Volume 93
Issue 3 *The National Coal Issue*
Article 2

April 1991

The Clean Air Act Amendments of 1990: An Innovative, but Uncertain Approach to Acid Rain Control

Robert C. Byrd
United States Senate

THE CLEAN AIR ACT AMENDMENTS OF 1990: AN INNOVATIVE, BUT UNCERTAIN APPROACH TO ACID RAIN CONTROL

U.S. SENATOR ROBERT C. BYRD

I. INTRODUCTION

There is no question but that the Clean Air Act Amendments of 1990, signed into law by President George Bush on November 15, 1990 will have a tremendous impact on the future of the American coal industry. Title IV of these amendments represents a bold step forward in the effort to control the precursors to acid rain, particularly in terms of its approach to reducing emissions of sulfur dioxide. Rather than relying on more traditional regulatory mechanisms — such as uniform emission standards or mandated technological controls — the acid rain provisions of the 1990 amendments are built around the creation of a system of marketable emission allowances. While economic theory has long suggested that the use of market-based regulatory mechanisms, such as marketable allowances, represents an efficient approach to achieving a predetermined environmental goal, we have had little practical experience with such market-based mechanisms in the United States, particularly at the federal level.

Undoubtedly, this lack of experience with the use of marketable emission allowances explains some of the anxiety and uncertainty caused by the passage of the Clean Air Act Amendments of 1990. Other possible explanations for the anxiety include the complexity

and length of the legislation, as well as the ambitious emission reduction requirements that it establishes. It is my hope that I might reduce at least some of the uncertainty that exists by: (1) outlining how the acid rain provisions of the 1990 Amendments are intended to work; and (2) explaining how I, working with a coalition of Senators from the coal states of Appalachia and the Midwest, attempted to amend and improve the bill as it moved both through the Senate and conference. Finally, I wish briefly to review some of the concerns I have with the Clean Air Act Amendments of 1990; concerns which led me to vote against both the final passage of the bill in the Senate on April 3, and the adoption of the conference report on October 27.

II. The Intent of the Clean Air Act Amendment of 1990

The primary goal of the acid rain provisions of the Clean Air Act Amendments of 1990, with respect to sulfur dioxide emissions, is to reduce such emissions by ten million tons below 1980 levels. Once achieved, this ten million ton reduction is to be maintained by the establishment of a permanent cap on future utility emissions of sulfur dioxide. The road from passage of the Clean Air Act Amendments of 1990 to achievement of a true ten million ton reduction in emissions is not, however, a straight one. As noted above, the law is complex, filled with a number of special provisions that often make it difficult to follow or understand.

Title IV of the law is structured in a way so that the goal of a ten million ton reduction is to be achieved in two phases.[1] In Phase I, only the largest emitters — those with a nameplate capacity of more than 100 megawatts (MWe) and a 1985 emissions rate greater than 2.5 pounds per million British Thermal Units (lb/

1. It may provide for an easier understanding of the law, to think of the emissions reduction program as actually being divided into three phases. The law itself sets forth only two phases: Phase I, which begins January 1, 1995; and, Phase II, which begins January 1, 2000. The law, however, also sets up a special reserve of allowances to be allocated to affected units over the first ten years of Phase II. As a result, although Phase II commences in calendar year 2000, as does imposition of a permanent cap on utility emissions, the goal of a ten-million-ton reduction in emissions is not achieved until the year 2010. One may find it easier, therefore, to think of a third phase of the law's acid rain control program as beginning on January 1, 2010, although no such phase is explicitly mentioned in the law.

mmBtu) — are defined as "affected sources," and are subject to the emissions limitations specified in the law. In Phase II, virtually every utility that burns fossil fuels, except very small units with a nameplate capacity of twenty-five MWe or less, is subject to some level of emissions limitation.

