Regulatory Assistance Project
Issuesletter
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Carbon Caps and the Power Industry: Recent State Activity and the Design Issues for Regulators

AFTER YEARS OF INACTION AT THE FEDERAL LEVEL, *programs to decrease power sector greenhouse gas (GHG) emissions are being designed at the state and regional levels. Work is underway to create carbon cap-and-trade programs in at least eight Northeastern states through the Regional Greenhouse Gas Initiative (RGGI), and in four Western states (CA, OR, WA, and NM — now separately, but with an eye to future coordination). These are important efforts, both because the economies and carbon profiles involved are quite large and because these state actions will create models for the US as a whole.*

This Issuesletter focuses on how cap-and-trade systems for carbon need to be different from those currently used under the Clean Air Act for other air emissions. It also discusses how a cap and trade program that is designed to accelerate investments in energy efficiency will permit more rapid carbon reduction at much lower cost to consumers and economies.

Governors, legislators, and environmental advocates have focused on the power sector as a good place to start the United States moving on climate action. Compared with other industrial and transportation GHG sources, the utility sector is not only a very large contributor of GHG, but it is also the most straightforward sector to manage. The power sector is the largest single source of industrial pollution, accounting for **39% of US emissions of CO_2.**[1] Emissions from the US power sector[2] exceed the total national GHG emissions of every other nation except China. Moreover, the US electrical power sector is already subject to economic regulation; it is not particularly vulnerable to international competition; and it consists of a reasonably small number of known sources. It is not a surprise that major cap and trade efforts on both coasts have begun first with the power sector.

However, significantly reducing carbon emissions from the power sector will not be easy. About **71%** of the nation's electric power **now comes from fossil sources, and slightly less**

1 Calculated by RAP from data in: US EPA. 2006. "Greenhouse Gas Emissions and Sinks: 1990-2004." Trends in Greenhouse Gas Emissions, P. 2-25, Table 2-16. See http://www.epa.gov/climatechange/emissions/usinventoryreport.html

2 Electric power production in the US emitted over 2.375 billion metric tons of CO_2 in 2005. Source: EIA Emissions of Greenhouse Gases in the United States, 2005. See http://www.eia.doe.gov/oiaf/1605/ggrpt/carbon.html.

than half comes from coal generation. Demand for electricity continues to grow at a brisk pace and even aggressively developed renewable sources can cover only a part of the new demand. Nuclear power remains both expensive and controversial, and therefore, unlikely to provide significant new capacity to regional grids any time soon. During the past ten years, natural gas combined cycle plants, which emit less carbon than typical coal plants, provided the large majority of new capacity additions yet GHG emissions from power generation have risen 28% since 1990, and the carbon intensity of generation has actually increased.[3] Today we find ourselves with significantly higher natural gas prices that are driving renewed interest in coal for new generation. Somewhere in the neighborhood of 90 GW of new coal generation capacity is currently in the planning, licensing or construction stages within the United States.

State and Regional Cap and Trade Initiatives

THE KEY INITIATIVES are being developed on the East and West coasts. The flagship effort in the East is the Regional Greenhouse Gas Initiative (RGGI), a multi-state effort launched by Governor Pataki of New York in 2003. After more than two years of intense work, in December 2005, the Governors of seven of the RGGI states adopted a Memorandum of Understanding, in which each state pledges to adopt laws and rules needed to implement a regional cap-and-trade program for power generators in their states.[4]

In the West, the Governors of California, Oregon, Washington, and New Mexico have agreed to coordinate their work on climate change. In focusing on the power sector, California and Oregon are clearly in the lead. Governor Schwarzenegger has made this a high priority, creating a multi-agency group which is now looking at power sector carbon management. In addition, the California PUC has shown remarkable policy leadership in this area through a formal investigation of cap and trade options and a rulemaking examining the integration of greenhouse gas emissions standards into procurement policies. Oregon has also launched a serious effort. Following a report from the Governor's Advisory Group on Global Warming, Governor Kulongoski adopted a goal for Oregon to stabilize statewide emissions by 2010, reduce them 10% by 2020, and to reduce them to levels 75% below 1990 levels by 2050.

California and Oregon are now each developing an innovative "load-side cap and trade" approach which focuses upon those who purchase electricity rather than those who generate it, to create carbon budgets, building upon previous experience with utility portfolio manage-

3 Trexler and Associates, Climate Insights, January 2006, citing U.S. DOE 2004 annual report on U.S. greenhouse gas (GHG) emissions (downloadable at http://ftp.eia.doe.gov/pub/oiaf/1605/cdrom/pdf/ggrpt/057304.pdf).

4 The RGGI Memorandum of Understanding was signed by the Governors of Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont. The Governors of Massachusetts and Rhode Island, which participated actively in developing the RGGI proposal and MOU, decided at the end of the process not to sign the MOU, but the MOU is written with them in mind. Many observers expect these states to rejoin the effort before the cap-and-trade plan would go into effect in 2009. Maryland enacted legislation in early 2006 that would make it the 10th RGGI state.

ment and renewable portfolio standards. Like RGGI, these efforts focus on the power system, but unlike RGGI, the West coast efforts would count and cap the carbon associated with serving load, wherever the power comes from, and are not limited to managing smokestacks within an individual state.

Even in global terms, these state efforts are decidedly non-trivial initiatives. Taken together, the east coast states of NY, MD, DE, NJ, MA, CT, RI, ME, VT, NH would comprise the world's 4th largest economy; their greenhouse emissions exceed those of Germany. California's emissions are about the same as Australia's and exceed those of Brazil. These state and regional efforts are seen by many in the international community working on climate change as important steps towards a more comprehensive national carbon program in the United States.

