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Companies and Regulators in Emissions Trading Programs

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Abstract

Much has been written about the economic and environmental performance of U.S. emissions trading programs for "acid rain" (sulfur dioxide) and nitrogen oxides. Less explored have been the unique roles and interactions of environmental regulators and the companies they regulate. I first examine how these roles change the way that regulators and companies operate within their own organizations and with each other. Next, I use examples from U.S. trading programs to illustrate the design and administrative features that allow program administrators and industry to best fulfill their respective roles. Finally, I examine briefly whether these features are present in the EU Emissions Trading System and determine the implications for its effectiveness.

Key Words: emissions trading, climate change, environmental management, information technology

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Joesph Kruger*

1 Introduction

One of the most striking aspects of an emissions trading program is the unique roles and interactions of environmental regulators and the companies they regulate. Emissions trading programs are starkly different from traditional regulatory programs that mandate specific technologies or facility-specific standards. In an emissions trading program, regulators defer decisions on technology and compliance strategy to the companies, which best understand their business operations. Regulators focus instead on monitoring and verification of emissions, tracking the transfer of emissions allowances, ensuring that companies hold enough allowances to match their emissions, and assessing any necessary penalties.

Similarly, companies have a very different role in emissions trading programs. Under the traditional command-and-control approach, a company might simply have its environmental compliance department interpret and implement a technology mandate. In contrast, an emissions trading program requires a more integrated approach. Because there is complete flexibility in compliance in an emissions trading program, the compliance strategy becomes integrated into the company's overall business strategy. Most companies explore numerous compliance scenarios before selecting a strategy based on their analysis of fuel markets, tax and accounting consequences, finance implications, and even public relations.[1]

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[1] Lober and Bailey found that there was a correlation between nonparticipation in the SO_2 allowance auctions and concerns by companies about negative public views of allowance trading (Lober and Bailey 1997). Some of this concern was spurred by negative press reports about the first few SO_2 allowance trades. For example, following the first publicly reported allowance trade in 1992, an opinion piece in *USA Today* argued that as a result of allowance trading "people will die" (Kruger and Dean 1997).

In this paper, I examine how those new roles change the way that both regulators and companies operate within their own organizations, interact with each other, and contribute to the overall effectiveness of the program. I also explore whether the same factors that shaped the U.S. programs are beginning to affect the European Union Emissions Trading System (EU ETS).

In brief, I find that companies participating in the U.S. sulfur dioxide (SO_2) and nitrogen oxides (NO_x) trading programs have developed internal structures to handle the significant complexities of flexible compliance planning and to manage both price and regulatory uncertainties. Regulators at the Environmental Protection Agency (EPA) have developed their internal structures to ensure consistency and environmental integrity, but also to improve administrative certainty for companies. Although regulatory uncertainties are often beyond the control of both program administrators and companies, the focus of both parties on a routine and predictable administrative program has been mutually beneficial and has led to a reasonably harmonious relationship between industry and program administrators.[2] Although it is far too early to make any definitive conclusions about the EU ETS, I find that many of these same features are present. However, companies in the European Union face significantly greater uncertainty about future environmental requirements than did their U.S. counterparts. Moreover, it will be worth watching whether the flexible system of emissions reporting and verification for the EU ETS will provide the administrative certainty required for the efficient and effective operation of the program.

2 Industry's Role: Strategic Planner and Entrepreneur

Compliance planning in an emissions trading program is both simpler and more complex than under command-and-control regulations. It is simpler in that the compliance determination itself is objective and straightforward—a company simply holds enough allowances to match its emissions. The flexibility of emissions trading programs allows a company to tailor a cost-effective strategy to its own circumstances. A company is not forced to meet a technology mandate that may not make sense for its plant configuration or business plan. There are no

[2] Regulatory uncertainties such as restructuring of the electric power sector may have both economic and market implications. However, for purposes of this paper, the term regulatory uncertainties refers to potential changes in environmental requirements that might affect utility decision making about compliance strategies or investment choices.

complex reviews of whether the firm meets technical or process specifications, or whether its pollution abatement equipment is operating as it should. Finally, there is no uncertainty about whether regulators will react favorably to a compliance plan.[3]

On the other hand, the flexibility and freedom inherent in a performance-based emissions trading program put added pressure on a company to develop an effective strategy. A poor strategy could lower shareholder value and erode the competitiveness of a company vis-à-vis other firms in the industry. Thus, a variety of factors must be considered, including future changes in fuel markets, technological options, financing issues, tax considerations, and possible regulatory changes. Reconciling all of these factors may be considerably more challenging than implementing a technology mandate.

The wide range of possible strategies and options increases the complexity of the analysis that must take place as a company develops its compliance strategy. Compliance choices may require large capital outlays or have long lead times for completion. For example, some of the initial compliance decisions for the SO_2 program had to be made three years in advance to allow time to install pollution control equipment (Reinhardt 1993). Building a new power plant may require an even longer lead time for design, permitting, and construction (EMA 1999). Thus, knowledge of how requirements of a trading program may evolve over time and how these changing requirements will alter the cost of complying with an emissions trading program is critical to making the right investment decisions. For example, a company might make entirely different decisions if it knows that an emissions cap will remain unchanged over many years, or if it expects an overall change in a cap within a few years.