III. Phase I of the Clean Air Act

In Phase I, individual affected "units," which are a part of an affected source, are awarded a specific number of allowances annually, with each allowance essentially entitling its holder to emit one ton of sulfur dioxide into the atmosphere. Although the exact number of allowances issued in Phase I to each affected unit is listed in Table A of section 404 of the Act, the number of allowances so allocated is based on a formula equal to each unit's "baseline" (its average annual fuel consumption in 1985-87, measured in millions of Btu's) multiplied by a 2.5 lb/mmBtu emissions rate, and divided by 2,000. While the Phase I allowance formula is based on a 2.5 lb/mmBtu emission rate, it would be incorrect to characterize affected Phase I units as being required to meet a 2.5 lb/mmBtu emissions rate standard.

Allowances are transferable, both between affected units and from a current year to any future year. As a result, to the extent that some affected units elect to overcontrol, or exceed their emissions reduction obligations, and then trade their excess allowances, other affected units will be able to undercontrol, or reduce their emissions less than would be required under a mandatory 2.5 lb/mmBtu emission rate standard. An affected Phase I unit could, in other words, continue to operate after January 1, 1995, at an emissions rate greater than 2.5 lb/mmBtu and still comply with the law, as long as the owner/operator of the unit is able to purchase, from one or more other affected units, additional emission allowances sufficient to cover its excess emissions. A marketable allowance system thus allows each affected unit much greater flexibility in developing its compliance strategy than would a more traditional "command- and-control" approach. Assuming the existence of a robust market for allowances, this increased flexibility creates the potential for significant cost savings in achieving the

desired level of emissions reduction. In addition, allowance trading is also likely to create an opportunity for affected utility units with relatively large emission reduction obligations to realize some degree of cost-sharing relief.

High-emitting utilities are likely to face lower marginal costs of control than low-emitting utilities. As a result, there will be an incentive for a high-emitting utility to generate excess emission allowances through a strategy of overcontrol, so that it can then sell its excess allowances to another utility with relatively high control costs. The price at which the excess allowance would be sold would be somewhere between the marginal control costs of the low- and the high-emitting utilities. The net result would be a reduction in costs for both utilities. The high-emitting utility would use the proceeds from the sale to offset some portion of its overall compliance costs, and, since the price it would receive for the excess allowances would be greater than the cost of generating such allowances, the amount of revenues gained from overcontrol would exceed the incremental costs associated with overcontrol. In other words, the high-emitting utility would realize a net reduction in its compliance costs by generating and selling excess allowances. At the same time, by going into the market and purchasing the excess allowances of the high-emitting utility, the overall compliance costs of the low-emitting utility would also be reduced, since the cost of purchasing allowances would be less than the cost of actually reducing emissions. The key here is that allowance trading is not a zero-sum game. Both low- and high-emitting utilities can potentially gain from the flexibility and freedom of choice associated with a regulatory system built upon the use of marketable allowances, and will do so assuming there is a robust and smooth-functioning market for allowances. Whether or not such a market is likely to develop is an issue that will be discussed later.

IV. Byrd-Bond Amendment to the Clean Air Act

Another important aspect of the Clean Air Act Amendments of 1990 is that not all affected Phase I units are required to meet the Phase I compliance deadline of January 1, 1995. If an affected unit elects to meet its Phase I emissions reduction obligation either

by: (1) employing a technological system of continuous emissions control achieving a 90% reduction in emissions (i.e., a "qualifying Phase I technology") or (2) transferring its Phase I emissions reduction obligation to a unit employing a qualifying technology, it may qualify, as an "eligible Phase I extension unit," for a two-year extension or delay of the Phase I compliance deadline. During the period of the delay, in 1995 and 1996, each extension unit would be entitled to its regular allocation of emission allowance provided in Table A of section 404 of the Act. In both 1995 and 1996, each extension unit would also be issued additional allowances, from a special reserve of allowances available only for use by eligible extension units, equal to the difference between the number of allowances specified in Table A and the lesser of (1) its average annual emissions in 1988 and 1989 or (2) its projected emissions, absent any emission controls, in 1995 and 1996. Each extension unit would, in essence, be exempt from the emission reduction requirements of the Clean Air Act Amendments of 1990 until January 1, 1997.

