Allowance Trading Activity and State Regulatory Rulings: Evidence from the U.S. Acid Rain Program

by

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ABSTRACT

The U.S. Acid Rain Program is one of the first, and by far the most extensive, applications of a market based approach to pollution control. From the beginning, there has been concern whether utilities would participate in allowance trading, and whether regulatory activity at the state level would further complicate utilities' decision to trade allowances. This paper finds that public utility commission regulation has encouraged allowance trading activity in states with regulatory rulings, but that allowance trading activity has not been limited to states issuing regulations. Until there is evidence suggesting that significant additional cost savings could have been obtained if additional allowance trading activity had occurred in states without regulations or that utilities in states with regulations are still not taking advantage of all cost saving trading opportunities, this analysis suggests that there is little reason to believe that allowance trading activity is impeded by public utility commission regulations.

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SECTION I: INTRODUCTION

Title IV, the U.S. Acid Rain Program, was created by the 1990 Clean Air Act Amendments (Public Law 101-549). It is one of the first, and by far the most extensive, applications of a market based approach to pollution control. The Acid Rain Program applies to fossil fuel fired electric utilities in the 48 continental United States requiring the affected generating units to achieve, in sum, a reduction of 10 million tons of sulfur dioxide (SO_2) per year from 1980 emissions levels, and a 2 million ton reduction of nitrogen oxide (NO_x) emissions annually by the year 2000. Sulfur dioxide and nitrogen oxide are thought to be the two primary precursors of acid rain. The Acid Rain Program was implemented in two Phases, with the first round of emission limitations taking effect in 1995, and a stricter round of emissions limitations taking effect in the year 2000.

Compared to the historical "command and control" approach to pollution abatement, the market based approach to acid rain control instituted by the 1990 Clean Air Act Amendments (1990 CAAA) considers that the cost of pollution abatement is not identical across all generating units. Tradable permits, called allowances, are allocated to affected electric utility generating units. Each allowance represents one ton of sulfur dioxide. The firms are free to buy and sell the allowances with few restrictions in order to reduce aggregate sulfur dioxide emissions at the least cost. In theory, the higher marginal cost of abatement units reduce emissions by less, purchasing allowances to cover their higher SO_2 emissions, while the lesser cost of abatement units reduce SO_2 emissions by more, selling allowances generated from over-compliance to those units with higher abatement costs. Under Title IV, the only obligation on the part of the generating units is that at the end of every "true-up period"[1] each affected generating unit must hold an allowance with a vintage year of that year or earlier for each ton of SO_2 emitted in that year.

Earlier tradable permits programs, such as the EPA's emission trading program, which was initiated in 1974 to curb smog in the Los Angeles basin, have had more restrictive trading guidelines than the EPA's Acid Rain Program. While the smog control program restricts the ability to bank permits, devalues banked permits, restricts trading between geographic regions, and requires regulatory approval for permit trades,[2] the Acid Rain Program allows for unrestricted inter-temporal trading ("banking"), unrestricted geographic trading, and does not require the EPA's approval of allowance trades.[3] The only federal restriction on trading is that allowances may not be borrowed from future vintages for use in the current compliance year.

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[1]The "true-up" period is the thirty days (1 January to 30 January) following the compliance year during which affected units may do last minute buying or transferring of allowances into their unit accounts in order to match allowance holdings with their emissions tonnage for the year for which compliance is being established without incurring penalties. After these 30 days the affected units must surrender the appropriate number of allowances from their unit accounts to the EPA, on a first in first out basis unless otherwise requested, or be subject to a fine of $2,000 per ton. Gross non-compliance may result in criminal proceedings.

[2]See Foster and Hahn (1995).

[3]The differences in the freedom to trade permits in the two programs are due, in part, to differences in the nature of the pollutants, volatile organic chemicals, which cause smog, and the nature of the pollutant, sulfur dioxide, which causes acid rain.

From the beginning, there has been concern whether utilities would choose to participate in allowance trading, and whether regulatory activity at the state level would further complicate utilities' decision to trade allowances. Several sources suggested early on that electric utilities would be reluctant to engage in inter-utility allowance trading activity for various reasons including regulatory, industry, and market factors.[4] This concern was magnified by a second, and inter-related concern, that misrepresentations by the popular press of the tradable permits program[5] would cause state public utility commissions to bow to pressure from environmentalists and constituents, and balk at allowing utilities to trade allowances.[6]

This purpose of this paper is to determine whether, and the extent to which, public utility commission rulings explain observed allowance trading activity. The approach I take is to look first at the decision to trade allowances, involving both regulatory and non-regulatory factors, in the analysis. In the penultimate section, I present a simultaneous equation approach to analyzing the effect of state regulatory rulings on allowance trading activity. The results from this section corroborate the results from the previous sections. The conclusion reached is that regulation has been conducive to allowance trading activity in the early years of the Acid Rain Program. The final Section of this paper adds several caveats to drawing hasty policy implications from the above conclusion.

The organization of this paper is as follows. Section II sets the stage by providing a brief overview of the allowance trading activity observed to date. Section III discusses public utility commission regulations of emission allowances. Section IV considers the specification of the decision variables, discusses expected signs and magnitudes, lays out the equation to be estimated, the method of estimation, and describes the source and scope of the data used, as well as its limitations. Section V presents the empirical results. Section VI builds on the previous Section, and presents a simultaneous logit model in order to take into account the endogeneity of regulations and the regulated activity. Section VII offers concluding remarks.

SECTION II: TRADING ACTIVITY

Many kinds of allowance transfers have occurred since March 14, 1994, the first official day the Environmental Protection Agency's (EPA) Acid Rain Division began tracking the transactions of allowances for compliance purposes. At first blush, it may appear that more than 26 million allowances have been traded, since that is the total number of allowances that have been recorded changing accounts.[7] That would be an inaccurate way of examining trading activity. It is important to distinguish between what activity is a trade in its proper sense and what activity is merely transfer activity. A *trade* is defined to be a considered decision to move emission allowances based in whole or in part on the price of allowances, the compliance strategies of the unit(s), if any, involved, or for strategic reasons. Trades include allowances bought in the EPA's annual auctions, allowances sold in the EPA's annual private auctions, and movements of allowances between plants, units, operating companies, brokers, fuel companies, individuals, and organizations for considered reasons rather than for reallocation, accounting,

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[4]See Barry Solomon, "SO_2 Allowance Trading, What Rules Apply?" and the 1994 GAO report.

[5]See, for example, a June 1995 *New York Times* article which describes the Acid Rain Program as a Federal law which creates a national market to pollute.

[6]See Peter Passell, "Paying to Pollute: A Free Market Solution That's Yet to be Tested." *New York Times*. January 4, 1996.

[7]Just about 268 million allowances with a vintage between 1995 and 2025, inclusively, have been issued and are currently available to circulate.

and/or joint ownership agreements. A transfer is a movement of allowances between two accounts for reallocation, accounting, and/or prior contractual agreements. The distinction to keep in mind between a trade and a transfer is that a trade is an exchange which is considered in nature, such as for cost saving reasons, and is not simply the result of an accounting arrangement or a prior ownership agreement. This paper will be concerned solely with executed allowance *trades*. Using this definition, a little over 4 million allowances have been traded between two independent parties, with at least one of the parties being a utility, since the program's inception.[8]

Subsection A: Auctions

Title IV calls for the EPA to administer an annual auction for 50,000 spot[9] and 100,000 seven year advance allowances. Any unsold allowances from the annual allowance reserve are offered in a 6-year advance auction. In order to provide allowances for the auction and the direct sale reserve, 2.8 percent of each unit's annual allowance allocation in Phase I and in Phase II was withheld. In addition to the EPA's public offering of allowances, any private allowance holder, such as utilities, brokers, and individuals, may offer allowances with vintages from the current year, any previous year, or 7-years in the future, for sale as well.

