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US EXPERIENCE WITH EMISSIONS TRADING

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Although the EU's CO₂ Emissions Trading Scheme is now by far the world's largest, the US has the distinction of having provided the seed-bed for public policy experiments with emissions trading. Various forms of trading were introduced into the Clean Air Act in the 1970s; but a widely recognized success, the lead-in-gasoline phase-down program, did not occur until the mid-1980s. Soon thereafter proposals were put forward both for a national cap-and-trade program to control acid rain precursor emissions and for a similar program (RECLAIM) in the Los Angeles air basin to deal with persistent local pollution. The Northeastern NO_x Budget Program followed in the late 1990s, as well as several other local programs, among them the Chicago VOC (volatile organic compounds) program. Finally, mercury trading and a significant tightening of both the existing SO₂ and NO_x caps under the Clean Air Interstate Rule (CAIR) are in the offing. Most of the programs implemented to date have been considered successful, but not all.

Elements of what would now be called credit trading were very tentatively introduced into the overwhelmingly command-and-control structure of the Clean Air Act beginning in the mid-1970s in the form of netting, offsets, bubbles and banking. These cautious experiments aimed at providing flexibility in compliance with Clean Air Act requirements, but the application of each was carefully circumscribed and each trade was subject to regulatory approval. While cost savings were achieved, the use of the added flexibility was not widespread, and almost always internal to one firm (Hahn 1989). The main problem was the transaction costs involved in demonstrating what would now be called "addition-

ality," or, in the lingo of the day, demonstrating that the credits being created were not "anyway tons."

The lead phase-down program marked a step forward in not requiring additionality, perhaps because its objective was the complete elimination of lead in gasoline. It was an averaging, or baseline-and-credit, program in which credits were granted to firms doing better than the rapidly declining lead content standard (from 1.0 to 0.1 grams per leaded gallon in three years) and usable by firms not yet meeting the standard. In effect, it provided flexibility over time for the lumpy investments that were required to remove lead from gasoline. Firms that invested early were rewarded by earning credits that could be sold to those who invested later. Unlike credit trading within the Clean Air Act, the lead phase-down program was widely considered a success and provided the "break-through" in permit trading that made the next policy experiments possible (Newell and Rogers 2004).

The US SO₂ Trading Program also known as the Acid Rain Program benefited from the success of the lead phase-down program, but also from a decade of political stalemate over proposed, predominantly command-and-control legislation to reduce acid rain precursor emissions. For the new Republican president in 1989, a market-based approach to an environmental problem was just right. This next step removed the last pretense that it was the regulator who decided the level of emissions at the level of the firm. This was done by creating allowances, barely disguised property rights, distributing them to emitters in amounts less than pre-existing emissions, and allowing them to be traded without limitation (except for a ban on borrowing from future vintages). Within the limits imposed by the pre-existing prescriptive rules on SO₂ emissions, firms were free to choose their level of emissions and their method of abatement subject only to the requirement to surrender an allowance for every ton emitted. Effectively, a scarcity was imposed by the cap, while the ability to trade created the potential for a market that would provide a price that could be used by firms in deciding what abatement would be worth undertaking. The hope was that



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marginal abatement costs would be equalized and costs minimized.

Few doubted that the program would be effective in achieving the intended 50 percent reduction in SO₂ emissions. However, during the debate on the legislation in 1989–90 and in the years prior to implementation in 1995, there was considerable doubt that a market would emerge. The program applied only to electric utilities, which were viewed as conservative, price-regulated entities lacking an effective incentive to maximize profits. It was thought that they would readily trade internally among power plants they owned, but not externally with other electric utilities. Cost savings would occur within firms, but the larger savings available from inter-utility trading would not be realized. While most early compliance plans conformed to this expectation, market intermediaries quickly appeared and started to arbitrage the inter-company differences in marginal cost. The market developed with sufficient rapidity to cause a well-defined single price to appear before the program started in 1995. And, the volume of trading within a year or two made it clear that there was plenty of inter-utility trading (Ellerman et al. 2000).

To the surprise of many and despite a barely constraining initial cap, the sub-set of emissions included in an initial transitional phase dropped by almost 50 percent in the first year of the program. This unprecedented emission reduction solidly established the reputation of emissions trading as a means of reducing emissions quickly, as had been first demonstrated with the lead phase-down program. The reduction was the more impressive in that it was entirely voluntary in response to the possibility of banking early reductions to reduce the cost of the later more stringent cap. As such, it provided clear evidence that economic incentives worked (Ellerman 2004). Thereafter, the SO₂ program became the “poster child” of emissions trading and fully earned the epithets of “grand policy experiment” and “living legend” that have been bestowed upon it (Stavins 1998; Burtraw and Palmer 2004).