Beyond being granted a two-year delay in the Phase I compliance deadline, any extension unit that actually installs a qualifying technology, which, for all practical purposes, would be limited to a flue gas desulfurization (FGD) unit, or scrubber, given the 90% reduction requirement included in the definition of a qualifying technology, would also be entitled to receive, in calendar years 1997 through 1999, additional "bonus" allowances equal to the difference between the unit's actual emissions in each of those three years and its calculated emissions, at an emissions rate of 1.2 lb/mmBtu. (As with the extra allowances issued to an extension unit during the period of the two-year extension, these additional bonus allowances would also be drawn from the special reserve mentioned above.)

Finally, and significantly, if an eligible extension unit elects to begin scrubbing prior to January 1, 1997, that unit would not forfeit its eligibility for the two-year delay. Emissions reductions achieved by an extension unit in 1995 or 1996 would be early reductions. By scrubbing before the 1997 compliance deadline applicable to eligible extension units, an extension unit would, in

effect, be converting the benefits of the two-year extension into "credits for early reduction." Rather than being forced to use the additional allowances provided during the extension period to cover the emissions of the extension unit, scrubbing early would enable the owner/operator of the extension unit to use those allowances: (1) to offset the emissions reduction obligations of other affected Phase I (non-extension) units; (2) to save the allowances for use in Phase II; or (3) to sell the allowances to another utility or other buyer.

All of the provisions regarding eligible Phase I extension units are intended to encourage utilities with affected Phase I units to incorporate the use of scrubbers in their overall compliance strategies, and thus help reduce, at least during Phase I, the potentially disruptive impact of the Clean Air Act Amendments of 1990 on existing coal markets. From the outset of the debate over new clean air legislation, it was clear that any new effort to control sulfur dioxide emissions could have a devastating impact on the high-sulfur coal regions of northern Appalachia and the Midwest.

The scrubber incentives outlined above, taken from a proposal that eventually became known as the Byrd-Bond Amendment, were developed over a period of several months by a coalition of coal-state Senators, including Senator Christopher S. Bond of Missouri and myself, and are designed to help mitigate the impact of new sulfur dioxide controls on the high-sulfur mining communities in our states. While it is not yet possible to know precisely what impact the 1990 Amendments will have on the coal industry, it is my belief that the scrubber incentives incorporated into the law will have a significant positive effect in terms of minimizing the adverse impact of the Phase I emission reduction requirements on high-sulfur coal.

To understand how these Phase I scrubber incentives might reduce the impact of the law on the high-sulfur coal industry, consider the following hypothetical. Assume that the U.S. Power Company (US Power) has the following affected Phase I units:

Affected Phase I Units of US Power

	Projected Annual Emissions, 1995/1996*	Phase I Allowances	Emission Reduction Obligation
Big Bear			
1	160,000	67,000	93,000
Green Tree			
1	120,000	60,000	60,000
2	80,000	40,000	40,000
3	50,000	25,000	25,000
Red Spruce			
1	36,000	20,000	16,000
2	36,000	20,000	16,000
Bass Lake			
1	40,000	25,000	15,000
2	32,000	20,000	12,000

* Uncontrolled, and assumed to be equal to or less than average annual emissions in 1988 and 1989.

Further assume that US Power intends to reduce its emissions at Big Bear 1 through use of a "qualifying Phase I technology," thereby reducing its emissions at the unit to a level well below that allowed in Phase I. By developing a compliance plan based upon the installation of a scrubber at Big Bear 1, US Power would be eligible to receive a two-year extension of the Phase I compliance deadline at the unit. In addition, once the scrubber was made operational, US Power would be issued allowances, from Table A above, in excess of the number necessary to cover the unit's actual post-compliance emissions. Finally, by reducing the emissions rate at Big Bear 1 to a level less than 1.2 lb/mmBtu through the use of a qualifying technology, US Power would also be eligible to receive "bonus" allowances in calendar years 1997 through 1999.

The following two scenarios show how US Power might adjust its compliance strategy and use the excess allowances generated at Big Bear 1 to offset or cover the emissions reduction obligations of other Phase I units within its system.

Scenario 1: Assume US Power, electing to take full advantage of the two-year delay, begins operation of its "qualifying Phase I technology" at Big Bear 1 on January 1, 1997.