In the 1993 Spot auction, 52% of the allowances were bid for by utilities, while 95% of the allowances purchased were bought by utilities. In the 1993 7-year advance auction, 86% of the allowances were bid for by utilities and 99% of the allowances bought were purchased by utilities. The gap between the bidders and the winning bidders in both the spot and advance auction is taken up by brokerage firms, which may be bidding on behalf of utility clients for confidentiality reasons. In 1994, 62% of the allowances purchased in the spot auction were bought by utilities. A bidder, Allowance Holdings Corporation, whose account representative is a law firm which represents several Phase I and Phase II utilities, won 26% of the allowances. If the AHC is in fact a utility which designated its law firm to bid on its behalf, the percentage of winning allowances won by utilities rises to 88%. The advance auctions in 1994 were dominated by the AHC again which won 78.9% and 83.9% of the allowances in the 6 and 7 year auctions respectively. In the 1995 spot auction winning bidders were again overwhelmingly utilities who took over 75% of the allowances, while in the 6 and 7 year advance auction the took 99.8% and 68% respectively with the AHC capturing the other 30% in the 7-year advance auction.

The only offerer of allowances who sold any allowances in any of the eight auctions held in 1993, 1994, or 1995 has been the Wisconsin Public Service Corporation, in particular its Pulliam #8 unit. It is not possible to identify the name all those who have offered allowances since the identities are kept confidential, but, of those who offered allowances for sale, only the Wisconsin Public Service Corporation has had a winning bidder.

Subsection B: Private Trades

There are five broad categories of types of trades involving utilities in the open market: inter-utility cash sales, inter-utility swaps, intra-utility trades, trades between a utility and a broker, and trades between coal companies and utilities. The smallest volume of trades, 7.9 percent, is between coal companies and utilities. The majority of these allowance trades are

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[8]A little over 400 thousand allowances have been traded between two non-utility parties.

[9]For spot allowances in the years 1993 and 1994, the spot allowance vintage is 1995. For all spot allowances offered after 1995, the allowance vintage is that of the year of the auction.

bundled with the purchase of high sulfur coal. Intra-utility trades compose 25.3 percent of the trading volume observed involving utilities.

The volume of inter-utility trades compose 19.7 percent of the allowance trades involving utilities which have occurred. Inter-utility trades have been of two types: Cash trades and swaps. The majority of all trades have been cash trades. Duke Power is one utility that has been active in the swap market. For example, Allegheny Power Systems swapped 20,200 vintage 1996 allowances for 20,000 vintage 1995 allowances from Duke Power in October 1995. A second swap occurred between Duke Power and Hoosier Energy REC, Inc. in which Duke Power swapped 10,000 1995 allowances for 10,400 allowances with vintage years 2000 through 2003 from Indiana's Hoosier Energy REC, Inc.

The remaining volume of allowance trades, 47.5 percent, has occurred between brokers and utilities. Brokers have participated in trade activity by trading out of their own account (e.g. Cantor Fitzgerald), or by arranging an arms length transaction through their account (e.g. Emissions Exchange Corporation and Centre Financial).

Subsections C: Phase I and Phase II Utilities

Excluding Alaska, Hawaii, and Idaho which are not affected by Title IV, two thirds of potential participants have engaged in allowances trading activity: 13 states have been net buyers of allowances, 19 states have been net sellers of allowances, and 16 states (inclusive of the District of Columbia) have not traded any allowances. With the exception of Minnesota, all Phase I states have engaged in arms length allowance trades. Utilities in Phase I states have sold 75 percent of allowances traded by utilities while states with no Phase I units have sold the remainder of allowances sold by utilities. With respect to allowance purchases, Phase I affected states have purchased 36 percent of allowances traded by utilities while states with no Phase I units have bought 64 percent of allowances traded by utilities. Two states not affected by Phase I, North Carolina and South Carolina, have been active in allowance trading activity, purchasing two thirds of the 64 percent of allowances bought by non-Phase I states.

Notwithstanding early concerns that utilities would be reluctant to trade allowances, this section has shown that allowance trading activity has occurred in over half of the affected states, that trading activity has been both inter and intra utility in nature, and that both Phase I and Phase II states have been active in allowance trading.

SECTION III: REGULATION AND THE REGULATED ACTIVITY

Fifteen state public utility commissions have explicitly addressed the issue of allowance trading through the issuance of a formal generic order or an informal guideline. Although guidelines do not carry the same force as an order, they nevertheless convey the commission's attitude and intent. A complete discussion of state regulatory rulings from the fifteen state public utility commissions (PUCs) which have addressed the issue of allowance regulation is reserved for Appendix II; below I simply present two Tables summarizing the states whose PUC has issued a guideline or generic order on the regulatory treatment of allowances, and the increase in number of states with guidelines or generic orders.

STATES WITH PUC GUIDELINES OR GENERIC ORDERS

Guidelines Issued	Generic Order Issued
Florida	Connecticut*
Illinois	Georgia
Maryland	Indiana
New Hampshire	Iowa
New York	Mississippi
Ohio	Missouri
	North Carolina*
	Pennsylvania
	Wisconsin

*States with no Phase I affected units.
Note: To date, the issuance of guidelines or generic orders has been mutually exclusive.

NUMBER OF STATES WITH PUC GUIDELINES OR GENERIC ORDERS, 1993-1995

year	Guidelines: number of states	Generic Orders: number of states
1992	0	0
1993	5	5
1994	5	9
1995	6	9

See note to above Table.

There are several general points to highlight in an overview of the regulatory rulings that have been issued, formally or informally, by state public utility commissions. First, the regulations largely require one hundred percent of both expenses and revenues to be returned to the ratepayers. In terms of accounting practices, the net gain (or loss) incurred from allowance transactions are used to offset (or increase) fuel costs. Second, a few states have taken an incentive based approach to allowances, allowing the utility to retain a portion of any gains from allowance sales.[10] Finally, one should note that the regulations are often drawn to a state's specific circumstance. States with a large bank of allowances, due to a prior state SO_2 cap which makes units in those states largely unconstrained by Title IV (e.g. Wisconsin, Connecticut) or due to Phase I Extension Bonuses (e.g. Pennsylvania), have issued regulations creating favorable conditions for utilities to sell allowances, while states anticipating the purchase of allowances have issued regulations encouraging favorable conditions for utilities to buy allowances (e.g. Ohio, North Carolina).

As the number of states issuing regulations on the treatment of allowances has increased, so too has the number of states with utilities engaging in allowance trading activity. From zero in 1991, the number of states with utilities engaging in inter-utility allowance trading grew to

[10]Thus far, all rulings permit utilities to retain one hundred percent of the gains and losses from below the line transactions. A below the line transaction is one which only involves shareholder money.

twelve in 1993, then to eighteen in 1994, and to thirty in 1995, the first year that Phase I emission limitation requirements were in effect.[11] Looking over all years, thirty-one states have engaged in allowance trading activity. One interesting point to note is that while utilities in thirty-one states were trading allowances, only fifteen states had allowance rulings from their respective state commission. That half of all states trading allowances did not have a state regulatory rule at the time of trading, suggests that state regulatory rulings may not be a necessary prerequisite to allowance trading activity. It is possible that utilities in states with no formal ruling engaged in informal conversations with their state commission regarding the ratemaking treatment of allowances, but this type of guidance is much less certain and certainly less secure.

SECTION IV: MODEL SPECIFICATION AND DATA

SUBSECTION A: Variable Specification

Whether a state experiences allowance trading activity by one or more of its electric utilities is modeled in this paper as a binary choice.[12] A linear function of the independent variables, those characteristics which influence whether or not a state experiences allowance trading activity, is interpreted as a "trading potential index,"

$$I_i = ß_0 + \Sigma ß_k X_{ik}$$

where I_i is the "trading potential index" for state i, and X_k are the characteristics (there are K of them) which influence the decision to trade. Each state has its own critical value, I_i, above which the state will experience allowance trading activity. If the "trading potential index" for a state exceeds that state's critical value, then that state will experience allowance trading activity:

$I_i > I_i$ state i experiences allowance trading activity
$I_i \leq I_i$ state i does not experience allowance trading activity.

