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CLEAN AIR MARKET PROGRAMS

DISTRIBUTING ALLOWANCES FOR EMISSION TRADING PROGRAMS

—Reid Harvey and Andrew Mingst, U.S. Environmental Protection Agency

The distribution of emission allowances has been one of the more contentious issues for cap and trade programs, both in North America and Europe. Allowance distribution is an important economic and political issue, particularly since billions of dollars of assets can be at stake. However, as long as the emission cap is fixed, alternative methods of allowance allocations have no effect on achievement of the desired environmental goal.

This article is a short introduction to two commonly discussed methods for allowance distribution—auctions and allocations.

AUCTIONS

Revenue-raising auctions are considered the most economically efficient method for distributing allowances if the revenues are used to offset existing taxes. They have not, however, been widely used to date. In a revenue-raising auction, the government distributes allowances to the highest bidders. Participating emission sources must purchase allowances at the auction or through secondary markets. The government can use the proceeds from the auction to reduce distortionary taxes, invest in environmental protection, or serve other public purposes. Deciding how to use the auction proceeds can be a controversial subject.

Limited, non-revenue-raising auctions are used in the U.S. SO_2 Allowance Trading Program. The U.S. Environmental Protection Agency

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(EPA) auctions 2.8 percent of allowances from the cap in a non-revenue-raising auction conducted by the Chicago Board of Trade. Because it is a non-revenue-raising auction, the proceeds are returned to the emission sources from which the allowances were withheld in the initial allocation process. The Clear Skies Act, recently proposed by the Bush Administration, would include a revenue-raising auction that gradually increases from 1 percent of available allowances under the cap to 100 percent over more than 50 years.

Allocations

In contrast to auctions, no-cost allocations are seen as less efficient by economists and less equitable because producers benefit more than consumers. They are, however, often more politically feasible than auctions and, as a result, a more popular policy choice.

An important distinction among allocation approaches is whether the allocation is permanent or changes over time. A permanent system calls for a fixed allocation of allowances that never changes (or changes in ways that are specified in advance, such as a fixed reduction each year.) A commonly used permanent system, referred to as grandfathering, allocates allowances based on historical information. Under this system, new emission sources do not receive allocations (unless a set-aside has been created) and must purchase allowances from other sources on the secondary market. The alternative to a permanent system is an updating system, in which the allocation changes over time depending on activities of the participating sources after the program begins. A permanent system, therefore, establishes a fixed distribution of the benefits, whereas an updating system allows for the redistribution of those benefits, with each updated allocation based on the recent activities of the participating sources.

Permanent and updating allocation systems differ in the incentives they create. A permanent system generally has no impact on the decisions of the participating sources once the system is implemented. An updating system, however, influences the decisions made by the operators of participating sources, at least in theory. Because an updating system changes the allocation periodically, firms have an incentive to do more of the activity that will earn them more allowances. For example, if future allowances will be allocated based on the amount of output a participating source produces this year, the source has an incentive to produce more output to collect additional allowances in the future.

Allocations, whether permanent or updating, may be based on a variety of metrics, including historical fuel or heat inputs, outputs, or emissions. Each metric produces different "winners" and "losers."

Inputs

Allocating emission allowances based on inputs involves multiplying fuel usage or energy inputs by an emission performance metric (e.g., emissions per unit of fuel input). If a single metric is used, this approach rewards emission sources that are inherently cleaner (e.g., natural gas units) or those that pursued early reductions because those sources' emission rates may be below the emission performance metric. This method can work well if the emission sources cross several industrial sectors with different outputs.

The U.S. SO_2 Allowance Trading Program uses a permanent approach based on heat inputs. During Phase I, EPA allocated emission allowances using an input standard of 2.5 pounds of SO_2 per million British thermal units (mmBtu) of heat input, multiplied by the unit's average heat input from 1985 through 1987. During Phase 2, EPA reduced the emission rate to 1.2 pounds per mmBtu. Sources with an emission rate below 1.2 pounds per mmBtu received allowances greater than their actual emissions.

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Outputs

Basing emission allocations on outputs involves multiplying production levels by an efficiency performance metric (e.g., emissions per unit of electricity produced). This approach rewards efficient sources as well as sources that pursued early reductions. This method works best when applied to sources and/or industries that produce a homogeneous product (e.g., electricity).