In both 1995 and 1996, as an "eligible Phase I extension unit," Big Bear 1 would be provided with additional emission allowances sufficient to allow the unit to operate without any new emission controls. Beginning in 1997, with its scrubber operational, Big Bear 1 would emit only sixteen tons of sulfur dioxide annually, a level 51,000 tons below its allowable Phase I emissions. In addition, Big Bear 1 would also generate 16,000 "bonus" allowances each year between 1997 and 1999, as a result of its emissions rate falling to a level below 1.2 lb/mmBtu. Altogether, Big Bear 1 would generate 67,000 excess allowances a year between 1997 and 1999. It would thus generate a supply of excess allowances sufficient to cover the combined Phase I emission reduction obligations of Green Tree 2, Bass Lake 1, and Bass Lake 2. As a result, US Power would be able to transfer the emission reduction obligations of all three units to Big Bear 1, thereby also qualifying Green Tree 2, Bass Lake 1, and Bass Lake 2 for treatment as "eligible Phase I extension units."

Overall, US Power's Phase I compliance strategy would entail:

- scrubbing Big Bear 1 in 1997;
- fuel-switching Green Tree 1, Green Tree 3, Red Spruce 1, and Red Spruce 2 in 1995; and
- taking no action to reduce emissions at Green Tree 2, Bass Lake 1, or Bass Lake 2.

Scenario 2: Assume US Power, electing to earn credit for making early reductions, begins operation of its "qualifying Phase I technology" at Big Bear 1 on January 1, 1995.

As under scenario 1, between 1997 and 1999, scrubbing Big Bear 1 would generate a sufficient number of excess allowances to cover the combined emissions reduction obligations of Green Tree 2, Bass Lake 1, and Bass Lake 2, thereby allowing US Power to transfer the emission reduction obligations of those units to Big Bear 1. As a result, as under the previous scenario, Big Bear 1 and the three "transfer" units would qualify for treatment as "eligible Phase I

extension units," and scrubbing Big Bear 1 would allow US Power to avoid having to reduce emissions at Green Tree 2, Bass Lake 1, or Bass Lake 2 during Phase I.

In addition, by scrubbing Big Bear 1 early, US Power would also be able to generate an additional 144,000 excess allowances in both 1995 and 1996. The decision to scrub Big Bear 1 early would not invalidate its eligibility for a two-year extension of the Phase I compliance deadline. While emissions at Big Bear 1, with a scrubber in operation, would be reduced to only 16,000 tons in both 1995 and 1996, the unit would be awarded 160,000 allowances in each of those years: 67,000 from the Table A allocation of allowances, and an additional 93,000 from the special Phase I allowance reserve set aside for eligible extension units. As a result, Big Bear 1 would generate a total of 288,000 additional excess allowances during the 1995-1996 period. Spread over five years, these additional allowances could be used to offset an additional 58,000 tons of emission reduction obligations during Phase I. US Power could thus cover the combined Phase I emission reduction obligations of Green Tree 3, Red Spruce 1, and Red Spruce 2 with the excess allowances generated by scrubbing Big Bear 1 early.

Overall, US Power's Phase I compliance strategy would include:

- Scrubbing Big Bear 1 in 1995;
- fuel-switching Green Tree 1 in 1995; and
- taking no action to reduce emissions at Green Tree 2, Green Tree 3, Red Spruce 1, Red Spruce 2, Bass Lake 1, or Bass Lake 2.

If US Power elected not to scrub Big Bear 1, it would be required either to fuel-switch all eight of its affected Phase I units beginning in 1995, or to go into the market and purchase allowances from another utility to cover the excess emissions for any unit at which it does not fuel-switch. Clearly, the high- sulfur coal industry would suffer a significant loss of market share if utilities, such as US Power in the above hypothetical, chose not to scrub any affected Phase I units. Yet, as shown in the above hypothetical, the scrubber incentives incorporated in the Clean Air Act Amendments will enable a utility to maintain existing high-sulfur coal contracts at a larger num-

ber of affected units than those at which an FGD unit will be installed. By scrubbing Big Bear 1 in 1997, as in scenario 1, US Power would be able to cover the emission reduction obligations of three other affected units, thereby avoiding the need to fuel-switch those units. In scenario 2, scrubbing Big Bear 1 in 1995 would enable US Power to cover the emission reduction obligations of six other affected units, leaving it with only one unit at which it would be forced to fuel-switch.