Experience in the United States has shown that companies address complexities and uncertainties in several ways. First, companies in the U.S. SO_2 and NO_x trading programs have adopted an interdepartmental approach to compliance planning and operations. Second, to handle the complexity of planning under a variety of scenarios, companies have used sophisticated analytical tools. Third, some companies have taken advantage of risk management strategies

[3] In contrast, traditional regulatory programs often use a detailed permitting process that requires government review of technology or process measures used to reduce emissions. In these programs, sources submit detailed permit applications describing plan configurations, the proposed technology and its specifications, expected emissions and levels of operation, proposed expenditures, and other information. Government officials review this information for each facility and issue a detailed, legally enforceable permit. In some countries, significant changes at a facility require additional extensive submissions by industry and review by government officials (UK Environment Agency 2000; U.S. EPA 2000).

made possible by a liquid emissions allowance market. Finally, to an unprecedented degree, companies have adopted information technologies for data management and regulatory reporting. These aspects of organization and corporate behavior in an emissions trading program are discussed below.

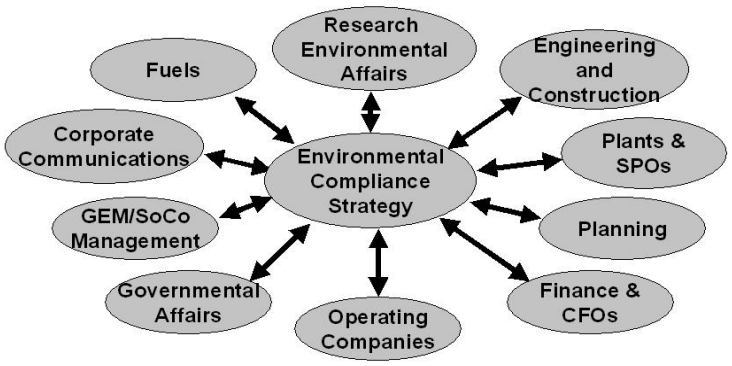
2.1 An Interdepartmental Approach

The diversity of corporate issues that arise in compliance planning in an emissions trading program are surprisingly broad. Previously, compliance planning was often assigned to an environmental affairs department. With the advent of the SO_2 trading program, environmental strategy became more central to overall business strategy. It therefore required input from a number of departments and required extensive coordination across the company (Gloski et al. 1995; Price and Crockett 1995). In the early years of the program, companies often formed teams to ensure that they had structures in place to meet compliance requirements. For example, South Carolina Electric & Gas formed an interdepartmental team to assess the capabilities required for software needed for compliance (Mosier 1995).

Interdepartmental coordination continues to be critical for compliance planning. For example, Southern Company, the United States' largest electric power company in terms of electricity sales, incorporates input from 10 departments in the development of its compliance strategies. The process includes input from senior officials, including all the chief financial officers within the holding company's six operating companies. Figure 1 on the next page shows the various departments that have input into Southern Company's compliance strategy.

There is some evidence that the way companies organize to implement trading programs may depend on the overall corporate view of emissions trading within a company. In a survey conducted for the Electric Power Research Institute during the early years of the SO_2 trading program, Price and Crockett (1995) found that companies that placed a priority on matching allowances to their own emissions often gave the lead to environmental or power production departments. In contrast, companies that viewed allowances as a marketable commodity tended to give the lead to the fuel or bulk power departments. Over time, there has also been a trend in some companies to shift allowance trading activities to new departments that focus on all energy-related commodities, including electricity and natural gas (Swift 2001).

Figure 1. Departments participating in Southern Company compliance planning.



CFO chief financial officer, *SoCo* Southern Company, *SPO* senior production officer in charge of all the plants for a specific operating company, *GEM* Generation and Energy Marketing (an internal organization that crosses operating company boundaries and pulls together management of power plants, fuel, planning, and marketing under one umbrella)

Source: Southern Company

Companies that take an active approach to managing their allowance assets may give considerable autonomy to trading departments. For example, at American Electric Power, day-to-day decisions on allowance trading are made by the company's trading department, which also handles general energy trading strategies. Meanwhile, broader decisions on capital investments for pollution controls, such as scrubbers for SO_2 or selective catalytic reduction technologies for NO_x, are made in the departments that address overall corporate strategy or major investments in generation (Braine 2004).

In some cases, effective integration of environmental planning departments with trading departments requires significant changes. For example, initially at PG&E National Energy Group, the environmental affairs department made decisions on individual allowance trades, and the energy trading department executed the trades and was responsible for overall risk management and oversight. Starting in 2000, the company decided to give day-to-day emissions allowance portfolio management duties to the trading department, with the stipulation that allowances be returned to environmental affairs by a set date for compliance. Ultimately, this change required the environmental affairs department to have confidence that the allowance market had enough liquidity, and that an active trading program would not jeopardize environmental compliance, although it might put the cost of compliance at risk (LaCount 2000).

2.2 Sophisticated Analytical Tools

Although much attention is placed on the trading of allowances, it is important to note that trading is only one component of a strategy in a cap-and-trade program. The flexible, performance-based nature of these programs and the ability to conduct compliance planning on a companywide basis also allows considerable cost savings. This is true even if there is no trading (Burtraw 1996).[4] This flexibility has led companies to develop and consider multiple scenarios for compliance (Reinhardt 1993). Companies have developed sophisticated tools to help them evaluate these scenarios. For example, PEPCO, a company that operates in Maryland and the District of Columbia, developed a computer model that forecasts emissions and simulates compliance options while optimizing net profits. We Energies (formerly WEPCO) developed a simulation model that was capable of looking ahead 20 years or more while developing least-cost compliance scenarios (EMA 1999).