Emissions

Allocating emission allowances based on emissions involves distributing allowances based on an emission source's relative share of emissions. This approach rewards the highest emitting and least efficient sources by providing them with the majority of emission allowances. It also penalizes those sources that pursued early emission reductions because their emissions are already lower, reflecting the emission reductions.

For more information on allowance allocations, particularly in the U.S. SO_2 and NO_x cap and trade programs, visit <www.epa.gov/airmarkets> or contact the author at <harvey.reid@epa.gov>.

Clearing the Air: Cap and Trade Q&A

Despite the successes and growing use of cap and trade to reduce air pollution, the public debate reveals that some aspects of emission trading are not fully understood. The following questions and answers are intended to help clarify some of these common misunderstandings.

Q: How does cap and trade work?

A: The "cap" places a limit on total emissions from all emission sources participating in the cap and trade program. The cap is then divided into emission allowances that are distributed to emission sources, either via a no-cost or low-cost allocation or an auction (see the cover article about distributing allowances for emission trading programs.) Each allowance authorizes the holder to emit a specific quantity of emissions (e.g., 1 ton of SO_2). At the end of each compliance period, every source must have sufficient allowances to cover its emissions for that year.

Participating sources are free to develop a compliance strategy that accounts for their situation. Their strategy may include shifting to cleaner-burning fuels, improving efficiency, installing control technologies, buying excess allowances from other sources that have reduced their emissions, or using a combination of these and other methods.

Compliance is determined by comparing each source's total emissions to the allowances in its account(s). Therefore, accurate emission measurement is crucial to the success of the program. Sources must measure and account for total emissions and surrender one allowance for each specific quantity of emissions. Sources that do not report accurately or do not have enough allowances to cover total emissions are subject to automatic noncompliance actions and penalties.

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Q: Why does cap and trade work?

A: The cap on emissions, when properly enforced, provides environmental certainty that emissions will not exceed the specified level. Even in the case of high growth industries, the cap restricts total emissions. This arrangement provides a distinct advantage over traditional command-and-control regulatory methods that establish source-specific emission rates. Traditional programs can't ensure that aggregate emissions don't rise as new sources come on line or as existing sources increase utilization.

The limited allowances create scarcity that ensures economic value for allowances, and value provides incentives to reduce emissions.

Because cap and trade programs give sources flexibility to choose the lowest-cost compliance option, regulators can pursue more ambitious environmental goals for a given expenditure.

Q: Aren't sources just shifting their emissions around instead of reducing them?

A: All trading occurs under a cap that represents a reduction in total emissions. For example, in the U.S. SO_2 Allowance Trading Program, the nationwide cap for the electric power generation sector is set at 50 percent below 1980 SO_2 emission levels.

The flexibility under a cap and trade system isn't about whether to reduce emissions. Rather, it's about how to reduce them at the lowest possible cost. Sources may buy and sell allowances, but trading is generally only one small component of an overall strategy for meeting the emission limits. In the U.S. experience, the largest polluters often have the most cost-effective emission reductions and, as a result, reduce their emissions significantly.

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Q: Doesn't trading result in hot spots (areas of high, localized emissions) and higher health risk?

A: Cap and trade is only one component of an environmental regulatory toolkit. In addition to the reductions required under the U.S. SO_2 Allowance Trading Program, all areas of the United States must meet national, health-based air quality standards that are separate from the cap and trade program's requirements. No source may use allocated or purchased allowances to emit more SO_2 than the level specified for protecting human health. Recent analyses show that emission trading in the United States has not adversely affected attainment of air quality standards. In fact, under the SO_2 Allowance Trading Program, the greatest reductions occurred in the regions with the greatest emissions. (For a description of the interaction between different policy instruments in the United States, see *Clean Air Markets Update*, Issue 2.)

Q: Isn't the real purpose of emission trading to save sources money?

A: While a cap and trade system reduces compliance costs, it also creates incentives to reduce emissions below allowable levels, spurring technological innovation and energy efficiency. For example, in the United States during the 1990s, the cost of scrubber technology for SO_2 decreased by 40 percent and the sulfur removal efficiencies improved from 90 to 95 percent. These cost reductions and efficiency improvements are due in part to the flexibility provided to sources that created competition among emission reduction technologies.