The Sections below will refer to the case $I_i > I_i$ as $TRADE_i=1$, and the case $I_i \leq I_i$ as $TRADE_i=0$. The assumption one makes about how the critical values are distributed influences the estimation routine (see notes 17 and 18).

The model presented here is based on annual observations between 1993 and 1995. The dependent variable is the probability $TRADE_{it}=1$, where $TRADE_{it}=1$ if state i experienced at least one arms length[13] allowance trade in year t. An "experience" occurs if one party of the

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[11]There are 21 states which have at least one generating unit affected by Phase I emission limitations.

[12]The binary choice model does not differentiate between large volumes of trading activity nor large numbers of trades. As a result, this analysis will not capture the possibility that states without allowance regulations have observed only small volumes of trades or small numbers of trades, while those states with regulations observe large volumes of trades or large numbers of trades.

[13]The criteria of arms length has been chosen for precision since intra-utility activities rarely raise eyebrows at the commission. It is an innocuous condition in light of the trading activity to

trade is an electric utility serving that state. Several variables are hypothesized to affect the probability of a state experiencing allowance trading activity. The variables can be characterized as one of two types, regulatory factors (RATING, GUIDE, GENERIC) and non-regulatory factors (CMFA, CMFASQ, PAST, UNITS, THREE, FOUR). The Table below summarizes the variables specified to affect the probability trading activity occurs.

Decision Variable[14]	Variable	Denoted
State experienced allowance trading activity in year t	1 if trading occurred, 0 otherwise	TRADE
PUC is favorable to electric utility shareholders in year t	Merrill Lynch *Opinions of Regulation*, 1992 - 1995. 1 is least favorable to shareholders, 15 is most[15]	RATING
PUC has informally addressed allowance trading issues	1 if state PUC has issued a guideline at or prior to trading activity	GUIDE
PUC has issued a generic order on allowance trading issues	1 if state PUC has issued a generic order at or prior to trading activity	GENERIC
aggregate number of excess allowances allocated to the state	difference and difference squared between Title IV and cost minimizing allowance allocation[16]	CMFA, CMFASQ

date: No state switches $TRADE_t$ status if this criterion is relaxed to "any trading activity in year t."

[14]Appendix I presents a Table of descriptive statistics. I have experimented with several other variables and variations, such as number of units subject to Phase I emission limitations and/or a dummy variable for Connecticut, the only state which has established an incentive based approach to the ratemaking treatment of allowances. These approaches turned up nothing interesting or encouraging.

[15]For a discussion of the use of investment bank ratings as a gauge of the regulatory climate faced by electric utilities see Joskow, Rose and Wolfram and the literature they cite.

[16]CMFA = "Title IV allowance allocation" - "cost minimizing allowance allocation". CMFASQ = $CMFA^2$. The cost minimizing allowance allocation in each state (using the high abatement case, no interstate trading, marginal cost=$572) is calculated from ICF Resources Incorporated Comparison of the Economic Impacts of the Acid Rain Provisions of the Senate Bill (S.1630) and the House Bill (S.1630) Table A-2. See Joskow and Schmalensee (1996), "The Political Economy of Market-Based Environmental Policy: The 1990 Acid Rain Program" for more details on the cost minimizing allowance allocation and other comparative allowance

state affected by Phase I emission limitation requirements	percentage of state generating capacity affected by Phase I emission limitation requirements	UNITS
effect of experience, learning, and/or familiarity with the trading of emission allowances	1 if at least one utility in the state traded allowances in a previous year	PAST
year	1 if year of trade is 1993, 1 if year of trade is 1994	THREE, FOUR

A rating variable is included because electric utilities are concerned with public utility commission attitudes and rulings primarily because expenditure decisions made by utilities are subject to a prudence test, meaning that if the PUC determines that a purchase by a utility was reasonable under the circumstances that were known, or reasonably knowable, at the time of the expenditure, then cost recovery (usually through the rate base) of the expenditure is allowed. Should the purchase be deemed imprudent, then the utility is not permitted to pass the costs incurred on to the ratepayers. Since emission allowances are a relatively new cost for a PUC to apply a prudence test to, utilities may perceive an added risk when purchasing allowances, namely that the commission will be inexperienced in judging the prudence of allowance purchases, and will too frequently determine allowance purchases imprudent. A commission more favorable to electric utility shareholder interests may be less likely to rule allowance purchases imprudent. A risk associated with allowance sales may also be perceived by utilities. In particular, utilities may perceive a risk that during a ratemaking case, the price that any allowances were sold at will be questioned by the commission as to whether it was the "best" available price, or that they will be chastised by the commission for not seeking out a "better" price. A commission more favorable to electric utility shareholder interests may be less likely to question the sale of allowances.

SUBSECTION B: Expected Signs and Magnitudes

Recall the "trading potential index" function,

$$I = ß_0+ß_1RATING+ß_2GUIDE+ß_3GENERIC+ß_4CMFA+ß_5CMFASQ+ß_6UNITS+ß_7PAST+ß_8THREE+ß_9FOUR$$

described in the above Section. The following signs and magnitudes are expected for the maximum likelihood coefficient estimates.

$ß_1$: POSITIVE. A state public utility commission which is more favorable to electric utility shareholder interests should increase the probability that utilities in that state engage in allowance trading activity.

$ß_2$: POSITIVE. An advisory or guideline issued by the state PUC on how the commission intends to treat allowances for ratemaking purposes should decrease the risk and uncertainty associated with the buying and selling of allowances. Therefore, the probability that utilities in that state trade allowances should increase.

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allocations. What I have denoted as the cost minimizing allocation should be thought of as cost minimizing only in a limited sense as the ICF data used assumes no interstate allowance trading.

$ß_3$: POSITIVE. A formal ruling or generic order issued by the state PUC specifying how the commission will treat allowances for ratemaking purposes should decrease the risk and uncertainty associated with allowance trading, and thus increase the probability utilities in that state buy and/or sell allowances.

$ß_4$: POSITIVE. An annual state emission allowance allocation (i.e. the sum over all a state's utilities' annual allowance issuance) above or below the state's cost minimizing allowance issuance - that is, the state has a positive or negative excess allowance issuance - should increase the probability that that state experiences allowance trading activity.

$ß_5$: POSITIVE. An annual state emission allowance allocation very far away from the state's cost minimizing allowance issuance should increase the probability that that state experiences allowance trading activity.

$ß_6$: POSITIVE. A greater percentage of a state's generating capacity subject to Phase I emission limitation requirements should increase the probability that allowance trading activity be observed in that state.

$ß_7$: POSITIVE. Engaging in allowance trading activity in a previous period should decrease the risk and uncertainty associated with the trading of allowances, perhaps due to a learning or familiarity effect, and therefore should increase the probability that trading occurs in the current period.

$ß_8$: NEGATIVE. The probability of trading allowances should be smaller in earlier periods (relative to 1995) for two reasons: First because planning for the first year of compliance is less immediate in earlier periods, and second because utilities may perceive the risk and uncertainty associated with allowance trading to be greater in earlier years of the program.

$ß_9$: NEGATIVE. For the reasons given above, the probability of trading allowances should be smaller in earlier periods (relative to 1995). Additionally, it is expected that the likelihood of allowance trading activity in 1994 will be greater than the likelihood of allowance trading activity in 1993, all else constant, for the same reasons given above.

