Federal Legislative and Regulatory Record

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I am going to look back over the last 20 years to help, as part of this session, set the stage for a lot of the information you are going to hear in the presentations in the next two days.

As I look back over the acid rain story over the past 20 years, I really see two intertwined story lines, one about the science and the other about the policy and program. The decade of the 1980s opened with rather polarized views about the issue of acid rain. One view held that acid rain was a serious environment problem. It was killing our aquatic and terrestrial life. It was getting rapidly worse and might be irreversible. It was caused primarily from emissions from power plants, and primarily power plants in the Midwest.

The other view held that it was not a problem at all, that it was actually a political issue. If it were a problem, it was not a serious one. It had existed for decades it wasn't getting any worse. Besides, you couldn't prove that emissions from the Midwest led to acidic deposition in the east, and that deposition was actually responsible for the effects that we were seeing on the lakes and streams in the east.

Therefore, it was premature to do anything about the issue. At most, we should study the problem more to reduce all the scientific uncertainties. It was really because of that last concern, since we couldn't resolve these two views, we did go to a rather intensive research effort.

Although over 70 bills were introduced through 1988, the administration supported none of those bills, and I do not believe that any of them actually made it to the floor of either house for a vote.

However, as Dr. Bernabo pointed out, we did embark on one of the most intensive and expensive research efforts ever, $500 million at that time, but it pales in comparison to the climate work.

The research was driven by two basic questions, how bad was the problem, which was part of the debate in 1980, and what should we do about it.

More specifically, there were questions like, how many acidic lakes and streams are there in the United States? How many forests have been damaged? This was the scope question which was in dispute. We had anecdotal data, but we didn't have a systematic determination of this.

Is it getting worse? If so, how fast is it getting worse? This is the rate of change question.

What is the relationship between emissions and deposition? What is the relationship between deposition and environmental effects? These were the mechanism questions. They were hypotheses but we hadn't really tested them.

What is the cost of control?

Major data gathering and research efforts were undertaken and major accomplishments were achieved during the decade of the 1980s. For example, we did conduct a national lake and stream survey, the first time it had ever been done. It was a systematic, very high quality effort, which allowed us to have a much better sense of what the scope of this problem was.

We also did forest surveys and we set up monitoring systems, or added to monitoring systems that were already beginning, monitoring of deposition trends, monitoring of effects. We increased our understanding of the response of ecosystems to deposition, and we captured that in models, such as the MAGIC model. We increased our understanding of atmospheric chemistry and transport, which was captured in models like RADM.

We increased our understanding of emissions control options and likely economic decisions, which we captured in models like AUSM and CEUM, for those of you familiar with these things. AUSM was the advanced utility simulation model, which has since fallen by the wayside, and CEUM was the coal and electric utility model. These models, more than just models, were actually places where people put their knowledge together and tried to express, in the best way they could, the processes that we were trying to explain and understand. Thanks to these efforts, scientific uncertainties regarding causal links – between emissions and deposition, between deposition and acidification – were greatly reduced during the

1980s. The models reflecting our best understanding of these phenomena were linked to emissions to economic models, so that we could support credible policy analysis.

As I said earlier, there was another story line to the 1980s. In 1980, the principal instrument for achieving environmental improvement was what we have come to call command and control regulation. There was little use of economic instruments. Taxes were frowned upon, are still frowned upon, and emissions trading was still in its infancy at that time.

The bills introduced in the 1980s either mandated scrubbing or set an emissions rate to be met by every plant. Emissions trading or other flexible approaches were not given too much attention. They were mentioned, but people really didn't dwell on them too much.

In 1989, to help break the legislative logjam, the Bush administration, with the support of groups like the Environmental Defense Fund, put forth a new approach, one that relied on a national emissions cap, with trading of emissions allowances. It was designed to provide the economic savings promised by emissions trading, but with the environmental credibility lacking in previous trading efforts.