Some companies use these models because they believe that superior analytic capabilities provide them with a strategic edge. For example, a recent assessment of American Electric Power's environmental strategy noted that the company's development of a proprietary model to assess environmental compliance options was "one of the company's most important accomplishments." This report, written by independent members of the company's board of

[4] Burtraw (1996) also found that cost savings resulted from market competition between different vendors of technologies and fuels. These vendors were forced to compete with each other for the first time under the SO_2 trading program.

directors, concluded that AEP's model had provided the company with an important competitive advantage (AEP 2004).

To run these models, companies must develop a series of inputs, some of which are based on additional analyses and scenarios. For example, Southern Company holds a series of forecasting workshops for the different types of fuels used at its power plants. The company must also make periodic assumptions about future technology costs and allowance prices. Figure 2 shows some of the other considerations that go into compliance planning at Southern Company, including assumptions about how regulatory requirements may change in the future.

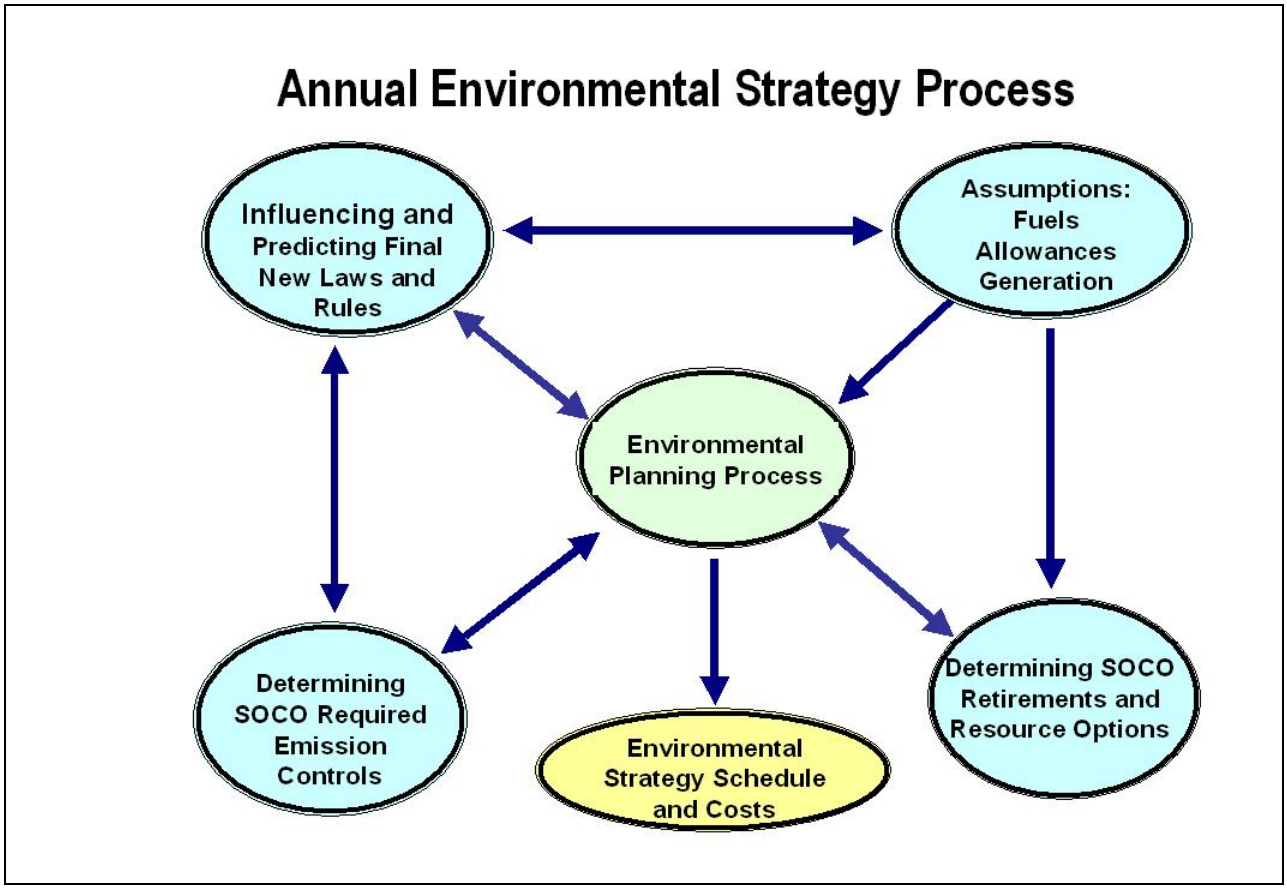
2.3 Application of Risk Management Tools and Strategies

The inherent price uncertainty in emissions markets has led some U.S. companies to use strategies to manage risk (Canterbury 2003). The same tools that are used in financial markets to hedge risk have been used in the U.S. SO_2 program. These include relatively simple strategies like dollar cost averaging, which spreads the buying or selling of allowances over a period of time so that the firm can avoid buying large amounts of allowances at the top of the market or selling large amounts at the bottom of a market cycle. They also include more complex structures, such as forward settlements, swaps of allowance vintage years, loans of allowances, options, weather-contingent contracts, and other mechanisms (EMA 1999; Hart 2000; Zaborowsky 2004).[5] Finally, there has also been bundling of coal supplies with emissions allowances in packages designed to meet the emissions specification of electric power companies and to conduct arbitrage between coal and allowance markets (Doucett and Strauss 1994; Ellerman et al. 2000).