SUBSECTION C: Estimation and Data

Assuming the index function follows a logistic distribution, the probability that a state experiences allowance trading activity is estimated by a maximum likelihood logit[17] model,

$$P(TRADE=1)$$

$$= P(I>I)$$

$$=P(ß_0+ß_1RATING+ß_2GUIDE+ß_3GENERIC+ß_4CMFA+ß_5CMFASQ+ß_6UNITS+ß_7PAST+ß_8THREE+ß_9FOUR+\mu>I)$$

$$= \exp(\mathbf{B'X})/(1+\exp(\mathbf{B'X})),$$

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[17]As I have no a priori reason to assume a particular probability distribution function, I also estimate a model assuming the index function is normally distributed, which gives rise to the maximum likelihood probit model. The logistic distribution is similar to the normal except for the tails, which are considerably heavier (see Greene (1990), Cht 21).

where **B** and **X** are the vectors of coefficients and explanatory variables, respectively. The primary source for the data used to estimate the model above is the Allowance Transaction System (ATS), a weekly updated file which serves as the Environmental Protection Agency's official record of allowance holdings for compliance purposes for all unit and general accounts. Trades for allowances to be used for compliance in the current compliance year must be recorded in the ATS files, but it need not be earlier than the "true up" deadline. This fact, *inter alia*, may lead to an underestimate of the number of trades occurring and the volume of allowances being traded. Consequently, I have supplemented the ATS data with data from reports in *Energy Daily*, as well as from reports in *Clean Air Compliance Review*, a publication specifically targeted to issues of clean air compliance for stationary sources. Options to buy allowances which have not been exercised have not been included. A comparison of trades listed in the trade press to trades listed in the ATS files indicates that most trades have been registered with the ATS regardless of the allowances' vintage or the year the unit or operating company intends to use the allowances for compliance purposes.

Units of observation are not drawn from all fifty U.S. states. Five states have been excluded: Nebraska, because it does not have any investor owned utilities, Alaska, Hawaii, and Idaho because they are not affected by Title IV, and Tennessee because all generating units in Tennessee are both operated and regulated by the Tennessee Valley Authority. The District of Columbia has been included, and is referred to as a state for the purposes of this paper.

SECTION V: EMPIRICAL RESULTS

The Table below presents the maximum likelihood logit[18] estimates using data from 46 states inclusive of the District of Columbia, in the years from 1993 to 1995. The subsequent Table presents the results in the form of odds ratios.

	coefficient	estimate	asymptotic standard error	asymptotic normal test	robust asymptotic standard error	asymptotic normal test
$ß_0$		-2.279	0.982	-2.320**	0.829	-2.746***
$ß_1$	RATING	0.249	0.115	2.166**	0.098	2.530***
$ß_2$	GUIDE	2.587	1.237	2.091**	1.263	2.049**
$ß_3$	GENERIC	0.892	0.740	1.205	0.709	1.257
$ß_4$	CMFA	0.0004	0.0005	0.811	0.0004	0.898
$ß_5$	CMFASQ	5.58e-7	4.6e-7	1.213	4.11e-7	1.360
$ß_6$	UNITS	3.389	1.903	1.780*	1.842	1.839*
$ß_7$	PAST	2.125	0.869	2.445**	0.954	2.228**
$ß_8$	THREE	-2.165	0.679	-3.190***	0.607	-3.569***
$ß_9$	FOUR	-1.810	0.629	-2.878**	0.642	-2.820***

N=138. *significant at 10%, **significant at 5%, ***significant at 1%
LogLikelihood, lnL, = -54.813

[18]Estimating the probit model reveals that the model is robust to different assumptions on the distribution of the error term. For convenience I have chosen to report only estimates from the logit model.

Odds Ratios[19]

coefficient	odds ratio	asymptotic standard error	asymptotic normal test
RATING	1.283	0.147	2.166**
GUIDE	13.29	16.45	2.091**
GENERIC	2.440	1.801	1.205
CMFA	1.000	0.0005	0.811
CMFASQ	1.000	4.6e-7	1.213
UNITS	29.66	56.47	1.780*
PAST	8.380	7.287	2.445**
THREE	0.115	0.078	-3.190***
FOUR	0.163	0.103	-2.878**

N=138. *significant at 10%, **significant at 5%, ***significant at 1%

A likelihood ratio test was used to test the null hypothesis that $ß_i=0$ for i=1,2,...8. Denoting L_0 as the restricted logit model ($ß_i=0$ for i=1,2,...8) and L as the unrestricted logit model where all coefficients are free, $(-2.0)(\ln L_0 - \ln L)$ is distributed as a chi-square with 9 degrees of freedom. Performing this test, I calculate a test statistic of 78.82, and reject the null at the 1% significance level.

The Table of coefficients, or alternately that of the odds ratios, presented above, gives several results. With respect to PUC behavior, the coefficient on favorability of the PUC to electric utility shareholders (RATING) is positive and significant at the 1% level, indicating that a state with a PUC more favorable to utility shareholder interests is more likely to experience allowance trading activity. Although, the coefficient on issuance of a generic order (GENERIC) is insignificant, the coefficient on issuance of an informal guideline (GUIDE) is positive and significant at the 5% level, implying that a state whose PUC commission has issued a guideline on the regulatory treatment of allowances is more likely to experience allowance trading activity. The coefficients on the number of excess allowances issued to a state and its square are insignificant. The percent of generating capacity affected by Phase I emissions limitations (UNITS) and trading activity in a previous period (PAST) both have the correct predicted sign and are significant at the 10% and 5% level respectively. Finally, being in year 1993 or 1994 has a negative and significant affect on the probability of a state experiencing trading activity at the 1% level.

The interpretation of the effect of the independent variables on the probability of observing allowance trading activity using the odds ratio Table is a more intuitive approach than

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[19]Odds relate to the chances for an event to the chances against the event. When one says the odds are two to one (written 2:1), he means there are two chances in three that the event will occur or a probability of 2/3 that the event will occur. A useful relation to remember is

odds of the event occurring = probability event occurs/(1-probability event occurs).

The odds ratio is the number by which we would multiply the odds of the event occurring for each one unit increase in the independent variable. Suppose the odds of an event occurring are 2:1 at a given set of conditions and we then decide to increase by one unit an independent variable which has an odds ratio of 1.5. The odds of the event occurring at the new set of conditions is 3:1 (2*1.5 = 3), that is, a 50% increase in the odds of the event occurring.

looking at the logistic coefficient Table: An odds ratio greater than one indicates that the odds of the state experiencing allowance trading activity increase when the independent variable increases; an odds ratio less than one indicates that the odds of the state experiencing allowance trading activity decrease when the independent variable increases. For example, a one unit increase in the favorability rating of the state's commission (RATING) increases the odds of that state experiencing allowance trading activity by 28.3% (1.283 - 1.0 = 0.283).

Several tests were done to assess the null hypothesis that PUC behavior does not affect allowance trading activity. It is clear from the above Table that the coefficients on RATING and GUIDE are individually significantly different from zero, while the coefficient on GENERIC is individually not significantly different from zero. It is puzzling why the issuance of a generic order is not significant while the issuance of a guideline is, and suggests that endogeneity, a subject turned to in the subsequent section, is obscuring the true impact of GENERIC on the probability of trading activity occurring. Likelihood ratio tests were used to test two other versions of a null hypothesis that PUCs do not affect allowance trading activity. First, I test that neither a commission's issuance of guidelines nor the issuance of generic orders affect allowance trading activity (H_0: $ß_2=ß_3=0$). Performing this test, I calculate a test statistic of 6.36 with two degrees of freedom. I reject the null at the 5% significance level, and conclude that the issuance of guidelines or generic orders positively affects trading behavior. I next test that neither a commission's treatment of electric utilities in its jurisdiction (RATING) nor the issuance of orders, informal (GUIDE) or formal (GENERIC), pertaining to the treatment of allowances affects trading activity (H_0: $ß_1=ß_2=ß_3=0$). Performing this test, I calculate a test statistic of 13.91 with three degrees of freedom. I reject the null at the 1% significance level.[20] These results are strongly suggestive that the behavior of a state public utility commission has an effect on allowance trading activity in that state.