It is important to note that, although the costs associated with the installation and operation of an FGD unit are, in almost all cases, higher than the costs involved in switching to a lower sulfur coal, the scrubber incentives built into the law will not increase the overall costs of compliance. As noted previously, affected utilities will be free to develop their own individual compliance strategies, and it can be generally assumed that they will adopt compliance strategies that minimize their compliance costs. As a result, a utility will elect to scrub an affected Phase I unit only if doing so is estimated to be cost-effective. Rather than mandating the use of scrubbers, the 1990 Amendments to the Clean Air Act encourage the use of technological emission controls by increasing the benefits associated with the use of such technological controls. It is, in fact, possible that the scrubber incentives included in the Act could reduce the overall costs of compliance.

The only social cost associated with these scrubber incentives is likely to be environmental, not economic. To the extent that some affected Phase I units are allowed to delay compliance with the Phase I emission reduction requirements of the law, there will also be a delay in achieving some amount of sulfur dioxide emission reductions. I would suggest, however, that the potential cost to the environment is negligible. Without any Phase I scrubber incentives, the Clean Air Act Amendments of 1990 could be expected to achieve a cumulative reduction in sulfur dioxide emissions of 100 million tons or more by the year 2010. The magnitude of any emissions reductions foregone as a result of the provisions relating to eligible extension units is limited to the size of the special reserve of allowances created for use by such units. In view of the fact that this reserve will contain no more than 3.5 million allowances, or

about three percent of the cumulative emissions reductions expected over the next 20 years, I would suggest that the potential environmental cost of the emissions reductions foregone is acceptable. Taking into account the potentially devastating job losses and economic dislocation that will be avoided in the high-sulfur mining regions of northern Appalachia and the Midwest, I would go so far as to suggest that the technology incentives included in the 1990 amendments to the Clean Air Act could produce a net social welfare gain.

V. Phase II of the Clean Air Act

In Phase II, which commences on January 1, 2000, the universe of affected units is substantially broader, as almost every utility unit with a nameplate capacity greater than twenty-five MWe is subject to some level of emissions limitation. Unlike in Phase I, however, no single formula is used to determine the number of allowances to which every affected Phase II unit is entitled. Instead, the Phase II allowance formulas vary according to the 1985 emission rates of the affected units, as well as their size or nameplate capacity. (Except for some very narrowly drawn exceptions, each of the Phase II allowance formulas is based on emission rates of 1.2 lb/mmBtu or less.) Additionally, as noted earlier, a special reserve of allowances is created in Phase II for the purpose of providing affected units with additional allowances through the year 2009. The allocation formulas for these reserve allowances are also based on the 1985 emission rates and nameplate capacity figures of the affected units. Finally, there are a number of targeted provisions designed to provide additional allowances to specific utility units or systems deemed to be worthy of special relief.

In total, there are more than thirty different provisions relating to Phase II allowance allocations. While providing a description here of each would be cumbersome, and possibly overwhelming, it would be accurate to say that, in general, low-emitting and smaller units are treated more favorably under the Clean Air Act Amendments of 1990 than are larger units with high 1985 emission rates. As in Phase I, not all affected Phase II units are required to meet the Phase II compliance deadline of January 1, 2000. Both to en-

courage and even to allow the use of emerging clean coal technologies in phase II, any affected unit that elects to "repower" its existing coal-fired boiler with an approved clean coal technology may delay compliance with the emission reduction requirements of the Act until December 31, 2003. With respect to the specific technologies that would allow an affected unit to qualify for the extension, a list of approved technologies is included in the law. In addition, the list may be expanded, if the Administrator of the Environmental Protection Agency (EPA), in consultation with the Secretary of the Department of Energy, determines that additional technologies satisfy a rigorous set of standards relating to multiple emissions reductions, improved boiler or generation efficiency, and increased waste reduction.

It is highly unlikely that the clean coal technologies currently under development will be commercially available by January 1, 2000. Therefore, absent an adequate extension of the Phase II compliance deadline, utilities would be effectively precluded from using advanced clean coal technologies as part of their compliance strategies. Given the role that these technologies could have in helping to achieve future environmental and energy goals, the Phase II deadline extension for affected units that elect to employ a clean coal technology is an important part of the Clean Air Act Amendments of 1990.