U.S. experience with the SO_2 trading program has shown that companies have also benefited from using banking strategies to manage price uncertainty and to facilitate compliance

5 According to emissions trading brokers and other observers, unregulated electric power companies, merchant generators, and energy marketing firms take a more active role in the asset management of allowances than do regulated electric utilities (Zaborowsky 2002).

Figure 2. Southern Company (SOCO) compliance process



planning.[6] Allowance banking can create a cushion that will prevent price spikes and can hedge uncertainty in allowance prices (Jacoby and Ellerman 2004). Essentially, a banking provision allows the arbitrage between actual marginal abatement costs in one phase of a program and the expected abatement cost in a future phase of a program. Banking can also mitigate the consequences of "overinvestment" by providing extra allowances that may then be used for future compliance (Ellerman et al. 2000). Moreover, the temporal flexibility of banking is

[6] In contrast, the lack of an adequate banking provision in the RECLAIM trading program in Southern California may have been at least partially responsible for extreme price volatility following high electricity demand in 2000. See Ellerman et al. (2003).

particularly useful for companies facing large capital expenditures because it provides some flexibility in the timing of those expenditures (Tietenberg 2003).

2.4 Incorporation of InformationTechnology

Companies affected by U.S. emissions trading programs have used increasingly sophisticated software to help them manage their emissions and allowances (US EPA 1996). The huge amount of data that must be tracked by companies is, in the words of one industry official, "an accountability monster" that makes information technology a necessity (Martin 1995). In addition to the software developed by EPA for firms to submit emissions reports (discussed below), many companies use software that tracks and projects emissions throughout the year, compares emissions and allowance holdings, and manages allowance transfers and accounting issues. This same software can reconcile utility allowance databases with those of EPA and submit electronic filings to EPA. For example, the Allowance Tracking Workstation (ATW)[7] —a software application manufactured by Environmental Software Providers that is used to manage roughly 40% of the allowances in the SO_2 trading program (Gloski 2004)—handles several types of functions:

- Generates electronic transfer file
- Generates allowance deduction form, including selection of serialized allowance blocks
- Allows electronic emissions reports to be submitted to EPA
- Tracks all allowance trades by serial numbers and allows comparison of ATW database with the EPA registry
- Tracks actual emissions versus projected emissions
- Allows tracking of multiple accounts
- Generates forms required for allowance accounting associated with interstate sales of electricity
- Calculates moving average costs of allowance for accounting and valuation purposes

Company officials have noted that integrating their emissions monitoring systems with their overall data systems allows them to share emissions information among departments

[7] For more information see http://esp-net.com/pdfs/ecoAsset.pdf.

(Konings 1995; Caulfield and Dene 1995). This capability also allows them to determine well ahead of compliance deadlines whether their allowance holdings are adequate. For example, Southern Company puts out monthly emissions reports that allow its operating companies' allowance managers to determine whether they risk running short on emissions allowances. When a compliance period ends, they can tally their emissions within a few days and go out on the market to buy any additional allowances they need (Hart 2004).

3 Role of Regulators: Banker/Accountant

Ellerman (1999) has noted the "revolutionary" role played by the environmental regulator in an emissions trading program. He writes that this role "is no longer that of grandly deciding what is best for firms and individuals, entertaining equitable appeals, and enforcing the result" (Ellerman 1998). Instead, regulators assume the role of a banker or accountant by focusing on the accurate tracking of emissions and allowances. In the U.S. SO_2 program, for example, approximately 75% of staff resources (75 people, including personnel in regional EPA offices and state agencies) are focused on the measurement, verification, and tracking of emissions data. They also provide policy guidance on measurement issues (discussed below), develop and operate the information systems that track emissions and allowances, certify monitoring equipment, verify reported emissions data, and audit facilities (US EPA 2003).

Although the main organizing principle of program administrators is maintaining accountability for the system, an important secondary goal is providing administrative certainty. For example, regulated companies must be certain that administrators won't second-guess their compliance or business decisions, whether technology investments or individual emissions allowance trades. Both government and industry officials have noted the importance of a "hands-off" approach by government to the market. For example, an EPA program administrator contends,

> Government should refrain from trying to participate in, control, or fine tune the market, particularly since many changes, such as restructuring, may occur outside the regulator's purview. This focus should provide the certainty, efficiency, and stability desired by all and necessary for optimal market performance. (McLean 1997)

An emissions trading manager at one of the largest power companies in the United States notes that by playing an appropriate role, regulators facilitate the market. He writes,

> The EPA has acted as a type of clearinghouse for this system and through their annual auction and their compliance verification process has assured those participating in the market that the allowances they buy, sell, or trade are valid and fungible. (Hart 2000)

In addition to not interfering in market activity, program administrators have tried to create administrative certainty by making program operations routine and not subject to discretion. The routine nature and lack of regulatory discretion of the U.S. trading programs manifests itself in several ways. First, the rules for emissions monitoring are extraordinarily detailed and prescriptive, leaving little discretion for either companies or regulators. Second, there is heavy reliance on information technologies to operate the program and to automate routine procedures. Finally, excess emissions penalties are nondiscretionary and automatic. These aspects of how regulators operate are described below.

3.1 Detailed Rules for Emissions Monitoring and Reporting

Monitoring rules are highly detailed in the U.S. SO_2 and NO_x programs. The regulations for monitoring cover almost 300 pages and provide detailed standards for installation and certification of monitors, quality assurance and testing, handling of missing data, recordkeeping, and other features.[8] Most of these rules are now incorporated into software systems at both the companies and EPA so that the reporting and review of emissions reports are highly standardized.