Using the logistic coefficient Table, one can calculate that the probability of a state, which has issued a guideline on the treatment of allowances (GUIDE=1, GENERIC=0), no previous trading activity (PAST=0), and all other variables evaluated at their mean, experiencing allowance trading activity in 1995 (THREE=0, FOUR=0) is 0.940. A second relevant probability to calculate is that for a state in 1995 (THREE=0, FOUR=0) which has not issued a guideline or generic order (GUIDE=0, GENERIC=0), no previous trading activity (PAST=0), and all other variables evaluated at their mean. The probability of a state with those above characteristics experiencing allowance trading activity is 0.542.

From the above Table it is clear that the coefficient on THREE and the coefficient on FOUR are both individually significantly different from zero at the 1% level, suggesting that there is a marked difference in the effect of being in either 1993 or 1994 relative to 1995 on allowance trading activity. Using the odds ratios, being in year 1993 or 1994 decreases the odds of a state experiencing allowance trading activity by 87.8% and 82.9%, respectively. A likelihood ratio test was done to test the null hypothesis that the effect of year=1993 (THREE) on trading activity is equal to the effect of year=1994 (FOUR) on trading activity (H_0: $ß_8=ß_9$). Performing this test, I calculate a test statistic of 0.29 with two degrees of freedom. I fail to reject the null at the 10% significance level, and conclude that the effect of being in 1993 on allowance trading activity is the same as the effect of being in 1994 on allowance trading activity. The individual significance and joint significance of the coefficients of 1993 and 1994 agree with the hypothesis that there is a strong tendency for utilities to wait until they are

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[20] I also test that only factors relating to regulatory treatment matter while those relating to non-regulatory factors play no role in the decision to trade (H_0: $ß_i=0$ for i=4,5,...9). This test is distributed as a chi-square with six degrees of freedom. I fail to reject the null at the 10% significance level and conclude non-regulatory factors also matter in the decision to trade allowances.

mandated to come into compliance (i.e. 1995) before engaging in allowance trading activity. The strong negative effect of being in year 1993 or 1994 also agrees with the assertion that the novelty of allowance trading discouraged anticipatory trading.

Several measures were used to assess the goodness of fit of the logit model estimated. A likelihood ratio index (LRI) was calculated (LRI = 1 - $\ln L/\ln L_0$) with a value of 0.4213. The interpretation of the LRI is analogous to that of the R^2 in a standard ordinary least squares regression. In addition, a table of "hits and misses" was calculated. The predicted value for TRADE takes on the value 1 when $F(I_{hat,\,i}) > 0.5$ and 0 otherwise, where F is the cumulative logistic distribution and $I_{hat,\,i}$ is the calculated logit index for observation i. The Table below presents a summary of the predicted calculation and the observed value for TRADE.

		Predicted	
		TRADE=0	TRADE=1
Observed	TRADE=0	68	9
	TRADE=1	15	46

A simple calculation from the above Table shows that the logit model estimated correctly predicts the value taken on by the dependent variable for 82.61% of the observations.

SECTION VI: ENDOGENOUS REGULATION

Implicit in the previous sections is the assumption that causality runs only one way: From regulatory rulings to allowance trading activity. A thorough reading of the guidelines and generic orders issued by state PUCs, other PUC documents pertaining to the ratemaking treatment of allowances, as well as conversations with PUC staff directly involved in the regulatory treatment of allowances, reveals that, in most cases, the regulation is prompted by a request from one of the utilities in the commission's jurisdiction for a ruling prior to the appearance of any trading activity in that state. But this is not always the case. For instance, the New York State Department of Public Service took the initiative in 1992, prior to any trading activity or requests from utilities for guidelines on allowance treatment, to issue a notice to utilities under its jurisdiction soliciting comments on basic questions regarding the ratemaking treatment of allowances and the role the New York state commission should have in shaping utility emission compliance actions. As the above example shows, it is likely that causality also runs from trading activity to regulatory rulings. The causation in the relationship between regulatory rulings and allowance trading activity is therefore bi-directional, and the effect of these two variables are thus jointly determined.[21]

Situations in which the dependent variables are determined by the simultaneous interaction of several relationships should be properly estimated in a simultaneous equation estimation framework, otherwise the coefficient estimates are generally inconsistent and inefficient. To address this, I consider allowance trading activity in a simultaneous equation framework specifying both a decision to trade equation and a decision to issue regulations equation.

In this Section, the decision to trade is modeled as above with one modification, the variable ORDER replaces GENERIC and GUIDE, where ORDER is simply whether or not the state has

[21]Variables which are jointly determined are called endogeneous.

issued a formal or informal order regulating allowance trading activity prior to year t. Here I write this in matrix notation as

$$I = R_t\beta + \alpha ORDER_t .$$

The decision to issue a regulation on allowance trading activity is also modeled as a binary choice. Following Section IV,

$$I' = Q_t\gamma + \delta TRADE_t ,$$

where the index function, I', is assumed to be logistically distributed. As in Section IV, if the index, I', is greater than some critical value, I', then that state's PUC will issue an order on allowance trading activity (ORDER=1). Q is a matrix of variables specified to affect the decision to issue an allowance regulation. The variables specified to affect the decision to issue regulations on allowance trading activity are as follows:

Decision Variable	Variable	Denoted
PUC has issued an ruling, formal or informal, on allowance trading issues	1 if state PUC has issued a generic order at or prior to period t, 0 otherwise	ORDER
state affected by Phase I emission limitation requirements	percentage of state generating capacity affected by Phase I emission limitation requirements	UNITS
PUC commissioner(s) elected to office	1 if state elects commissioner(s)	ELECTED
State experienced allowance trading activity in year t	1 if trading occurred	TRADE

A larger percent of the state's generating capacity affected by Phase I emission limitations should make the state commission more likely to issue allowance regulations. An elected commissioner(s) should cause the PUC to be more observant to the whim of public opinion, environmental pressure, or constituent pressure, thereby lowering the probability of the commission issuing a regulation on allowance trading activity. Experiencing allowance trading activity should increase the probability that the state's commission issue a regulation on allowance trading issues.

Following Schmidt and Strauss (1975), I write down a simultaneous logit model. Schmidt and Strauss show that from the above specification it must follow that $\delta = \alpha$, and that the appropriate likelihood function to maximize over β, γ, and α is

$$\prod_{i=0}^{1}\prod_{j=0}^{1}\prod_{t\in\Theta_{i,j}} P(ORDER_t = i, TRADE_t = j) \qquad (i,j=0,1)$$

where $ORDER_t$ and $TRADE_t$ are as defined above, $\Theta_{i,j} = \{t | ORDERt = i, TRADEt = j\}$, and $P(ORDER_t = i, TRADE_t = j)$ takes on one of the following functions depending on the value of $ORDER_t$ and $TRADE_t$:

$$P(ORDER_t=0, TRADE_t=0) = 1/\Delta_t$$
$$P(ORDER_t=0, TRADE_t=1) = \exp(R_t\beta)/\Delta_t$$
$$P(ORDER_t=1, TRADE_t=0) = \exp(Q_t\gamma)/\Delta_t$$
$$P(ORDER_t=1, TRADE_t=1) = \exp(R_t\beta + Q_t\gamma + \alpha)/\Delta_t$$

where $\Delta_t = 1 + \exp(R_t\beta) + \exp(Q_t\gamma) + \exp(R_t\beta + Q_t\gamma + \alpha)$.