VI. Concerns about the Clean Air Act

Having provided an outline of how the acid rain provisions of the law are intended to work, let me now briefly turn to some concerns I have with the Clean Air Act Amendments of 1990. As noted earlier, realization of the cost-minimizing benefits of a regulatory system built upon the use of marketable allowances is dependent on the development of an active and smooth-functioning market for those allowances. If such a market fails to develop, and allowance trading fails to occur, the potential cost-saving benefits of a market-based regulatory approach are not likely to be achieved.

In my view, it is not clear how well market-based incentives, such as tradeable allowances, will work in a heavily regulated industry, such as the electric utility industry. I am concerned that,

with respect to the acid rain provisions of the Clean Air Act Amendments of 1990, reality may very well diverge from theory, and the cost-saving and cost-sharing potential of this bold new regulatory approach may never be realized. Few, if any, industries are as heavily regulated as the electric utility industry. As a result of the regulated environment in which they operate, electric utilities are not necessarily driven by the same profit-maximizing motives that are assumed to motivate most free-market enterprises, or at least not driven to the same degree by such motives. Certainly, few would take exception to an assertion that utilities are likely to be more risk averse than are businesses operating in highly competitive and unregulated markets. As a result, it is not clear that a robust market for emission allowances will necessarily develop.

As already noted, cost-minimization assumes that utilities with relatively low marginal costs of control will overcontrol and thus generate excess emission allowances which will be sold to utilities with relatively high marginal control costs. Yet, a utility with low marginal control costs may be unwilling to bear the risk of having to incur the extra costs necessary to generate excess allowances on the chance that it will, at some point in time, be able to recover those additional costs, either from being able to sell the allowances to another utility or from being allowed to pass on the costs to its customers in the form of higher electric rates. If the utility is unwilling to bear this risk, it would simply elect not to overcontrol.

With respect to the compliance strategies of utilities affected by the Clean Air Act Amendments of 1990, it is not unreasonable to think that utilities with affected Phase I units may assume that the risks associated with overcontrol are excessively high. It is likely that such utilities will be attempting to finalize their Phase I compliance strategies before a clear market price for allowances will have had time to be established. Without a clear signal as to what the market price for allowances will be, utilities with presumably relatively low marginal control costs may be hesitant to adopt a strategy incorporating some degree of overcontrol. Because of the uncertainty of the market price for allowances, and the risk associated with that uncertainty, it is possible that allowance trading may, in effect, be restricted in Phase I to trades between affected units within the same

utility system. Although intra utility trading would almost certainly produce some reduction in overall costs, it is likely that the cost-savings generated would be less than the potential savings associated with unrestricted inter utility trading. (Even with respect to intra utility trading, there are reasons to expect that trading in this arena may also be impeded, particularly if the potential trades involve utility units in different states. As a result, even the potential cost-savings to be gained from intra-utility trading may not be fully realized.)

The problem associated with the lack of a clear market price for allowances is but one potential problem associated with the market-based regulatory system created under the Clean Air Act Amendments of 1990. There are numerous other potential problems as well. For example, even if a utility were willing to bear the risk discussed above, and elected to overcontrol in Phase I and generate excess allowances, there is some questions as to whether the utility would be free to sell any excess allowances it might so generate. Because the law places a permanent cap on utility emissions after the year 2000, any future growth in emissions will have to be offset by reductions in emissions at existing sources in excess of the specific emission reduction obligations for such sources already set forth in the law. In other words, to the extent that economic growth stimulates the demand for electricity, and thereby increases emissions, allowances could become a key to future economic growth. In light of this fact, a state public service commission (PSC) may attempt to prohibit its utilities from selling or trading away any excess allowances they might generate through overcontrol. If this were to occur, the result would, again, be a breakdown in the allowance trading system, and the loss of part, if not all, of the potential cost-savings associated with allowance trading.