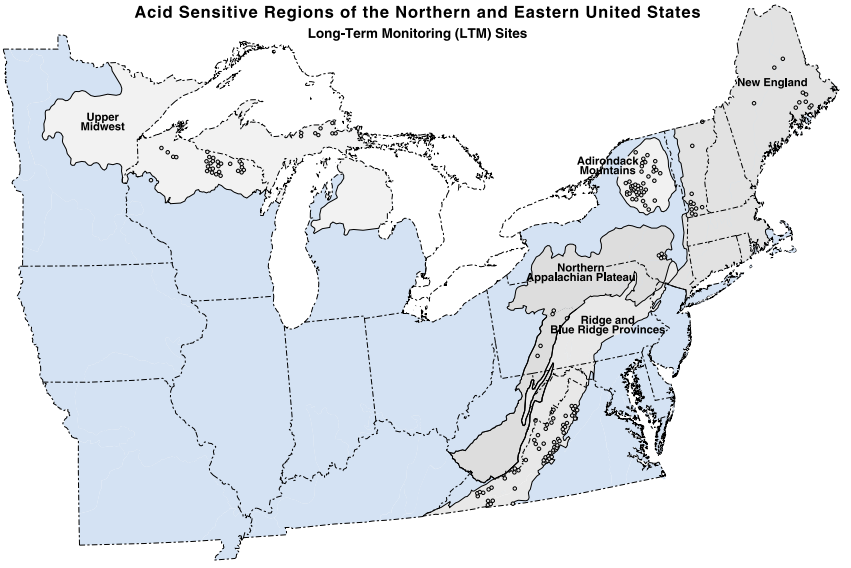
Q: Are all emission trading programs the same?

A: Not all emission trading programs have the same features. Critical features include the emission cap, accurate and complete measurement of emissions, and substantial and automatic penalties for noncompliance. (For a description of different types of emission trading programs, see *Clean Air Markets Update*, Issue 3.)

This article is taken from "Clearing the Air: The Facts About Capping and Trading Emissions." To view the entire document, visit <www.epa.gov/airmarkets/articles/clearingtheair.pdf>.

Update on U.S. Emission Trading Programs: New Report on Acid Rain and Surface Water

EPA recently released a report entitled "Response of Surface Water Chemistry to the Clean Air Act Amendments of 1990." The report assesses changes in surface water chemistry in the northern and eastern United States. The purpose of the assessment was to determine if there have been reductions in the acidity of lakes and streams affected by acid deposition resulting from pollutants emitted from coal-powered plants and other sources of combusted fossil fuels.



The results of this study indicate that improvements in surface water chemistry (e.g., lower sulfate concentrations and decreases in acidity) have resulted from emission regulations enacted as part of the Clean Air Act Amendments of 1990 (CAAA), including the SO_2 Allowance Trading Program.

The CAAA, and the SO_2 Allowance Trading Program in particular, have resulted in a large and widespread decrease in the deposition of sulfur. Wet sulfate deposition declined by approximately 40 percent in the 1990s. In the same period, surface water sulfate declined in all regions except the Ridge and Blue Ridge provinces (Virginia).

The SO_2 Allowance Trading Program has achieved more emission reductions at a faster pace and lower cost than originally expected. The 1990 law set a goal of reducing annual SO_2 emissions from electric power plants by approximately 50 percent below 1980 levels in the year 2010. By 2002, emissions of SO_2 under the program measured 10.2 million tons, already more than 7 million tons below 1980 levels of 17.4 million tons. The reductions to date represent 80 percent of the progress needed to reach the program's emission reduction goal.

Acid neutralizing capacity (ANC)—a key indicator of recovery—increased in three of the regions (Adirondacks, Northern Appalachian Plateau, and Upper Midwest) and was unchanged in New England and the Ridge/Blue Ridge region. Modest increases in ANC have reduced the number of acidic lakes and stream segments in some regions.

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Results

- In three of the five areas evaluated, one-quarter to one-third of lakes and streams previously affected by acid rain are no longer acidic, although they are still highly sensitive to future changes in deposition.
- The number of acidic lakes in the Adirondacks decreased by 38 percent, from 13 percent in the early 1990s to 8 percent.
- Fewer than 1 percent of lakes in the Upper Midwestern states are currently acidic, down from 3 percent in the early 1980s (comparable data are not available for early 1990s).
- The length in miles of acidic streams in the Northern Appalachian Plateau region declined by 25 percent, from 12 percent in the early 1990s to 9 percent.
- Not all lakes show improvement, however. Of the 48 lakes monitored for water chemistry in the Adirondacks, 29 show improvements. The rest show no trends or continue to acidify. The data suggest that recovery is not complete, but is only starting. Though the signs are encouraging, acid rain is still impacting sensitive ecosystems.