The Table below presents maximum likelihood estimates from the above likelihood function using data from 46 states inclusive of the District of Columbia in the years from 1993 to 1995.

	coefficient	estimate	asymptotic standard error	asymptotic normal test
$ß_0$		-1.545	0.867	-1.783*
$ß_1$	RATING	0.119	0.100	1.193
α	ORDER	5.372	0.932	5.764***
$ß_3$	CMFA	-0.0005	0.0004	-1.009
$ß_4$	CMFASQ	6.3e-8	4.6e-7	0.136
$ß_5$	UNITS	-2.445	2.188	-1.114
$ß_6$	PAST	0.063	0.653	0.096
$ß_7$	THREE	-1.627	0.642	-2.532***
$ß_8$	FOUR	-1.226	0.550	-2.230**
γ_0		-7.222	1.118	-6.456***
γ_1	UNITS	4.848	2.639	1.837*
γ_2	ELECTED	-26.767	8211.4	-0.003
δ	TRADE	5.373	0.932	5.764***

N=138. *significant at 10%, **significant at 5%, ***significant at 1%
LogLikelihood, lnL, = -50.303

A likelihood ratio test was used to test the null hypothesis that $ß_i = \gamma_j = 0$ for i=1,2,...7 and j=1,2. Denoting L_0 as the restricted logit model and L as the unrestricted logit model where all coefficients are free, $(-2.0)(\ln L_0 - \ln L)$ is distributed as a chi-square with 9 degrees of freedom. Performing this test, I calculate a test statistic of 236.26, and reject the null at the 1% significance level.

A likelihood ratio test was done to assess the null hypothesis that PUC behavior does not affect allowance trading activity. It is clear from the above Table that the coefficients on ORDER is individually significantly different from zero. A joint test of the null hypothesis that $ß_1 = \alpha = 0$ rejects the null at the 1% significance level, and I conclude that PUC behavior positively affects allowance trading activity. A likelihood ratio test was also done to test the null hypothesis that the effect of year=1993 (THREE) on trading activity is equal to the effect of year=1994 (FOUR) on trading activity (H_0: $ß_7 = ß_8$). Performing this test, I find I fail to reject the null at the 5% significance level, and conclude that the effect of being in 1993 on allowance trading activity is the same as the effect of being in 1994 on allowance trading activity.

In order to compare the results from the simultaneous approach to the single equation approach, I reestimate the decision to trade model as a single equation, replacing the variables GENERIC and GUIDE with the ORDER variable used in the simultaneous logit model. I also estimate the decision to issue regulations model as a single equation. The following Table presents the estimates when the two equations are estimated separately by a maximum likelihood logit routine. The top section of the Table presents estimates from the decision to trade specification, while the bottom section of the Table presents estimates from the decision to issue regulations specification.

	coefficient	estimate	asymptotic standard error	asymptotic normal test
$ß_0$		-2.264	0.838	-2.702***
$ß_1$	RATING	0.244	0.0997	2.444**
$ß_2$	ORDER	1.372	0.625	2.195**
$ß_3$	CMFA	0.0005	0.0004	1.515
$ß_4$	CMFASQ	6.7e-7	3.8e-7	1.745*
$ß_5$	UNITS	3.346	1.865	1.793*
$ß_6$	PAST	2.106	0.958	2.197**
$ß_7$	THREE	-2.095	0.591	-3.544***
$ß_8$	FOUR	-1.828	0.652	-2.805***
γ_0		-5.853	0.558	-5.853***
γ_1	UNITS	7.129	1.588	4.489***
γ_2	ELECTED	-0.0004	0.0002	-2.064**
γ_3	TRADE	4.189	0.578	4.189***

N=138. *significant at 10%, **significant at 5%, ***significant at 1%
LogLikelihood for the decision to trade equation (top) is -55.801
LogLikelihood for the decision to issue regulations equation (bottom) is -51.017

For conciseness I omit the details of the various likelihood ratio tests done for the decision to trade specification, as the implications from these tests are the same as those from the tests done in Section VI, *mutatis mutandis*. For the decision to issue regulations specification, a likelihood ratio test of the null hypothesis that $\gamma_i = 0$ for i=1, 2, 3 gives a test statistic of 62.30 with 3 degrees of freedom clearly rejecting the null hypothesis at the 1% level.
The implications from the simultaneous approach compared to those from the single equation approach are similar. Looking first at the decision to trade, the coefficients on the year coefficients are very similar in magnitude, direction, and significance between the two

estimation approaches. The coefficient on ORDER, an endogenous variable, becomes larger and becomes significant at the 1% level when one takes the endogeneity into account. Although the negative sign on the coefficient UNITS in the simultaneous approach is disturbing, the variable does not carry any explanatory power. The coefficients on PAST, CMFA, and CMFASQ become smaller and lose significance in the simultaneous logit approach.[22] Turning to the decision to regulate equation, the coefficients on UNITS and TRADE are very similar in magnitude, direction, and significance between the two estimation approaches. The variable ELECTED loses all explanatory power when one accounts for the endogeneity of trading activity.

SECTION VII: IMPLICATIONS AND CONCLUDING REMARKS

When considering allowance trading activity, the question naturally arises whether there would be still more allowance trading activity if state public utility commission rulings were more favorable, such as explicit incentive regulation, or if more state commissions had issued rulings specific to the ratemaking treatment of allowances. One tempting, but incorrect, argument to make goes along these lines: "Fifteen states have issued rulings on allowance trading activity, and arms length allowance trading activity was observed in all fifteen of these states. Thirty-two states have not issued guidelines or generic orders, and no trading was observed in half of these states. Therefore, regulations should be issued in states without regulations in order to encourage allowance trading activity in those states."

There are three inter-related rejoinders to that argument. The first two stem from this analysis and the third rests on basic economic principles. First, it is clear that PUC rulings on the treatment of allowances are not a prerequisite for allowance trading. As this paper discussed, thirty-one states have traded allowances, but only fifteen states have allowance regulations on the books. Put another way, sixteen states have traded allowances without a formal or informal ruling from their state public utility commission. Of course several caveats need to be tied to this remark. Because this analysis looks only at the binary trade/no trade decision, and ignores any information available on the number and volume of allowance trading activity that has occurred to date, I can not rule out the possibility that the states without allowance regulations have observed only small volumes of trades or small numbers of trades, while those states with regulations observe large volumes of trades or large numbers of trades. This project is only a first step in analyzing the effect regulation has had on allowance trading activity. A subject for future research would be to extend the dependent variable to a continuous measure of trading activity, for example volume of allowances traded, number of allowance trades, or some weighted average of the two. Nevertheless, even if I had chosen to analyze the decision to trade with a more robust dependent variable, it <u>does not</u> follow that more trading activity, measured by a number, volume, or some combination of the two, is preferred to less in all states nor in the aggregate. The third remark takes this issue up in more detail.

Second, to my knowledge, no state public utility commission which has been requested to rule on the ratemaking treatment of allowances from one of its utilities has flatly denied the request. In doing this project, I spoke with the staff of most commissions that had yet to concern themselves with the ratemaking treatment of allowances. When questioned as to why they

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[22]What is going on here is that without considering the endogenous nature of regulatory rulings, the logit technique attributes both an increase in the disturbance term and the accompanied increase in the regulatory ruling variable (the disturbance in the decision to trade equation and regulatory ruling variable are correlated due to endogeneity, and as discussed above, they are positively correlated) to the regulatory ruling variable. When one estimates the influence of any regressor on the probability of trading activity occurring, the non-simultaneous logit technique then overestimates the coefficient and gives inefficient standard error estimates.

had not issue a ruling, the response was typically that they had not received any requests for formal or informal guidance from utilities under their jurisdiction. While this is an imperfect, and perhaps biased, measure of the need for regulatory rulings, it does suggest that some utilities are comfortable trading without a formal ruling on how allowances will be treated for ratemaking purposes.

The third and final comment I have to the assertion that regulation is hindering allowance trading activity is that it is not obvious that more trading activity should be occurring than that observed to date, in aggregate or in any particular state. A large amount of trading, as measuring in terms of volume of allowances traded, number of allowance trades occurring, or simply as the number of states with utilities trading allowances, is not an indication of how well the market is functioning. More allowance trading, or less for that matter, relative to what has been observed to date, without additional information on cost savings, says very little about the success of the allowance trading program. Only if there are additional cost saving that could have been obtained by additional allowance trading activity should we begin to wonder if state regulations, or the lack thereof, are the cause. Therefore, although the conclusion reached in this analysis is that regulation has had a strong positive effect on allowance trading activity in the early years of the Acid Rain Program, this study should not be interpreted as suggesting that the issuance of guidelines or orders by more state public utility commissions would have lead to more allowance trading.