Because a national emissions cap and trading regime had never been implemented before, or even proposed, it was referred to by some as a grand policy experiment. Most of its features were unprecedented and untested. The purpose of the program that eventually emerged from Congress was to reduce SO2 emissions by 10 million tons (Figure 1). The bulk of those emission reductions would be coming from electric utilities, 8.5 million tons.

The scope of the program was to be national, except for Hawaii and Alaska, the continental contiguous states of the United States (Figure 2). It was to include every major power plant and every new power plant built. Again, this was unprecedented. We had never run a stationary source program like this before.

The program would specify what needed to be done by setting a maximum emissions cap that would require measurement of all emissions from all sources, and have automatic financial and emissions offset penalties for non-compliance.

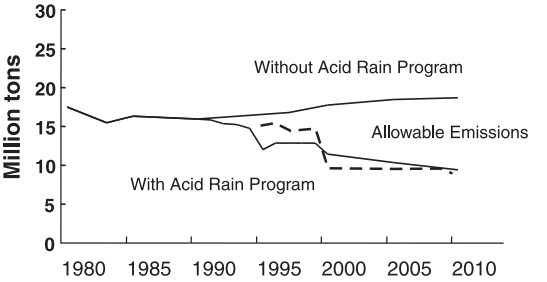

Figure 1. SO_2 reductions from power generation. Goal of SO_2 Program – Reduce SO_2 emissions by 10 million tons from 1980 level – 8.5 million tons from power generation through "cap and trade" mechanisms.

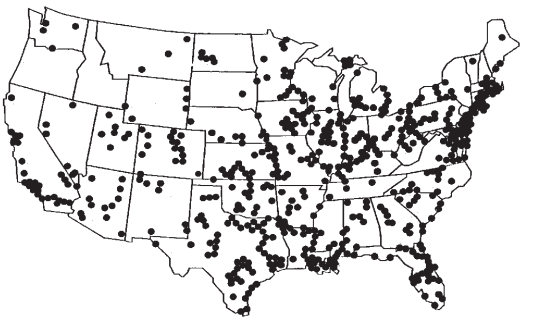

Figure 2. Scope of SO_2 program - over 2,500 sources affected.

It would also allow unprecedented flexibility for sources to apply. Unlike command and control regulation, it would not specify how or when a particular facility needed to control.

Sources could change their compliance plans or trade allowances without government approval, but the trading would not be allowed to override local standards, to protect local air quality.

So, let's look at the results quickly. Emissions declined sharply in 1995, to the surprise, I think, of everyone, including the industry and us. It was unusual, in that the reductions occurred on time. It was unusual in the significance of emissions, and they have declined since. As we move into phase II of the program, we hope that they continue to decline (Figure 3).

Most important to those of us here today is that wet sulfate deposition also declined, significantly throughout the east. All the modeling, all

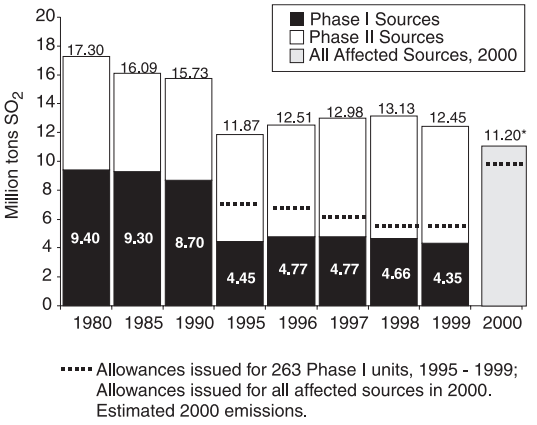

Figure 3. SO_2 emission from Title IV sources.

the source receptor work that was done proved to be correct.

We did understand the relationships and, when we reduced emissions, we did see the effects in terms of reduced deposition throughout the east (Figure 4).

This is just under the first phase of the program. There were also expected to be benefits to human health (Figure 5). Over the past decade, we have improved our ability to quantify and monetise health benefits. We see that, when the program is fully implemented over the next several years, we expect to see benefits in the range of $50 billion per year from health benefits, simply from the reductions of sulfates.