At approximately the same time as the US SO₂ Trading Program was being developed, air quality authorities in the Los Angeles air basin decided to adopt a cap-and-trade approach to replace a detailed but infeasible command-and-control plan to further reduce local SO₂ and NO_x emissions to address persistent local air quality problems. The result was the

two separate programs known as RECLAIM that came into effect in 1994 (Harrison 2004). These two programs are noteworthy for several reasons. They applied to sources across several industries. They introduced a form of spatial differentiation into trading. And they provided the first of many instances in which air quality regulators, who possess ample legal authority to implement a command-and-control program, would choose to refocus efforts on designing a market-based system that would provide appropriate incentives for the desired abatement, and thereby overcome the informational asymmetries and political resistance that were increasingly rendering prescriptive regulation less effective.

The NO_x part of the RECLAIM program encountered significant difficulties in 2000–01 that led to its partial suspension. In brief, the price of permits soared from less than \$5,000/ton to more than \$90,000/ton in the space of a few months; some sources were unable to acquire permits at any price; a \$15,000/ton fine for non-compliance was implemented retroactively; and electric utility sources were separated from other sources and subjected to prescriptive regulation mandating the installation of NO_x removal equipment before being reintegrated into the program several years later. The causes of this break-down are essentially two: the absence of banking or borrowing and the highly unusual confluence of events surrounding the California electricity crisis in 2000–01. The latter placed extraordinary demand upon a set of old, generating units without NO_x controls that had previously been used for only a few hours a year to meet peak demand. The inability to bank or borrow made it impossible to meet the extraordinary demand for permits within the one-year compliance period in a program that was also small in its geographic scope. The effect of this temporal constraint was clearly signaled by forward prices that were significantly lower than current compliance period prices and which reflected the ability to retrofit NO_x control equipment with sufficient time and the expected passing of the unusual events of 2000–01. The unavoidable result was the break-down of the trading program and the temporary return to more conventional prescriptive measures.

The Northeastern NO_x Budget Program lagged the national SO₂ and the RECLAIM programs slightly in its development and implementation; however, when it started in 1999, it provided yet more evidence of the turn towards the use of cap-and-trade mechanisms to deal with air quality issues. As was

the case with RECLAIM, the air quality regulators possessed the legal authority under the Clean Air Act to mandate appropriate measures, but they turned instead to a market-based approach as more effective and efficient. The distinctive feature of the Northeastern NO_x Budget Program is that it was an interstate agreement to establish a common emissions market to deal with a problem that was the responsibility of each state but which was in large part caused by out-of-state sources (Aulisi et al. 2005). The federal Environmental Protection Agency (EPA) assigned NO_x “budgets” to each state and operated the registries, but enforcement and the allocation of allowances to sources within the state were the responsibility of each state. The program is also important in introducing an element of time differentiation; the cap applies only during the months from May through September when the meteorological conditions conducive to ozone formation are present in the Northeast.

The Northeastern NO_x Budget Program provided the foundation for what was to be the most radical and telling (if unheralded) change in air quality regulation in the United States, the NO_x SIP Call. The acronym SIP stands for State Implementation Plan, which is the detailed source-specific set of regulations that prescribes air emission limits on all sources within the state in order to attain or to maintain the National Ambient Air Quality Standard (NAAQS) for specified pollutants. As such, it is the heart of the command-and-control approach of air quality regulation that had become the norm with the Clean Air Act Amendments of 1970. In response to a tightening of the NAAQS for ozone in the late 1990s, the EPA offered the affected states the option of either submitting a conventional prescriptive SIP to EPA for approval or accepting an EPA-determined state budget and adopting the “Model Rule” that would allow trading among all sources in the multi-state region. Every state chose the latter option and thus was born in 2003–04 what is now called simply the NO_x Budget Program, which extends well beyond the Northeast to include all sources east of the Great Plains. In offering this choice and in accepting it, both the federal EPA and the state air quality regulators recognized and acknowledged the limits of the traditional prescriptive form of regulation.