In summary, it is clear utilities are trading allowances, and that commissions have, by and large, been responsive to utilities' requests for guidance. The regulatory rulings that have been issued have had the effect of minimizing the perceived risk of unfavorable rulings on the ratemaking treatment of allowances from trading activity. In addition, the language of the orders encourages, rather than restricts, allowance trading activity. Until there is evidence suggesting that significant additional cost savings could have been obtained if additional allowance trading activity had occurred in states without regulations or that utilities in states with regulations are still not taking advantage of all cost saving trading opportunities, this analysis suggests that there is little reason to believe that allowance trading activity is impeded by public utility commission regulations.

APPENDIX I
DESCRIPTIVE STATISTICS

VARIABLE		Mean	Std. Dev.	Observations
Trading activity	TRADE (1=traded)	0.442	0.498	138
Regulation Issuance	GUIDE (1=issued)	0.116	0.321	138
	GENERIC (1=issued)	0.167	0.374	138
	ORDER (1=issued)	0.282	0.452	138
Decision to Trade	RATING	8.399	2.698	138
	CMFA	16.71	562.2	138
	CMFASQ	314087.0	658592.0	138
	UNITS	0.109	0.171	138
	PAST (1=past)	0.224	0.419	138
	THREE (1=1993)	0.333	0.473	138
	FOUR (1=1994)	0.333	0.473	138
Decision to Regulate	ELECTED (1=elected)	0.196	0.398	138

APPENDIX II
PUBLIC UTILITY COMMISSION GUIDELINES AND GENERIC ORDERS

Review of FERC Accounting Guidelines

On March 31, 1993 the Federal Energy Regulatory Commission (FERC) issued Revisions to the Uniform System of Accounts in order to account for allowances. The revisions are not intended to promote or discourage particular ratemaking treatment for allowances, and FERC leaves the revisions open to state PUC variations. Deliberately distinguishing allowances from fuel or financial instruments, allowances are to be classified as Allowance Inventory or Allowances Withheld. Allowances acquired for speculative purposes must be accounted for in "Other Investments". Allowances must be expensed monthly based on each months SO2 emissions. The FERC revision states that historical cost is the appropriate measure of the accounting value of allowances, but makes clear the distinction that historical cost is not necessarily the best measure for the ratemaking value of allowances and leaves open the option for alternate treatments with respect to ratemaking. All allowances, including those purchased and sold between affiliates, are to be accounted for at the purchased price (read historical cost). Other revisions include a call for weighted average cost methods for allowance inventory accounting, and a decision to decline to adopt below the line sharing of gains or losses on the purchase or sale of allowances (except for allowances used for speculative purposes whose gains or losses are kept entirely by the utility).

An Overview of Commission Guidelines and Generic Orders

While all utilities must follow FERC accounting practices, the state public utility treatment of allowances for ratemaking purposes has been varied. Though the majority of states issuing generic ratemaking treatment of allowances are those that are affected most immediately by Phase I, there are two Phase II states, Connecticut and North Carolina, which have taken significant steps to define the treatment of allowances for ratemaking purposes. Ratemaking treatment varies widely among those states which have issued a generic order but tends to require revenues and expenses are passed on 100% to the ratepayers via offsets to fuel costs. The informal guidelines in states which are working on a case by case basis are similar in theme to those developed by states with formal orders. Most state guidelines have stated that allowance expenses and gains flow to the ratepayers one for one through some type of fuel adjustment clause.

Two Phase I states have not concerned themselves with the ratemaking treatment of allowances nor with the revenue generated from the pro rata return of moneys from the EPA annual auctions. Kansas has only one Phase I utility, Quindaro, a municipal, which is not subject to the jurisdiction of the Kansas Public Utility Commission. In Tennessee, the Tennessee Valley Authority (TVA) generates electricity for all units in Tennessee. In addition, TVA self-regulates all its electric generating units. As a consequence, TVA simply factors in sulfur dioxide allowances as a cost of doing business and no concern has been raised as to how, or if, revenue from allowance sales (or purchases) should be considered in the ratemaking process. Beyond Kansas and Tennessee, two other Phase I states have yet to think about the treatment of allowances. Both the Michigan Public Utility Commission and the Minnesota Public Utility Commission are not currently dealing with the issue. Not surprisingly, both Michigan and Minnesota have only one unit each affected in Phase I.

CONNECTICUT

The Connecticut Public Utility Commission ruling establishes an incentive based approach to the ratemaking treatment of allowances encouraging the sale of allowances. In 1993, Connecticut issued a generic order requiring that 85% of the costs and benefits resulting from allowance transactions on non-bonus allowances be returned to the ratepayers with the other 15% of the benefits retained by the utility. Non-incentive revenue, such as revenue from the pro-rata return of moneys from the EPA advance auctions as well as revenue from the sale of bonus Conservation and Renewable Energy Reserve (CRER) allowances that Connecticut utilities received, were ordered to be returned 100% to the ratepayers. All revenue is returned to the ratepayers by offsetting rate increases due to the costs incurred from state regulations which require utilities to undertake conservation load management.

GEORGIA

In April of 1994, the Georgia Public Service Commission issued a procedural response as a way to answer questions raised by Savannah Electric and Power and Georgia Power Company regarding these utilities plans for compliance with the CAAA. With respect to the accounting and ratemaking treatment of allowances, Georgia Power Company, a Phase I operating company, will include emissions allowances in inventory at cost and will expense them as they are consumed. Utilities are required to flow any allowance gains or losses at market value (rather than at FERC historic cost accounting) through the fuel adjustment clause on an annual basis, and will be treated as a rate reduction for ratemaking purposes. Any allowance profits or losses made on below the line transactions would be kept entirely by the utility. The commission also denied Georgia Power its request to keep fifty percent of all profits on allowances sales from those allowances that Georgia Power acquired from joining the Phase I Extension Pool. The PSC ruled that all profits (or losses) from those allowances would flow to the ratepayers.

INDIANA

Indiana Utility Regulatory Commission has issued a statute which requires up front approval of all allowance purchases and sales, as well as an order which dictates that allowances are the property of ratepayer. As a consequence of a PSI Energy petition for approval of its Environmental Compliance Plan, the Indiana Utility Regulatory Commission ruled that PSI Energy must conform its emissions allowances accounting practices to those laid out by the FERC final rules issued in 1993. Emission allowances used to satisfy off-system loads will be accounted separately from other allowances. A tariff rider will be used to recover allowance costs. Since FERC rules did not explicitly treat banked allowances the Commission decided to make its own rulings on the treatment of banked allowances; the Commission rejected PSI Energy's proposal to add incremental costs to the historic costs of the banked emissions allowances ruling such allowance costs are to be recorded at their acquisitions costs. The Commission goes on to note it will defer issues of carrying charges on allowances purchased specifically for banking to future hearings.

IOWA

In Iowa, all moneys generated from the purchase or sale of allowances flow through to the ratepayer one for one through an energy adjustment clause. In order to recover the cost of purchasing allowances, a rate-regulated utility must file monthly reports with the commission indicating the number and cost of allowances used per month, as well as the number and price of all allowances purchased or sold in that month, and the dollar amount of any gains or losses.

MISSISSIPPI
Until December 1995, the Mississippi Public Service Commission had allowed the recovery of all revenues and expenses from allowance transactions to be recovered (or rebated) through an environmental compliance plan. At the request of the Mississippi Power Company, the Commission has revised the means by which revenues and expenses are recovered and has instead incorporated the costs and gains from allowance purchases and sales into the fuel adjustment clause (FAC) and are now recovered in the same manner as other direct fuel expenses. All moneys continue to be recovered (or rebated) one for one to ratepayers.