To provide certainty and ensure consistency, EPA devotes extensive resources to answering and documenting questions that arise about monitoring requirements. EPA has an online policy manual that is largely in a question-and-answer format. It has been updated more than a dozen times over the life of the program and is now nearly 500 pages long. These detailed monitoring and reporting requirements, though complex, have provided companies with considerable certainty that if they follow the procedures, their emissions reports will be accepted in a timely manner.

3.2 Centrality of Information Technology

The routine nature of the decisions that regulators make and the vast amounts of emissions and allowance data that must be handled have allowed regulators to build the

[8] To a certain extent, the use of continuous emissions monitors (CEMs) in the U.S. trading system has required this more prescriptive approach. However, although 96% of emissions in the U.S. SO_2 program are monitored with CEMs, only 36% of units are required to use CEMs. Gas-fired units, for example, are allowed to use alternative methods. The regulations for these alternative methods are still quite detailed (e.g., there are 30 pages of regulations for a method that allows gas-fired units to use fuel meters and emissions factors).

operation of the trading program largely around information technology (Kruger et al. 2000; Perez-Henriquez 2004). For example, companies are required to report emissions data to EPA in a standardized electronic format. Once the data are received, EPA computers run quality assurance tests and give electronic feedback to companies. Additional software is used to run electronic audits on emissions reports. Emissions data are maintained in a database that is accessible via the Internet (Husk and DeSantis 2002).

EPA's allowance registry is similar to an online banking system, with companies able to manage their allowance accounts and make transfers without submitting paper forms. Approximately 80% of all transfers of allowances are now done over the Internet by the sources themselves. Similarly, EPA has implemented a new application that allows companies to log onto a secure site and perform functions that were previously done with paper forms. These include changing information about company officials who are authorized to act for an allowance account, submitting data about new or retired emissions sources, and determining whether a source is required to participate in the program (Husk and DeSantis 2002).

Electronic reporting and processing of data have been critical in meeting the tight timeframes for the annual compliance true-up period. Companies submit their final quarter's emissions data by January 31 and have until March 1 to transfer allowances and submit final compliance certification forms. EPA then completes verification of the annual emissions data and compares them electronically with allowances within the accounts of each unit. Typically, this process is completed by June.

Finally, through the development of standardized reporting formats and protocols, EPA and companies have meshed their data systems. Early in the program, EPA developed and distributed software to help companies develop their emissions reporting systems (McLean 1997). As discussed earlier, software used by companies to track allowances and emissions incorporates standardized EPA electronic reporting formats and allows companies to compare their own records of allowance holdings with those in the EPA registry.

3.3 Automatic and Nondiscretionary Penalties

The certainty that a penalty will be imposed is a critical element in providing the correct incentives in an emissions trading program. The automatic nature of excess emissions penalties in U.S. trading programs contrasts with the traditional regulatory approach, in which sources in violation negotiate for a regulatory exemption (Ellerman 2003). If the negotiation costs are less than the cost of compliance, then participants in a trading program have little incentive to

comply. Conversely, if participants in a trading program know that the cost of a ton of excess emissions will exceed the cost of buying an allowance on the market, they have every financial incentive to comply. Administrators of the U.S. trading program argue that the automatic nature of penalties and the certainty of other compliance-related provisions focus corporate resources and attention on low-cost compliance strategies, rather than on lobbying or litigating to reduce costs (McLean 2004).

Compliance interactions between regulators and companies mainly involve resolving discrepancies over emissions data that arise in the quality assurance process. As discussed earlier, quarterly electronic reporting and feedback give companies adequate notice of data problems and time to correct these problems before the annual reconciliation of allowances and emissions data. Compliance is a largely routine process; allowances are electronically compared with emissions at each utility unit. With an automatic penalty that is significantly higher than the market price for allowances, and with a liquid market for allowances, there has been nearly 100% compliance with the SO_2 trading program.[9]

4 Industry Attitudes toward U.S. Program Administrators

The routinization of decisions made by regulators has led to a relatively harmonious relationship between regulators and companies in the U.S. programs. Although there has been no formal study of attitudes toward regulators in the SO_2 program, there is anecdotal evidence that industry officials are generally satisfied with the interactions. One industry representative notes that this constructive relationship between industry and regulators is due to a clear mission for regulators—that is, "to get the system up and working, to ensure compliance, and to report on progress" (Braine 2004). Swift (2001) argues that this focus on emissions results rather than compliance choices creates less friction between regulators and companies because it reduces transaction costs and avoids delays inherent in the review of industry strategies. This represents a considerable improvement over earlier emissions trading programs, in which case-by-case reviews of trades contributed to delays and uncertainties (Hahn and Hester 1989). Finally, industry officials have also lauded the lack of interference in the allowance market by program administrators (Chartier 1997), the lack of restrictions on banking (Hart 2000), and the general

[9] In nine years of operation, there have been 15 penalties, ranging from $2,682 to $1,580,000. There have been a few additional civil penalties for other violations, such as failures to monitor and report emissions (Kruger 2004).

ease of administration (McManus 2001). All of these features have made it easier for companies to take advantage of the flexibility inherent in a market-based program.[10]

5 The European Union Emissions Trading System

5.1 Administrative Certainty in the EU ETS

In general, the EU ETS incorporates many of the lessons learned from earlier emissions trading programs about the appropriate roles of regulators and companies. There are no restrictions on allowance trading, nor are there case-by-case reviews of individual allowance trades. Moreover, there is no role for regulators in determining the compliance strategies that should be followed by companies. Interestingly, it is not clear that all member state authorities fully agree with this hands-off role. In their review of member states' national allocation plans, European Commission regulators flagged allocation provisions in some plans that would have interfered with the development of allowance markets. Specifically, the commission prohibited the use of ex post adjustment clauses in the national allocation plans of Germany, Austria, Luxembourg, Portugal, and Belgium (EC 2004a, 2004b). The commission noted that these provisions, which would allow authorities to confiscate allowances from companies if emissions were lower than predicted, "would create uncertainty for operators and be detrimental to investment decisions and the market" (EC 2004b).