Whether or not all of the potential problems that could plague the allowance trading system will actually come to pass is not clear. Provisions attempting to deal with a number of these problems are included in the law. For example, beginning in 1993, the EPA is charged with conducting an annual auction of emission allowances withheld from affected units. Although the number of allowances to be auctioned will be relatively small, the purpose of the auctions

is to encourage the early establishment of a market price for allowances. Yet, establishing a market price for allowances in 1993 may not be early enough to address the problem discussed above. All affected Phase I units are required under the law to submit their Phase I compliance plans no later than February 15, 1993. Furthermore, as noted earlier, the reserve of allowances set aside for use by eligible Phase I extension units is limited to 3.5 million allowances or less. Allowances in this reserve are to be drawn down on a first-come, first-serve basis. Therefore, any affected Phase I unit wishing to qualify for the extension will be under great pressure to finalize and submit its compliance plans far in advance of the February 15, 1993 deadline. Conducting an allowance auction in 1993, while perhaps useful for other purposes, is unlikely to eliminate or reduce, in a timely fashion, the uncertainty about the market value of allowances that could retard or prevent the development of a robust trading system.

Although the concerns I have about the potential shortcomings of the allowance trading system established under the Clean Air Act Amendments of 1990 are very serious, my concerns extend beyond the allowance trading provisions of the law. Efficiency is not the only standard by which a system of environmental regulations should be judged. An equally important issue is that of equity, and, in this regard, I question whether the costs of the acid rain control provisions of the Clean Air Act Amendments of 1990 will be distributed in an equitable and fair manner. It is my contention that the emission reduction requirements of the law unfairly require that a disproportionate share of the overall ten million ton reduction in emissions be achieved by the utility sector and, in particular, by utilities in those states that have traditionally relied most on the use of high-sulfur coal.

According to the EPA, 25.7 million tons of sulfur dioxide were emitted into the air in the United States in 1980, with the utility sector accounting for approximately 17.5 million tons, or 68%, and the non-utility sector accounting for 8.2 million tons, or 32%. By the year 2010, under the Clean Air Act Amendments of 1990, utilities will be required to reduce their annual emissions of sulfur dioxide by 8.5 million tons below 1980 levels and approximately 7.0

million tons below 1985 levels. Over the same period, non-utility sources will be required to make no new reductions in emissions below 1985 levels. The reason for this apparent disparity is that non-utility sources are estimated to have reduced their emissions by 1.0 to 1.5 million tons between 1980 and 1985. Further, non-utility sulfur dioxide emissions are projected to remain at or below their 1985 levels indefinitely. As a result, the non-utility sector is essentially exempt from any further emission reduction requirements.

Even assuming that non-utility sources have already reduced emissions by 1.5 million tons below 1980 levels, to exempt the non-utility sector from any further emission reductions requires that the utility sector must assume responsibility for a disproportionate share of the overall ten million ton reduction goal. Although responsible for only 68% of total sulfur dioxide emissions in 1980, utilities will be required to make 85% of the emission reductions necessary to achieve the ten million ton goal. At the same time, non-utility sources escape from any further reduction requirements after making only 15% of the reductions necessary, even though such sources accounted for 32% of all 1980 emissions.

Setting aside the issue of the emission reduction requirements of the non-utility sector, a similar disproportionality exists within the utility sector itself. In 1980, seven states — Illinois, Indiana, Kentucky, Missouri, Ohio, Pennsylvania, and West Virginia — accounted for 54% of all sulfur dioxide emissions nationwide. Yet, under the Clean Air Act Amendments of 1990, these seven states will account for 72% of the total emission reductions to be achieved in the year 2010. Upon full implementation, the emission reduction requirements of the law will result in a 49% reduction in nationwide emissions in the year 2010. Although fairness may not necessitate an exactly proportional distribution of the overall emissions reduction burden, I would suggest that the actual distribution, as shown in the table below, is so far from proportional that it raises serious equity concerns. For example, while Missouri and Indiana will be required to reduce emissions by 75% and 69% respectively, utility emissions in Arkansas and Louisiana will be allowed to *increase* by 207% and 361% respectively.