MISSOURI
The state of Missouri has a statute which requires any part of utility used to make electricity to be subject to regulation. As a result, the Missouri Public Service Commission issued an order that requires utilities to get prior approval to sell allowances. The order recognizes sales may be decided quickly so in practice the PUC gives blanket permission for all sales. Missouri has had three cases which have raised the issue of allowance expenses and revenues. In each case, the ratemaking treatment of allowances was handled differently. Kansas City Power and Light's allowance sale was approved by the PUC and required KCP&L to defer all revenue until a future rate case. Empire District Electric Company was required to subtract off all annual EPA auction revenue from its fuel costs calculations. The decision in the Union Electric Case was to allow the utility to retain all profits from allowance sales if the profit was less than 11% with any profits in excess of 11% to be split fifty-fifty between the utility and the ratepayers.

NORTH CAROLINA
Prompted by a request from Duke Power to accrue a carrying cost on its net investment in allowances purchased in the 1993 EPA auctions (Duke Power purchased 25,000 vintage 2000 allowances for $3,675,000) the North Carolina PUC began discussions on issuing a generic order for allowance treatment. Carolina Power and Light had also notified the North Carolina commission of its purchase of allowances requesting, and receiving, permission to issue a promissory note for the purchase of allowances. In response to the requests, the North Carolina Commission ordered that allowances would be allowed to accrue a carrying charge on those allowances acquired for the purpose of achieving Phase II compliance in an analogous way to the accrual charge allowed on cost of work in progress (CWIP). The North Carolina Commission also ordered that no portion of the net investment in allowance inventory would be considered by the Commission for inclusion in the rate base prior to the year 1999. Sales of allowances must be reported to the Commission and the proceeds from such sales are to be used to offset the net investment in allowance inventory.

PENNSYLVANIA
In Pennsylvania, the Public Utility Commission's order dictates that costs associated with pollution control technologies can be considered a non-revenue producing investment, and recovered through the cost of work in progress (CWIP) clause only if any benefits from the sale of allowances related to that technology are passed on to the utility customers. The language of this clause suggests that it was written in light of the allowances that Pennsylvania received as a result of the Phase I Extension Bonuses. The Pennsylvania order goes on to require that allowances issued by the EPA be valued at original cost (i.e. zero cost) while purchased allowances will be valued at their full purchase price inclusive of broker fees. Emission allowances are treated as fuel inventory for ratemaking purposes and are recovered through the utility's energy cost rate (ECR). Furthermore, allowances in inventory are to earn a return in the same way as other rate base investments. The order does prohibit two significant actions, both of which Commissioner Wendell Holland dissented with when he announced the formal order. First, the commission's order explicitly prohibits the purchasing of allowance options and futures. Second, the order prohibits cost recovery incentives as part of a utility's compliance plan such as the retention of the gains from the sale of allowances funded from below the line sources.

WISCONSIN
Wisconsin requires utilities to report to the state a filing on what they expect to do over the next twenty years with respect to the use of their allowances including annual streams of allowances expected from the EPA, annual allowance use for compliance, and annual reserve banks. The purpose, says the Public Service Commission of Wisconsin, is to prevent a utility from selling too many allowances and finding itself short in future years. Net revenues from allowance transactions are credited entirely to the ratepayers and are accounted for in materials and supplies in the net investment rate base. A utility is required to notify the Commission after a trade has been made including price, quantity, and the second party(s) involved. The Commission explicitly states no aspect of the sale will be permitted to be confidential unless revealing the second party would cause harm to the ratepayers. Wisconsin makes specific the accounting treatment of allowance transactions between a utility and its holding company or one of its affiliates. Allowance trades between utilities and affiliates in a holding company system require that services or assets provided by a utility to an affiliate be priced at the greater of cost or fair market value.

Public Utility Commissions: Informal Guidelines

ALABAMA
Until allowances come into question during a ratemaking hearing or otherwise become an issue in Alabama, currently only Alabama Power Company units in the lower half of Alabama are affected in Phase I, the Alabama Public Service Commission rebates revenues and costs from allowance purchases and sales one for one to ratepayers through an Energy Cost Recovery clause. Pro rata auction revenues are returned to ratepayers entirely through a separate accounting clause. All other accounting practices such as historic cost accounting follow straight from the FERC policy statement on the ratemaking treatment of allowances.

FLORIDA
In Florida, the two Phase I affected utilities collect allowance expenses and rebate allowance revenues through cost recovery clauses. Gulf Power recovers through an environmental compliance cost recovery clause while Tampa Electric recovers its net revenues through a fuel adjustment clause. Both clauses are adjusted every 6 months, once in the spring and once in the fall. Revenue from the EPA auctions is currently being deferred. The Florida PUC currently allows net revenues generated from below the line allowance transactions to be retained 100 percent by the utility.

ILLINOIS
The Illinois Commerce Commission has issued two orders requiring all gains and losses from allowance purchase and sale be passed on 100 percent to the ratepayers through the fuel adjustment clause. Expenses and revenues are recovered monthly as the allowances are used to match tons of sulfur dioxide emissions. The Commission will value allowances at historical cost. Gains and losses from below the line transactions are kept entirely by the shareholders.

MARYLAND
The Maryland Public Service Commission has issued no final disposition on how allowances will be treated for ratemaking purposes. Potomac Edison has significant amounts of excess allowances due to scrubber installation and are currently in discussion with the Maryland PSC on how to handle the revenues if they are sold. Currently Potomac Edison's allowance revenues and costs are swallowed up in a fuel cost clause. Potomac Electric Power Company (PEPCo) has

a tariff (Fuel Rate-Rider) which allows pro rata revenues from the EPA auction to float through the fuel rate being returned dollar for dollar to the ratepayers.

NEW HAMPSHIRE

New Hampshire is poised to deal formally with the treatment of allowances in the next few months. It has been an ongoing issue which is only coming to a formal hearing the first week of December of 1995. Currently all pro rata revenue from the annual EPA auctions is being deferred until after the hearing.

NEW YORK

The New York State Department of Public Service issued an order in 1992 posing 22 questions regarding the ratemaking treatment and policy. The Commission has not acted on the responses to that order. On March 2 1994, the Commission issued a second order requiring all allowance moneys be deferred until a generic order is issued. The Commission is leaning towards revenue rebate and recovery one for one through a FAC, but their is still some question on that issue. Another strong point of contention yet to be resolved is how to treat allowance swaps and other allowance loans. This contention arises from trades which the Long Island Lighting Company has been involved in.

OHIO

Although Ohio has had four rate cases which have brought up the treatment of allowance revenue, Dayton Power and Light, Centerior Energy, Cincinnati Gas and Electric, and Monongahela Power, the Ohio Public Utilities Commission has yet to issue a generic order. Questions concerning the treatment of allowances have primarily been dealt with case by case because the PUC would like to integrate the treatment of allowances into utilities" Environmental Compliance Plan and as part of their Integrated Resource Plan. The Commission issued a guideline which recognized that carrying charges related to the emissions allowance trading process are legitimate costs of doing business, but the PUC has not specifically addressed this issue. The Ohio guidelines also recognize that all reasonable trading mechanisms such as sales, purchases, futures, leases, and options are legitimate forms of trade and should be evaluated on an equal basis. The guidelines also mandate that each utility submit an allowance trading status report with its EFC audit documenting actual and foregone transactions, allowance holdings, an explanation for why a particular bank level has been maintained, and any adverse experience they have had in trading with other states or encounters with other regulatory authorities. Finally the guidelines suggest that all gains or losses on emission allowance transactions flow through to ratepayers on an energy basis unless the utility created the gain or loss from a below the line transaction in which case all gains may be retained by the utility.

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