \$2,500 per ton penalty when it could purchase an allowance for \$100 per ton before the end of the compliance deadline.

Although the allowance program has met most of its goals and surpassed some expectations, there remain mainly two concerns that must be addressed: low volume level of interutility trades and lower than anticipated allowance prices.

Slow Emergence of Interutility Trades

The program has been criticized because most of the trades have been intra- rather than interutility trades, thus making the program lose some of its market-oriented approach. In intrautility trades, the trading occurs between units of the same company. Indeed, the Clean Air Act Amendments (1990) sets up a companywide "bubble" over each firm and allows the company to reallocate emissions within this bubble (Ackerman and Moomaw 1997). The flexibility of the program encourages units to select the compliance option that best fits their need—some opted to use low-sulfur coal, and others switched loads to minimize emissions. However, there are obstacles to interutility trading, the primary one being uncertainty about the regulatory rules, which invariably leads to speculation and caution in the market (Swift 1997). The utilities needed to select their compliance strate-

gies for the beginning of 1995 by the end of 1992; thus, their compliance decisions were made even before the EPA's rules were proposed or the first allowance auction was held (Rico 1995). In addition, several Phase I utilities have chosen a strategy to defer compliance decisions in the early years of Phase II by controlling extra emissions in Phase I and banking their allowances into Phase II (Rico 1995).

Prices of Permits

The market clearing prices of allowances have been much lower than the prices predicted by analysts. The prices were expected to be approximately \$1,000 per allowance (Zorpette 1994); they averaged \$130 per allowance in the first few years, dropped to a low of \$70 to \$75 in 1996, and recently rose to \$212 in May 1999 (EPA 1999c). (Refer to the graph in Figure 1 for a detailed breakdown of prices.)

The low prices and trading volumes are attributed most commonly to a variety of reasons: the presence of transactions costs (Doucet and Strauss 1994); uncertainty in the trading market (Bohi and Burtraw 1992; Burtraw 1996); an excess of new allowances greater than the original initial distribution (Rico 1995); local regulations that lead buyers to become sellers (Coggins and Swinton 1996); and competition in the coal, natural gas, and scrubber industries (Burtraw 1996; Ellerman and Montero 1996). However, Conrad and Kohn (1996) present a model of emissions trading and conclude that the decline in allowance prices was brought about by the proliferation of new allowances and tight air standards in some areas, coupled with irreversible investments in abatement equipment.

The technological change within the electric utility industry was fostered by the deregulation of railroads, input suppliers of low-sulfur coal, and price competition. It also was brought about by the shift from a CCP approach to a market-oriented approach to pollution control. This has led to lowered abatement costs and to reduced potential cost savings, because the heterogeneity of costs across units also was reduced (Conrad and Kohn 1996). Therefore, low trading volume and low price of permits within the electric utility industry primarily reflect lowered cost of emission abatement and a choice of new abatement options.

Discussion and Conclusions

The SO₂ allowance program offers invaluable lessons in designing and implementing environmental programs that are both effective and efficient. First, the environmental problem must be defined, clear goals should be set, and the need to take action should be accepted publicly (McLean 1997). Second, the design goals and responsibilities must be stated in simple and clear terms, the emissions of all the parties should be accounted for, and a cap of emissions should be set (McLean 1997). Third, the role of the government should be to set the goal in legislation, resolve the issues, and improve efficiency. It also should refrain from trying to control, participate in, or fine-tune the market, because changes such as restructuring occur outside the regulator's realm (McLean 1997).

After the initial harsh reactions to allowance trading, it has developed into a routine process. Because the program is still in Phase I, it is difficult to predict the additional vol-

ume of trading that would have taken place if the market barriers did not exist. But the fears of high transaction costs and public rejection of allowance trading have not materialized (Kruger and Dean 1997). The sophisticated design of the program was crucial to its success. This design includes initial allocations of emission allowances to units, which removes the necessity of reviewing every allocation on a case-by-case basis; the flexibility granted to units to engage in trades once the allocations are made; the use of continuous emissions monitoring systems to measure the traded allowances and ensure that emissions reductions take place; and the presence of enforceable penalties to ensure that compliance with the provisions takes place (Rico 1995).

The U.S. acid rain program was a result of political controversy and scientific assessment over a period of ten years (Rico 1995). The program has materialized into a market in which units trade allowance permits, participate in auctions to purchase allowances, invest in technology to reduce their emissions, report their emissions and allowance holdings to the EPA, and meet the national cap in emissions. Many indicators discussed here indicate that this program delivers significant cost savings over traditional environmental regulations and, at the same time, has led to a drop in the level of SO₂ emissions, acid rain, and wet sulfur deposition. The environmental benefits gained with less than expected costs ultimately have improved the quality of air in the United States with respect to SO₂. The proponents of the program state that a similar program should be designed for other acid rain pollutants such as NO_x.

This is an exciting time, with Phase I due to end in 1999 and Phase II to begin in 2000. Because the cap on emissions is tightened further beginning in Phase II, the participating units and new entrants will need to rely on the allowance market to ensure emissions reductions and compliance. Furthermore, this program could be applied on a global level, with the objective to reduce greenhouse gases at the lowest possible cost, in which countries could trade allowances with one another and initial allocations of allowances could be negotiated according to the development level and technological expertise of the country.

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