The EU ETS has also emphasized standardized emissions monitoring techniques through binding guidelines that are considerably more detailed than comparable past guidance put forward for EU environmental directives (Kruger and Pizer 2004a). Nevertheless, the European Union's emissions monitoring, reporting, and verification system procedures differ from those in the United States in several ways. First, the proposed guidelines are less prescriptive and give considerably more flexibility to installations and to member states.[11] There are several reasons

[10] Not surprisingly, Svendsen found that the flexibility of the cap and trade approach, coupled with increased competition in the electric power sector, is as one of the main reasons the U.S. electric power industry prefers a grandfathered tradeable permits market over other regulatory approaches (Svendsen 1999).

[11] Continuous emissions monitors are optional in the EU monitoring guidelines and most sources will likely use calculation methods. The guidance also spells out different "tiers" of methodologies with different degrees of assumed accuracy. Firms would propose installation-specific methodologies to the relevant authority in each Member State. Installations are assumed to use the top tiers, but they may petition to use lower tiered methods with lower assumed accuracy if they show that a methodology is impractical or cannot be achieved at reasonable cost. Each Member State has the autonomy to grant waivers from use of the top tier methods (EC 2004c).

for this flexibility. First, it reflects the diversity in the types of sources in the EU ETS. Second, it may be a sign of a fundamental difference in the underlying monitoring and reporting approach. The EU ETS approach relies more on the professional judgment of the verifier to interpret broader monitoring guidelines. In contrast, the U.S. system relies more heavily on detailed rules with less discretion for government verifiers.[12] Moreover, in contrast to the U.S. trading systems, member state authorities may require companies to use third-party verifiers if the government does not have the capacity to verify hundreds of emissions reports. Also, some advocates of third-party verification have argued that it is important to have verifiers who are independent of government authorities.[13]

It is not clear whether the use of more flexible guidelines and third-party verification will increase or decrease the certainty of the acceptability of emissions reports. On one hand, a flexible monitoring process implemented by a legion of competent third-party verifiers could provide adequate certainty to companies participating in the program. On the other hand, if portions of the guidelines are viewed as ambiguous and require additional interpretation, or if third-party verifiers differ significantly in their competence or consistency, then the EU ETS monitoring process could increase administrative uncertainty. It may also be more difficult to translate the flexible approach inherent in the monitoring and verification system into a standardized electronic reporting, verification, and auditing system like that in the United States. Finally, if uncertainties lead to delays in the approval of emissions reports, the EU allowance market could be affected, since the directive restricts the transfer of allowances from installations without approved emissions reports (EC 2003).

[12] Differences in emissions monitoring and verification approaches may be analogous to differences in accounting practices in the U.S. and Europe. The European corporate accounting system is characterized by "principles-based accounting", whereby accounting guidelines are more general and more discretion is given to interpretation. In contrast, the U.S. accounting system is "rules-based", with more detailed decision rules for accounting and less discretion for interpretation. See Lenihan and Hume (2003) for a discussion of the advantages and disadvantages of each approach.

[13] For example, the president of the International Emissions Trading Association has written to the Polish government to encourage officials not to have a government authority conduct verification. He writes that "we believe that the role of verifier and that of competent authority should be separated and that they should have an arms-length relationship" (Marcu 2004).

5.2 Planning in an Uncertain Regulatory Environment

Although there is some uncertainty about how monitoring guidelines and other provisions will work in the EU ETS, it is likely that the questions can be addressed during the pilot phase of the program. A more difficult set of questions surrounds future emissions reduction requirements. This includes ambiguity about allocations in the second phase of the program as well as uncertainty about the form and level of international commitment beyond 2012. This lack of clarity about the future will make planning difficult. It will also make it challenging for European industry to take a long-term approach to investing in climate-friendly technologies and to planning a least-cost, longer-term strategy for greenhouse gas abatement.

The absence of a banking provision between the first and second phases is a further complication for planning efforts. The lack of banking may undermine longer-term mitigation plans because firms may have little incentive to implement strategies that create extra emissions reductions beyond their allocated levels. The inability to bank these "early reductions" could be a significant disincentive if prices are low in the first period and high in the second. Moreover, although banking will be available between the second period and subsequent periods, member states and their industries facing uncertainty over the structure of a future international regime could be reluctant to make the investment decisions necessary to take advantage of a banking provision (Kruger and Pizer 2004b).