One of the biggest surprises of the program was the change in cost (Figure 6). Back in 1990,

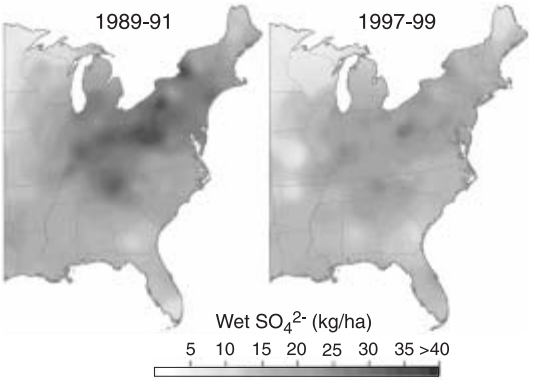

Figure 4. Reduction in wet sulfate deposition due to Acid Rain Program. Source: CASTNET and NADP/NTN 03/09/01.

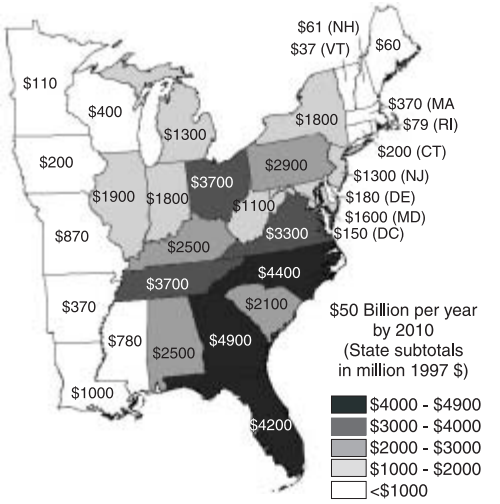

Figure 5. $50 billion in health benefits from Title IV SO_2 reductions.

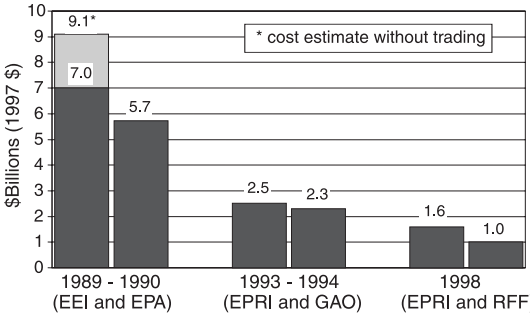

Figure 6. SO_2 cap and trade program: expected annual costs by 2010.

when the bill was being debated – and these numbers, by the way, for those of you who remember the numbers of the debate, have been updated to current dollars, so they are a little higher, so we can make comparisons across costs – the debate was EPA's numbers which, updated to today's dollars, would be about $5.7 billion per year, compared to industry estimates which ranged from $7 billion to $9 billion, $9 billion if the trading did not work. It was considered to be a very experimental program, and therefore there was a lot of concern about whether the benefits from the trading would actually accrue.

A few years after the program began, it was reevaluated, both by EPRI and by GAO. Cost estimates dropped sharply. We now had real world experience as to what people were actually doing to

respond to this program, and the costs were coming down. Low sulfur costs, railroad costs, scrubbing costs, various things were dropping.

A couple of years ago it was reevaluated again, both by EPRI and RFF and the costs were, again, lowered somewhat, down to the $1 billion to $1.5 billion range.

Of course, when the costs dropped, everyone asked why. How could we have been wrong in our estimates, because we know that economists are never wrong.

The fact is that there are a lot of factors combined that we hadn't considered totally when we did the analysis. I would say that the analysis done in 1990 was honest and credible with the best that we understood, but there were some things that we didn't understand.

We found that the competition across all different source options or options for control were pushing prices down more than we thought they would.