The Chicago VOC program was a local application of cap-and-trade, like RECLAIM, and like the NO_x programs, it aimed at ozone attainment, but it targeted a different set of ozone precursor emissions:

volatile organic compounds. As such, it was another first, but it is also notable in being judged largely a failure, at least in its initial form. Firms complied with the program, which went into effect in 2000, but there were some remarkable anomalies that indicated something was amiss, such as a positive price and expiring, unused banked allowances. The problem was a set of prescriptive hazardous air pollutant (HAP) regulations that had gone into effect at the same time concerning the same set of emissions. The interaction of the two instruments meant that some installations were constrained by the HAP regulations and others by the VOC trading program. The latter bought allowances, but the former did not always sell their excess allowance holdings and tended simply to ignore the market possibilities. The authors of the definitive study of this program describe it as market-based “window dressing” for a dense set of traditional regulatory measures that did the real work (Kosobud et al. 2006). Using two instruments to achieve the same goal provided some flexibility to a few participants but succeeded mainly in adding cost.

Although debate now focuses on cap-and-trade proposals to limit greenhouse gas emissions, it would be a mistake to omit the further extensions of emissions trading that will take effect in 2009–10 as a result of the Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR). Both have followed the regulatory route pioneered by the NO_x SIP Call whereby federal approval of the state’s implementation plan can be obtained by accepting the EPA-determined state budget and the trading rules set out in the respective Model Rules (Napolitano et al. 2007). In the case of CAIR, the SO₂ and NO_x caps in the existing SO₂ Trading and NO_x Budget Programs are being effectively reduced by about two-thirds over a five year period in order to address persistent ozone non-attainment and the new fine particulate standards. In the case of the mercury rule, a new emissions trading program is being set up to limit power plant emissions of a quasi-global pollutant that has been previously unregulated. These measures were implemented by administrative rule by the Bush Administration and they have gone virtually unnoticed by all but the parties involved.

The lack of controversy over the CAIR and CAMR contrasts markedly with the debate concerning greenhouse gas (GHG) emissions trading proposals now under consideration in Congress. After what would seem like an almost triumphal march of near universal acceptance of cap-and-trade systems for

dealing with challenging air quality problems, the whole concept is now being called into question with serious and well-meaning suggestions that alternative regulatory approaches may be more appropriate for GHG emissions. The contrasting reception of CAIR and the climate proposals is the more striking in that, when emissions trading emerged as a viable and practicable regulatory instrument in the 1990s, it was seen as applicable mostly to new problems that were not covered by the existing air quality regulation under the Clean Air Act. In fact, since then, it has proven harder to extend emissions trading to new problems, such as climate, than it has been to apply emissions trading to air quality problems falling squarely within the ambit of the Clean Air Act, perhaps because the legal authority and conventional prescriptive alternatives existed as an always present alternative.

If the time has not already arrived, the implementation of CAIR will soon create a situation where the extensive apparatus of prescriptive regulation of SO₂ and NO_x emissions from stationary sources will be redundant. Emissions from any given source will be determined by the cost of the respective allowances instead of the increasingly archaic prescriptive regulations that tell firms to do what they would do anyway as a result of the high price on emissions.

Whether the trend to increasing reliance on market incentives instead of prescriptive regulation will hold for greenhouse gases is the issue now being joined. As of this writing there is no cap-and-trade system for CO₂ or GHG's in existence in the US, although the Regional Greenhouse Gas Initiative is scheduled to start operating in 2009 if by then a sufficient number of Northeastern states adopt the proposed regulations, as they say they will. California's legislature and governor have empowered a regulatory agency to issue regulations to take effect in 2012 that would return the state's GHG emissions to 1990 levels by 2020, but it is almost certain that emissions trading will play only a partial role, probably restricted to electric utilities and perhaps some industrial facilities. Meanwhile, the more important and real debate is being engaged at the federal level, where several serious proposals to cap GHG emissions starting in 2012 are under consideration in the Congress. There are, however, significant differences concerning major design features among proposals and their supporters that will require a number of years to reconcile. The debate will be difficult and protracted, and the outcome is uncertain. It seems unlikely, but it would be the supreme irony if the calls for an alternative "simpler" approach are heeded, ignoring

the lessons from America's extensive experience with emissions trading and leaving Europe alone as the champion of a global GHG trading system.

References

The preceding essay draws principally from the following sources without attempting to summarize or present their complete findings. Readers interested in learning more about the US experience with emissions trading are advised to consult the following works.

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Evaluative research has not yet been possible for CAIR and CAMG; however the following article provides a good summary for those interested in learning more about these future programs.

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