6 Conclusions

Regulators and companies have developed roles in U.S. trading programs that allow them to organize and interact efficiently. The routine, nondiscretionary "banker-accountant" role played by regulators facilitates the complex "strategist-entrepreneur" role played by companies. Information technologies have allowed both regulators and companies to manage the huge amounts of data necessary to operate an emissions trading program and to reduce transaction and administrative costs. These technologies have also become a bridge between companies and program administrators and have allowed the two sides to operate cooperatively and efficiently. Both sides benefit from this relationship. Regulators get improved accountability and improved tracking of the environmental results of the program. Companies get more administrative certainty and the freedom to focus on integrating environmental options into their overall business strategies.

What factors will determine whether effective internal structures can be developed by companies and regulators in Europe? The companies have every incentive to evolve in ways that

will provide them with appropriate structures to handle the complexities of emissions trading. After all, in the long run, the fiscal impacts and strategic complexities of a carbon cap for European firms are even greater than were the impacts of the SO_2 cap on U.S. firms.[14] A greater challenge for European companies will be planning in the absence of certainty about Phase 2 allocations and post-Kyoto targets. Without a longer time frame for planning, European companies will face challenges making the right investment decisions no matter how well they operate across departments, take advantage of sophisticated planning tools, manage the price risks of compliance, and utilize information technology.

For regulators, the crucial question is whether the more flexible monitoring and verification system in the European Union will create enough certainty for industry while still maintaining environmental integrity. If flexibility leads to inconsistencies within or between member states, regulators may seek extended reviews of company emissions reports or third-party verification. Moreover, particularly during the early years of implementation, monitoring and verification issues will arise as emissions reports are reviewed. A process to expedite policy decisions on technical issues could be critical to give companies the administrative certainty they need. With the large number and diverse nature of installations in the EU ETS, and with the possible addition of more sectors in the second phase of the program, it will be worth watching whether program administrators and third-party verifiers can handle the huge volume of information in what is largely a paper-based emissions reporting system.

Finally, although it is far too early to make any definitive determination about the roles and interactions of companies and regulators in the EU ETS, the scope and diversity of the program will likely create new models and valuable lessons. For example, will the different business sectors represented in the program develop internal structures that reflect differing corporate cultures? Similarly, will different regulatory cultures represented in EU member states affect implementation of each domestic program? If so, does this make a difference for the overall effectiveness of the EU system? These and many other questions are worthy of further research as the regulators and the regulated in Europe implement the world's largest emissions trading system.

[14] However, several surveys have found that in the short term, some firms may face difficulties putting the internal structures in place in time for the quick startup of the EU ETS. See Carbon Finance 2004; Ernst and Young 2004; Logica 2004; PriceWaterhouseCoopers 2004.

References

AEP (American Electric Power) (2004). An assessment of AEP's actions to mitigate the economic impacts of emissions policies. Aug. 31. http://www.aep.com/environmental/-performance/emissionsassessment/default.htm

Braine B (2004) Personal communication with Bruce Braine, vice president, strategic policy analysis, American Electric Power Company, Oct. 24

Burtraw D (1996) The SO_2 emissions trading program: Cost savings without allowance trades. Contemporary Economic Policy 14:79–94

Canterbury M (2003) Portfolio management and environmental assets. *Environmental Finance* September: 27

Carbon Finance (2004) EU ETS Survey 1(9): http://www.carbonfinanceonline.com/issue/9

Caulfield D, Dene C (1995) CEM reporting workstation. In: Proceedings of the AWMA Acid Rain Conference. Air and Waste Management Association, Pittsburgh

Chartier D (1997) Statement by Daniel L. Chartier, manager, emissions trading, Wisconsin Electric Power Company, before the Joint Economic Committee, U.S. Congress. July 9

Doucett J, Strauss T (1994) On the bundling of coal and sulfur dioxide allowances. Energy Policy 22(9):764–770

Ellerman AD (2003) Are cap-and-trade programs more environmentally effective than conventional regulation? Working Paper 02-015. MIT Center for Energy and Environmental Policy Research, Cambridge

Ellerman AD, Joskow P, Schmalensee R, Montero JP, Bailey E (2000) *Markets for clean air, the U.S. acid rain program*. Cambridge University Press, Cambridge

Ellerman, AD, Joskow P, Harrison D (2003) Emissions trading in the US: Experience, lessons, and considerations for greenhouse gases. Pew Center on Global Climate Change, Arlington

Ellerman D (1998) Emissions trading and environmental policy. *The Emissions Trader* 2(4):1-5

———. (1999) The next restructuring: environmental regulation. *The Energy Journal* 20(1):141-148

EMA (Emissions Marketing Association) (1999) Emissions trading education initiative, emissions trading handbook. Milwaukee, EMA

Ernst and Young (2004) The European Union emissions trading scheme: A challenge for industry or just an illusion? July. Ernst and Young, London

EC (European Commission) (2003) Directive 2003/87/EC of the European parliament and of the council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the community and amending council directive 96/61/EC. Official Journal of the European Union, L 275/32. Oct. 25

———. (2004a) Communication from the commission to the council and to the European parliament. COM (2004) 681 final. Oct. 20. Brussels, EC

———. (2004b) Communication from the commission to the council and to the European parliament. COM (2004) 500 final. July 7. Brussels, EC

———. (2004c) Commission decision establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to directive 2003/87/EC of the European parliament and of the council. COM (2004) 130 Final. Jan. 29. Brussels, EC

Gloski D (2004) Personal communication with David Gloski, vice president, Software Providers, Sept. 28

Gloski D, Hoag R, Plank K (1995) Will the real allowance manager please stand up? The organizational impact of the allowance trading program on utilities. Proceedings of the AWMA Acid Rain Conference. Air and Waste Management Association, Pittsburgh