The results of the study suggest that additional reductions of SO_2 will further assist in ecosystem recovery. The report is available at <www.epa.gov/ord/htm/CAAA-2002-report-2col-rev-4.pdf>.

Program in Progress: The Dutch NO_x Trading Program

—Chris Dekkers, Dutch Ministry of the Environment

In 1997, the government and industry in the Netherlands began discussing the introduction of a NO_x emission trading program. By 2001, the government and all sectors of industry committed to a rate-based emission trading program. This approach allocates emission credits to industrial facilities on the basis of performance standard rates (PSR) multiplied by the source's actual fossil fuel combustion (i.e., fuel input). Sources with a capacity threshold of 20 MW must meet this PSR, either by abatement measures or the purchase of credits from other sources. Those sources with a rate lower than the PSR established for that year can sell excess credits to other sources.

Some major changes in the national legislation are required to fit emission trading into national law and to ensure that the approach fits into the European Union (EU) legislative framework. At the same time, the law must accommodate industry's need for flexibility toward economic growth and facility expansion.

By 1995, the Dutch ministry of environment recognized that the existing command-and-control policy instruments were not adequate to realize the 2000 and 2010 emission reductions required in the national environmental policy plan. Additional drivers for the policy included negotiations on national emission ceilings agreed to in the Gothenburg Protocol to Abate Acidification, Eutrophication, and Ground-level Ozone and the EU directive on national emission ceilings (NEC directive). A number of complicated issues—such as design options for emission trading, program participation, transfer procedures, and other technical and legal questions—had to be resolved before agreement was reached on the environmental targets in December 2000. Other issues involved compatibility with European legislation, particularly with the Integrated Pollution Prevention and Control (IPPC) Directive.

The environmental objective of the Dutch emission trading program is an industrial emission target of 55,000 tons of NO_x in 2010 compared to 1995 base year emissions of 122,000 tons with an average industrial emission rate of 94 grams per gigajoule (GJ). Further reductions are expected beyond 2010 as a result of the Clean Air for Europe program. As the environmental outcome of such a rate-based approach is not as certain as under an absolute emission cap, the government set an interim target of 75,000 tons of NO_x in 2005 to assess whether the established PSR—50 grams per GJ in 2010—will be sufficient to realize the target of 55,000 tons. Early estimates based on fossil fuel consumption forecasts show that the PSR level may need to be reduced further to 40 grams per GJ in 2010.

To balance out spikes in supply and demand, the Dutch NO_x program allows participating sources to borrow and bank credits. Each facility may borrow a limited number of credits from its next year's allocation or bank a limited number of credits for use in the following year. Borrowing and banking is limited to 10 percent of each source's 2004 NO_x allocation, 7 percent of the 2005 allocation, and 5 percent the allocations thereafter.

The Dutch government sought advice from EPA on many other critical issues, such as emission monitoring, reporting, enforcement, and validation and certification procedures.

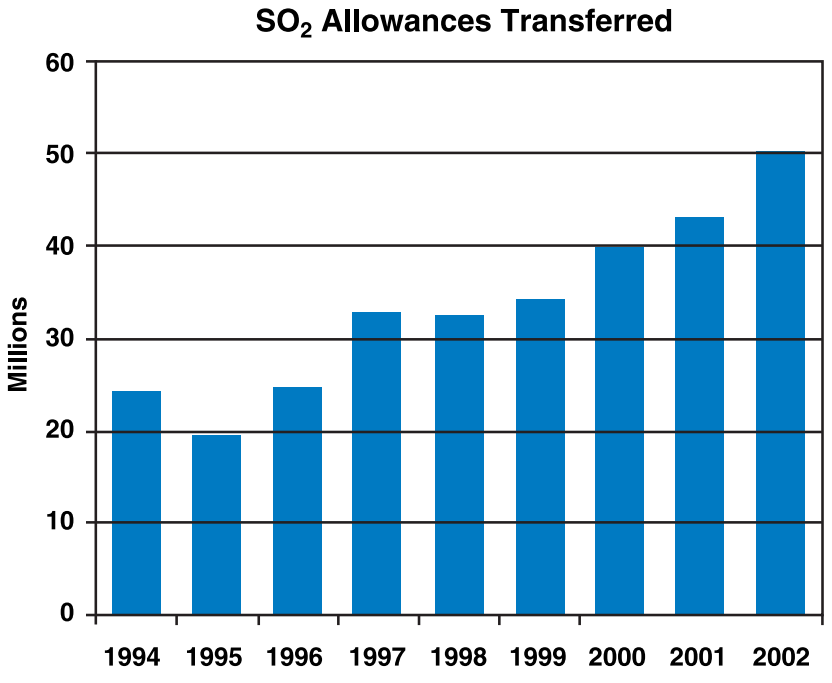
U.S. Lessons Learned from Operating Emission Trading Registries