The market builds in an incentive for continuous improvement, not just meeting the standard over time, as new techniques become available, taking advantage of those new techniques. The banking provisions allowed companies to make reductions earlier, but to save those reductions. In other words, there was no disincentive to over-control. The market gives you some indication over time of what the costs actually are, so that companies have a benchmark against which to judge their compliance options. Instead of sort of guessing at what the control costs might be, they actually have an alternative to compare against, and I think they made better choices about what to do. Lastly, the way the program operates, the government is not involved in the actual trading decisions. Therefore, they could flow freely and, as costs came down, people could take advantage of lower costs. The market has improved over time. The volume of trading activity has improved and it has no negative effects on the benefits except it simply keeps the costs down (Figure 7).

We have done over 15,000 trading transactions, over 20 million allowances have been moved among accounts. This has not created any environ-

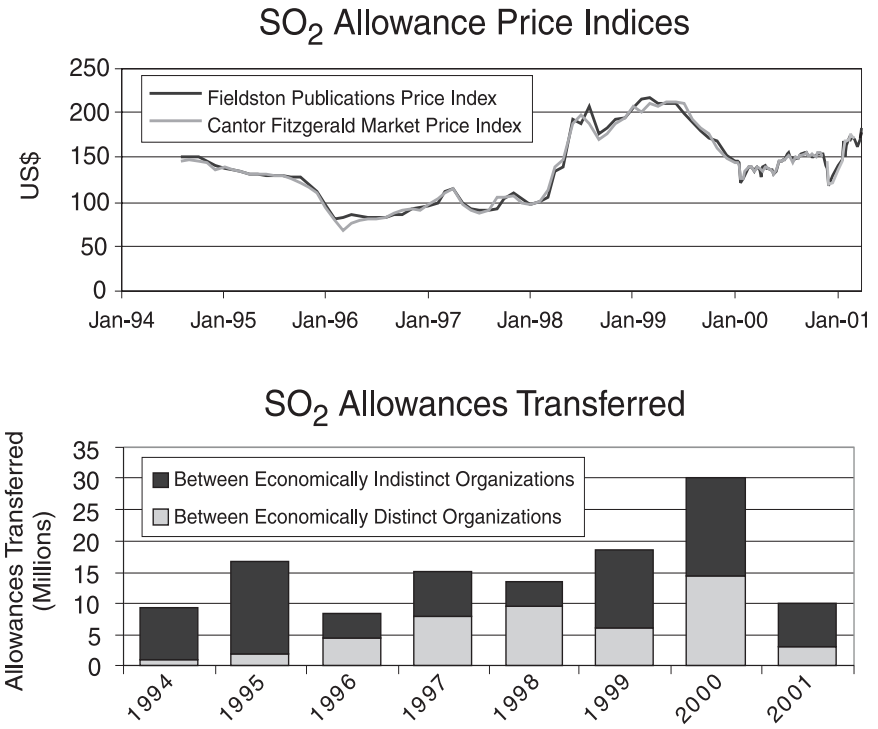

Figure 7. SO_2 allowance market. Source: Clean Air Markets Division.

mental problem, but it has significantly allowed people to reduce costs. As we look back on this policy experiment, we can summarize some of the benefits of this program. We think it has provided more certainty that a certain level of emission reductions will actually be achieved. In the face of economic growth, economic slow down, whatever the case may be, we are going to achieve those environmental benefits.

There is more regulatory certainty for sources because we have laid out a program over a number of years, and they can do their planning with respect to those targets. The compliance flexibility and the lower transaction costs have definitely helped, and there are fewer administrative resources in terms of running this kind of a program, which is also a benefit. Finally, this kind of a program allows companies to do what they naturally do, which is to try to reduce the costs. As they reduce the costs, we find that we are able to define our environmental problems and achieve benefits at a lower economic cost. Therefore, it makes it possible to look at problems and improve them at a lower cost.