Utility Sulfur Dioxide Emissions, 1980 vs. 2010
(in thousands of tons)

	Actual Emissions (1980)	Allowable Emissions (2010)	Change in Emissions (tons)	Change in Emissions (percent)
Missouri	1,171	288	-883	-75.4%
Indiana	1,575	489	-1,086	-69.0%
Tennessee	959	299	-660	-68.8%
Ohio	2,179	689	-1,490	-68.4%
California	71	25	-46	-64.8%
Illinois	1,115	408	-707	-63.4%
Kentucky	992	379	-613	-61.8%
Pennsylvania	1,472	582	-890	-60.5%
Wisconsin	462	184	-278	-60.2%
West Virginia	968	440	-528	-54.5%
ME/NH/VT	98	47	-51	-52.0%
Iowa	232	115	-117	-50.4%
U.S. Total	**17,483**	**8,907**	**-8,576**	**-49.1%**
Mississippi	128	67	-61	-47.7%
New York	485	278	-207	-42.7%
Alabama	577	338	-239	-41.4%
NC/SC	664	400	-264	-39.8%
Florida	733	451	-282	-38.5%
Georgia	760	468	-292	-38.4%
WA/OR	74	46	-28	-37.8%
Minnesota	164	107	-57	-34.8%
Wyoming	123	81	-42	-34.1%
Michigan	564	380	-184	-32.6%
New Jersey	105	72	-33	-31.4%
MD/DE/DC	281	196	-85	-30.2%
New Mexico	98	70	-28	-28.6%
Virginia	165	132	-33	-20.0%
KS/NE	212	170	-42	-19.8%
MA/CT/RI	309	266	-43	-13.9%
Montana	25	30	5	20.0%
Colorado	71	93	22	31.0%
ND/SD	113	150	37	32.7%
Utah	24	37	13	54.2%
Arizona	85	140	55	64.7%

Nevada	41	75	34	82.9%
Texas	299	624	325	108.7%
Oklahoma	39	102	63	161.5%
Arkansas	27	83	56	.4%
Louisiana	23	106	83	360.9%

source: ICF Resources, Incorporated

Finally, although the Clean Air Act Amendments of 1990 contain incentives designed to encourage the utilization of clean coal technologies by affected Phase II units, I question whether the incentives included are adequate to allow utilities to make use of the most advanced coal technologies currently under development. These advanced technologies promise to provide far greater environmental benefits than do any technologies available today. With respect to our long-term environmental and energy concerns, the continued development and future deployment of advanced clean coal technologies are perhaps our brightest hopes for the future.

VII. Conclusion

The realities of American energy use are clear. Reality number one is that coal is, by far, our most plentiful domestic energy resource. Reality number two is that coal currently accounts for more than 50% of our domestic electricity production. Reality number three is that, even with significant increases in conservation, as well as increased exploitation and development of other domestic energy resources, coal will continue to be responsible for over half of our electric power generation well into the future.

As a result, it is important that the continued development of new clean coal technologies be encouraged, not impeded. Such technologies are our best hope, not only for addressing concerns about acid rain, but also about global warming as well. The concern that I have with the Clean Air Act Amendments of 1990 is that, just as most clean coal technologies currently under development are unlikely to be ready for commercial application by the beginning of Phase II, many of the most advanced technologies are not likely to be commercially viable even by December 31, 2003. In an effort to reduce sulfur dioxide emissions as quickly as possible, the Clean Air Act Amendments of 1990 may, therefore, effectively preclude the

use of those clean coal technologies that promise to respond not only to current, but also to future, possibly even more serious, environmental concerns and energy needs. As noted at the outset, the acid rain control provisions of the Clean Air Amendments of 1990 represent a bold new step in the effort to improve the quality of our environment. The goals set forth by the law are ambitious, and the regulatory structure it establishes is innovative, as well as complicated. A full and complete understanding of the law requires a careful reading of its many provisions. Some questions and uncertainties about the law are likely to be resolved as the EPA proceeds with the unprecedented number of rulemakings that it is now charged with making in a relatively short period of time. Other questions will only be answered as the various provisions of the law actually take effect. For the coal industry, the future may appear cloudy, but the task ahead is clear: to make the Clean Air Act Amendments of 1990 work in a way that will improve the quality of our air, while still supplying the United States with the basic energy upon which its economic future continues to depend.