—Jeremy Schreifels, U.S. Environmental Protection Agency

Of the many valuable lessons learned from the U.S. SO_2 and NO_x cap and trade programs, perhaps one of the most important is the need for comprehensive, accurate, transparent, and timely information about emissions and tradable allowances. The most effective method available today to process and disseminate these data is through an emission trading registry.

The advantages of using registries go well beyond their ability to handle large amounts of data. Using a flexible, comprehensive system to collect and manage data can provide numerous benefits, including:

- **Increased data accuracy.** Tools such as electronic reporting and automated data quality checks reduce errors and eliminate redundant data entry.
- **Reduced time and costs.** Electronic reporting and automated data quality checks also reduce the time and costs required to complete, process, and review paper forms. In addition, the electronic storage of data can significantly reduce, or even eliminate, the costs associated with the collection, transport, storage, and dissemination of paper forms.
- **Enhanced access.** Electronic data storage makes it easier and faster to retrieve, analyze, and evaluate relevant data on demand. Improved access to data can also promote confidence in the trading program by permitting program participants and interested members of the public to retrieve data to ascertain compliance, evaluate a program's effectiveness, and make informed decisions.
- **Improved consistency and comparability.** Electronic reporting and electronic data storage encourage consistency by requiring all program participants to report the same information in a common reporting format. This consistency



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promotes comparability across time and among program participants.

For the U.S. SO_2 and NO_x cap and trade programs, EPA operates computerized tracking systems to collect emission data for SO_2, NO_x, and CO_2 from electric power generators and NO_x from other large industrial boilers (e.g., chemical plants and refineries) in the eastern United States. These systems also track the issuance, transfer, and compliance submission of allowances.

As the volume of data has grown, EPA has increased the use of electronic data transfer. In 2002, 100 percent of emission data and almost 80 percent of allowance transfers were submitted electronically. EPA has also introduced an online management system to encourage program participants to use the Internet to manage their participation in the program (see *Clean Air Markets Update*, Issue 3.)

Lessons Learned

EPA has operated registries for almost a decade and has learned many valuable lessons. The first generation registries were expensive and sometimes burdensome. However, as technologies improved and experience increased, the EPA began reengineering the systems to provide better data collection, auditing, management, analysis, and dissemination capabilities. Today's systems offer unprecedented automation and data access. The following are some of the lessons learned from designing and operating these registries.

Emphasize Data Quality

Compliance with an emission trading program is determined by comparing each source's total emissions with its allowance holdings. Ensuring the highest level of accuracy in both emission and allowance data is therefore extremely important. The U.S. registry system conducts hundreds of automated data quality checks on every emission submission. Errors and discrepancies are reported to the participating sources, and they are given an opportunity to resubmit the data. In addition, EPA provides sources with reporting software that conducts data quality checks before submitting the data. By moving the quality assurance checks to the data source, there is less opportunity for poor quality data to enter the registry.

Promote Transparency

A credible emission trading program must be based on a foundation of accurate and timely information. Public acceptance of an emission trading program will be heavily influenced by the degree to which the public trusts and understands the results of the program. Registries play a critical role in building public acceptance. By providing data in a transparent manner, registries can instill confidence in a program by revealing how well the program is enforced and ensuring accountability for each unit of emissions. Data transparency can also increase the efficiency of the

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market and reduce transaction costs by enabling participants to identify potential buyers and sellers. True transparency, however, requires providing the information in a useful and informative format. The U.S. SO_2 and NO_x registries provide data access tools that allow interested persons to develop customized queries of the data that are of most interest. In addition, mapping and other applications provide data in an easy-to-understand graphical format.