I think the keys to the success of this kind of a program are probably three general areas. One is the cap itself, both environmentally, which many people look at with certainty, but also, it provides a very stable market for the trading to occur, a very predictable situation. Secondly, the accountability of the program, this was much greater than previous programs, and it needed to be. Because of the flexibility, we also needed to have greater accountability. So, we do measure all the emissions and we do show everyone all the emissions, and there is a greater degree of transparency to the program. Lastly, the simplicity of the program, which we continue to work on to keep and improve, allows for the lower transaction costs, and the lower overall cost of the programs. I think that is an important feature.

In concluding, I want to turn back to the science for a second. Since the research funds, since 1990, have all but dried up, dedicated scientists around the country, both in government and in universities and in research centers, have continued to enhance our understanding of acid rain science. While we have been running this policy experiment over the past 10 years, we have also been running a real-world scientific experiment, reducing emissions and measuring and studying the impact on our environment. However much of the essential data used for this research is provided by a network that is deteriorating, both in measuring deposition and effects. As a result of this continuing experimentation and research, we have greatly improved our understanding of the role of nitrogen, for example, and you will hear more about that, I think, over the next couple of days, both in terms of its chronic effects and its episodic effects.

We have also recognized the role of nitrogen and eutrophication of coastal waters, as well as the role of nitrogen oxides in the formation of ozone, fine particles and regional haze. Second, we have continued to improve our understanding of the role of fine particles on human health and improve our ability, as I said earlier, to monetize those benefits. Sulfates are the single largest component of this problem, and nitrates can be a significant component in parts of the west.

In conclusion, looking back over the last 20 years, I have seen the acid rain story unfold along two lines. Along one, we have proven the usefulness of a new regulatory instrument. Along the other, we have substantially improved our scientific knowledge with regard to the effects of SO_2 and NO_X. The story is not over. As I look ahead, I realize that scientific investigation is never complete. Uncertainties are never totally resolved. Policy is never perfect. I look at what we know today that we didn't know 10 years ago when we last acted on this issue. I look at the progress we have made in both the science and in our ability to manage multi-state air pollution problems. We have shown that benefits of additional reductions of SO_2 and NO_X would far exceed additional costs.

So, armed with better science and improved policy tools, I don't see why we can't move forward to solve our regional air pollution problems. Thank you.

QUESTIONS

MR. MC LEAN: We, as well as many other people, have looked at all the information as to where the trades have occurred, where the emission

reductions have occurred which, of course, is the important factor. Some of those allowances are traded four or five times. It isn't really important how many times they trade. It is important where the emissions actually occur as a result of these trades. GAO has looked at this. We have looked at it. What we found is that the difference between how emissions would have occurred had we not had trading versus how emissions have occurred with the trading has shown virtually no difference.

The reason for that is there are inexpensive reductions in every state. There are inexpensive reductions at every company. When the trading actually occurs, most of it occurs within companies. Most of it occurs within states. There is limited – in a proportional sense – trading across states or between companies in different states. When trading occurs, it tends to balance. In other words, there are trades that go east to west and there are trades that go west to east.

So, we did some analysis. We have put it up on our web page that shows where the centroid of the sellers are, where the centroid of the buyers are, and they are within miles of each other, when you look at the whole country.

MS. BAUM: I just wanted to press you on one of your points. The evidence that there has been no environmental problem based on trading, brings up questions of where you have got trading going on largely – [remainder of question off microphone.]

MR. MC LEAN: In other words, the net effect of all that trading back and forth has been to leave emission reductions approximately where they were originally targeted. As Dr. Bernabo said, some of this is coincidental. Some of it is because the cheapest reductions occur in the areas with the highest emissions, and those areas have made the greatest emission reductions. In fact, when we look at some of this, for example, New York State may have actually benefited from the emission reductions, in that some of the reductions occurred a little bit more in the east than we have expected. The result is that those more immediate reductions have had slightly positive benefit. That is, if there is any effect at all, it is pretty small. I would not put too much weight on that, because they can fluctuate a few percent either way. We just haven't seen any significant geographic shift in emissions as a result of emissions trading.