Hahn RW, Hester GL (1989) Marketable permits: Lessons for theory and practice. Ecology Law Quarterly 16(361):397

Hart G (2000) Southern Company's BUBA strategy in the SO_2 allowance market. In: Richard Kosobud (ed) Emissions trading: Environmental policy's new approach. New York, John Wiley & Sons

———. (2004) Personal communication with Gary Hart, manager, emissions trading, Southern Company, Oct. 8

Husk M, DeSantis L (2002) E-government and the clean air markets division. Clean Air Markets Update 3(Winter):6

Jacoby HD, Ellerman AD (2004) The safety valve and climate policy. Energy Policy 32(4):481–491

Konings JG (1995) The evolution of personal computer based data acquisition and handling system network for compliance reporting. In: Proceedings of the AWMA Acid Rain Conference. Air and Waste Management Association, Pittsburgh

Kruger J (2004) Compliance with cap and trade programs: The U.S. experience. Presented at International Network for Environmental Compliance and Enforcement (INECE), International Conference on Compliance and Enforcement of Trading Schemes in Environmental Protection, Oxford, England, March 17

Kruger J, Dean M (1997) Looking back on SO_2 trading: What's good for the environment is good for the market. Public Utilities Fortnightly 135(15):30-37

Kruger J, Pizer WA (2004a) The EU emissions trading directive: Opportunities and potential pitfalls. Discussion paper 04-24. Washington, Resources for the Future

———. (2004b) Greenhouse gas trading in Europe: The new grand policy experiment. Environment 46(8):8-23

Kruger J, McLean B, Chen R (2000) A tale of two revolutions: Administration of the SO_2 trading program. In: R. Kosobud (ed) Emissions trading: Environmental policy's new approach. New York, John Wiley & Sons

LaCount R (2000) Compliance planning and emissions trading. Presented at Workshop on Emissions Trading for Chinese officials of the State Environmental Protection Agency, Washington, November

Lenihan DG, Hume D (2003) A question of standards: Accounting in the 21st century. Centre for Collaborative Government, Ottawa

Lober DJ, Bailey M (1997) Organizational strategy, managerial decision-making, and market-based environmental policies: Utility company bidding behavior in the sulfur dioxide allowance trading auctions. Managerial and Decisions Economics 19(6):471–489

Logica CMG (2004) Emissions improbable—will industry be ready for the EU emissions trading scheme? White paper. Logica CMG, London

Marcu A (2004) Input to the Polish Ministry of Environment regarding the proposed act emission trading regulation for Poland. Letter to Wojciech Jaworski. Aug. 19

Martin JL (1995) Allowance Tracking Workstation. In: Proceedings of the AWMA Acid Rain Conference. Air and Waste Management Association, Pittsburgh

McLean BJ (1997) Evolution of marketable permits: The U.S. experience with sulfur dioxide trading. International Journal of Environmental and Pollution 8(1/2):19–36

———. (2004) Personal communication with Brian McLean, director, U.S. EPA, Office of Atmospheric Programs, September

McManus J (2001) Compliance experience of regulated entities. In: Acid rain: Are the problems solved? Conference proceedings. Center for Environmental Information, Rochester

Mosier P (1995) Come together: Inter-departmental information flow. Proceedings of the AWMA Acid Rain Conference. Air and Waste Management Association, Pittsburgh

Perez Henriquez, Blas (2004) Information technology, the unsung hero of market-based environmental policies. Resources Fall/Winter: 9-12

Price JP, Crockett D (1995) Will the real allowance manager please stand up? The organizational impact of allowance trading (Part 1). Proceedings of the AWMA Acid Rain Conference. Air and Waste Management Association, Pittsburgh

PriceWaterhouseCoopers (2004) Emission critical: Connecting carbon and value strategies in utilities. March 31. PriceWaterhouseCoopers, London

Point Carbon (2004) DEFRA sells UK registry to nine states for ETS. Aug. 11. Point Carbon, Oslo

Reinhardt F (1993) Acid rain: The Southern Company (A). Harvard Business School Case Study #9-792-060. Harvard Business School, Cambridge

Svendsen GT (1999) U.S. interest groups prefer emission trading: A new perspective. Public Choice 101:109–128

Swift B (2001) How environmental laws work: An analysis of the utility sector's response to regulation of nitrogen oxides and sulfur dioxide under the Clean Air Act. Tulane Environmental Law Journal 14:309

Tietenberg T (2003) The tradable permits approach to protecting the commons: Lessons for climate change. Oxford Review of Economic Policy 19(3):400–419

UK Environment Agency (2000) Integrated pollution prevention and control (IPPC), part A(1): Guide for applicants. December. U.K. Environment Agency, London

US EPA (Environmental Protection Agency) (1996) Acid rain program update no. 3. EPA-430-R-96-004. May. Washington, U.S. EPA

———. (2000) Design of flexible air permits. Draft white paper. August. Washington, U.S. EPA, Office of Air Quality Planning and Standards

———. (2003) Tools of the trade: A guide to designing and operating a cap-and-trade program for pollution control. EPA 430-B-03-002. Washington, U.S. EPA, Office of Air and Radiation. http://www.epa.gov/airmarkets/international/tools.pdf

Zaborowsky P (2002) The trailblazers of emissions trading. Energy and Power Risk Management, April. http://www.evomarkets.com/assets/articles/trailblz.html

Zaborowsky P (2004) State of the world's largest smog market (redux). Evolution Markets Executive Brief 23:1-7