Design for the Future

When designing emission trading registries, every effort should be made to create a flexible, adaptable design that can accommodate future program changes as well as new programs. For example, if an emission trading program focuses on a single pollutant or sector, the system should be designed so that it can accept additional pollutants and sectors if programs are expanded or added in the future. Designing a flexible system might require more initial capital and effort, but it will reduce administrative burden and reengineering costs in the long run.

Integrate with Existing and Planned Systems

Most regulatory agencies already collect some data about the environmental performance of sources. The design of the registry should recognize those existing and planned systems to reduce data redundancy and administrative effort and costs for both government and industry. The different components within the registry itself can also be integrated (e.g., emission and allowance data) to reduce administration.

Automate Recurring Procedures

Many processes contain repetitive procedures. To the extent that these are automated, they will reduce the effort required to process data. In the U.S. registries, emission data are thoroughly audited by the system before they are even accepted, and the reconciliation process automatically deducts the appropriate number of allowances from each account according to predefined methods.

Emphasize Security

Due to their scarce nature, allowances in a cap and trade program have economic value. In addition, the costs of compliance (and noncompliance penalties) are based on emission data and allowance holdings. For this reason, registries must have a high degree of integrity to prevent fraudulent transactions and malicious attacks on the system.

Next Generation Systems

EPA has used these lessons to develop next generation registry systems for emission trading programs. In addition to the in-house systems in use at EPA for the U.S. SO_2 and NO_x cap and trade programs, EPA has built the Emission and Allowance Tracking Systems (EATS) for external use. EATS is currently in operation for the New Hampshire NO_x emission trading program in the United States, and rollout is planned for other nations. EATS is a flexible, generic registry to collect, manage, and disseminate emission and allowance data. For more information, contact the author at <schreifels.jeremy@epa.gov>.

News From Around the World

EPA released a final version of "Tools of the Trade: Designing and Operating a Cap and Trade Program," a guidebook for governments considering the implementation of domestic cap and trade programs. For more information, contact the *Clean Air Markets Update* editor at <camu@epa.gov>.

EPA released progress reports for the NO_x Budget and SO_2 Allowance Trading Programs. The progress reports provide a summary of the programs and recent results. For more information, visit the Clean Air Markets Division's Web site at <www.epa.gov/airmarkets>.

EPA held workshops in Atlanta on March 13 and 14; Chicago on April 10 and 11; and Washington, DC, on May 7 and 8 on implementation of the NO_x SIP Call Budget Trading Program. The SIP Call will create a NO_X emission trading program for 21 states and the District of Columbia. The program began on May 1, 2003, in 8 northeastern states and the District of Columbia, and will begin on May 31, 2004 for an additional 11 southern and midwestern states. The remaining two states will be brought in through a second EPA rulemaking, currently in proposal. For more information, contact Mary Shellabarger at +1 202 564-9188 or Beth Murray at +1 202 564-1247, or visit the workshop Web site at < www.epa.gov/airmarkets/business/noxsip>.

The Emissions Marketing Association (EMA) developed ET101 and ET201 training courses to educate participants about the basics of emission trading and an introduction to managing risk. EMA is conducting the training sessions at conferences and workshops around the world. For more information, visit EMA's Web site at <www.emissions.org>.

EMA held its 7th Annual Spring Meeting in Phoenix, Arizona, from May 4 to 6. For more information visit EMA's Web site at <www.emissions.org>.

The International Emission Trading Association (IETA) held a workshop on emission trading registries in Geneva on February 6. The workshop, co-sponsored by the California Climate Action Registry (CCAR), highlighted the technical, institutional, and legal issues of emission trading registries, and a presentation on the U.S. 1605(b) greenhouse gas emission registry. The organizations, along with BP, also held a workshop on greenhouse gas emission registries in San Francisco from May 4 to 6. For more information, visit IETA's Web site at <www.ieta.org> or CCAR's Web site at <www.climateregistry.org>.

Upcoming Events

September 21 to 23, 2003

The EMA 7th Annual Fall Meeting & International Conference at the Wyndham Miami Beach Resort in Miami, Florida. For more information about the conference and call for papers, visit EMA's Web site at <www.emissions.org>.

October 22 to 24, 2003

The International Emissions Trading Association (IETA) Annual Forum at the Fairmont Chateau Laurier in Ottawa, Canada. For more information about the forum, visit IETA's Web site at <www.ieta.org>.