MR. FRANKEL: Richard Frankel, General Accounting Office. Simple thinking or dynamic thinking suggests that there will come a point where it will get more expensive to make the next reduction. Are you starting to see that yet, or do you have a sense of where that will go? A lot of people have been overwhelmed with excitement over the fact that the cost of reductions was declining, at least basically in the market price over some of the early years.

MR. MC LEAN: My bottom line is, I would probably defer some of this to Dr. McManus, who is going to speak later from a company perspective. He probably has a better handle on what the future costs look like.

People have been projecting that the costs will increase in phase II. If we look at the trend over the last six years, I think there has been a slight increase, if you look from 1995 to today. Prices have risen from the mid-$150s to closer to $200. So, if you get rid of all the oscillations in price, I think there has been a slight rise in price. Some people expect that that will continue, maybe getting to the $250 or even $300 range.

Again, those are model predictions and I don't know exactly what will happen. Some of that depends on the economy itself. If the economy moves very strongly and we increase production of electricity, it is going to put more pressure on prices and you will probably see higher prices. If the economy slows, you are going to see less pressure and you will see less pressure on prices. That will probably be a more significant factor in the price, going forward.

AUDIENCE: A member of the NAPAP oversight review board reminded those on the board, when the first proposals were made for the cap and trade program, that the average decrease in cost, from the estimates provided before an environmental program is initiated and the final costs, vary between five and eight times. That is to say, the cost usually turns out to be one-fifth or one-eighth what it was, and your data confirms that statement. I wonder if you could comment on how far the deregulation of the railroads contributed to the decreasing costs, since the transport of

western coals to the east became less expensive as the result of other regulatory policies.

MR. MC LEAN: I do think that was a significant factor. Railroad deregulation had been enacted, I think, in 1980. During the 10 years of the 1980s the prices had dropped maybe 10 percent. After 1990 they dropped, I think, another 40 percent. It was a combination of that flexibility in railroad deregulation and the demand that was being placed on western coal that combined with increased competition in western railroads and, therefore lower rates. That was definitely a factor, which then affected scrubber costs, which had to compete with lower sulfur coal prices. So, they were interactive.

MR. WOOLEY: David Wooley, Clean Air Task Force. One of your bullets talked about allowing competition from all emission control options, essentially. I just wonder if you could comment on whether or not energy efficiency or renewables really had a full opportunity to compete in the market for emission control values, and if you would recommend any changes to allow greater participation from efficiency surfaces, wind and solar sources.

MR. MC LEAN: I would sort of split that into two questions, the energy efficiency demand side and the renewables, which is really an alternative supply side option.

The energy efficiency side is much harder to measure or detect and it is much more indirect here, and I think it is much more affected by the price of electricity than anything else, particularly in moving toward a more competitive electricity market. We don't know, other than general measures, that efficiency has been improving in the United States over the last 20 years at some rate, for a combination of reasons.

On the supply side, I think what happened here is that we did have an energy conservation renewable set aside, which did give a bonus to energy conservation and renewables. It was not taken advantage of to a great degree, and the primary reason was that the cost differential between renewables and conventional power was simply too great. In any new technology coming on, the costs tend to be higher. In those areas that you want to promote a particular technology, there are a number of tools for encouraging that new technology, from tax incentives to outright subsidies, to make that technology more competitive, to allow it to deploy and then the prices to come down to be more competitive.

I think in the renewable area, we have to look at that in sort of the natural energy context, as well as environmental context. If we want to promote those technologies in those areas, we have a number of tools that we could use. In addition, for this kind of a program, they provide no additional cost. In other words, they don't need allowances. Therefore, it is a slight competitive advantage, depending on the cost of those allowances.

As one controls more pollutants and puts a price on more pollutants from other alternatives, renewables become relatively more attractive. From the way you design the program to other incentives, there are any number of ways to promote those technologies that we believe should be promoted and deployed greater in the future, and make them a little more economically competitive in the future.