Cap and Trade Basics — Why Carbon is Different

A KEY LESSON emerging from the East and West Coast Carbon Cap Initiatives is that the cap-and-trade architecture used for the US Acid Rain program, and copied in other systems such as the European carbon trading system, is not optimal for carbon management in today's competitive electricity industry. By focusing on smokestacks, and by awarding carbon allowances to emitters on the basis of their historic pollution, ordinary cap and trade programs provide a financial windfall to generators far in excess of their cost of program compliance.

There is broad agreement among air experts that the US Acid Rain program, NOx trading, and similar programs have been successful, lowering emissions substantially at a lower cost than historic command and control systems. However, this does not mean that we should extend this model to carbon cap and trade systems. There are several crucial differences between conventional pollutants and carbon, including:

(a) Carbon reduction programs will involve larger dollar amounts and economic transfer payments over time, so flaws in architecture matter more.

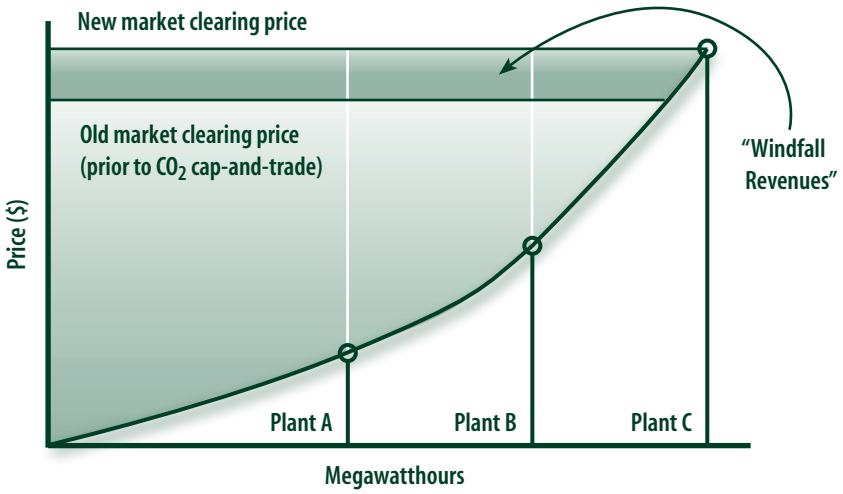
(b) Control options for carbon and for conventional pollutants are quite different. SOx and NOx reductions can usually be accomplished by generators at power stations through changes in fuel inputs or by plant modifications, such as scrubbers. In contrast, as it is often said, "there is no carbon scrubber" that can be added to a conventional power plant to reduce GHG emissions.[5] Real reductions in carbon intensity will come from actions taken by buyers — for example, substituting gas or renewables in the resource mix of a load-serving entity (LSE), or adding more efficiency and reducing consumption generally. These are actions that consumers — not fossil generators will need to take and will have to pay for.

(c) Finally, and perhaps easiest to see, energy markets are profoundly different today. When the Acid Rain program was designed, most generators were part of vertically-integrated, rate-regulated companies. If they did not have to buy allowances, then consumers did not have to pay for them, since the generators were

5 Burning low-sulfur coal or scrubbing emissions does not materially alter the carbon content of the emission stream. IGCC technology may provide a means for removing carbon from the combustion cycle, offering the opportunity for sequestration, but the economic feasibility of sequestration remains unknown.

regulated on a cost of service basis. Or, if the utility could sell allowances, the revenue would be credited to consumers in the cost of service. That is not what we have today. The generation sector today is dominated by independent power producers not subject to rate regulation, and selling their output in wholesale power markets where increased clearing prices for one generator can provide revenue gains to all other generators being dispatched at the same time. In general, when the Acid Rain program was invented, generator profits were not linked directly to operation of the program. Most generators would recover their program compliance costs and no more, in rates. In contrast, badly-designed cap-and-trade programs today can create significant windfall gains for most generators while charging consumers much more than the actual cost that power providers incur to deliver a cleaner resource mix. This is often called the problem of "generator windfall gains."

Figure 1:
Theoretical Representation of "Windfall Revenues"
A fossil unit on the margin increases the market clearing price (i.e., the price paid to all generating units dispatched to reflect the cost of CO_2 compliance)



How Traditional Cap and Trade Creates Windfall Gains for Generators

IT IS TEMPTING to assume that if carbon credits are allocated by the government to power generators for free, that generators will, in turn, not seek to recover their value when they sell their output in power markets. However this is not how markets work. Carbon credits are not "use it or lose it" permits — they are freely tradable, "use it or sell it" credits. In economic terms, carbon credits have an opportunity cost, which means that generators will require the market to pay for them when they are used. When a fossil generator has to "burn" credits as well as burning fuel in order to generate power, the plant will seek the market value of both the credits and the fuel before committing to run the plant. Regardless of the original price of the credits, generators will want customers to pay enough to make running the plant at least as profitable as not running the plant and selling the fuel and the credits to someone else. Any fossil plant's bid price will logically rise. In this way, the use of carbon credits adds costs to consumers, even if the government awarded the credits to the generator for free.

Today's regional wholesale markets, including all three ISOs serving the RGGI region, operate what are known as "single price auctions." In these regional wholesale markets, the market bid price posted by the last unit dispatched is paid to ALL operating generators in the bid stack in that time period. Thus, if

the marginal price is raised by a fossil unit with higher carbon costs, every other generator in the bid stack will receive a higher price for its output. These prices show up first in day-ahead and spot market prices, but over time, these higher prices will be reflected in bilateral power costs as well. It's easy to see that for low-carbon resources (e.g., nuclear, wind, hydro), this is nothing but good news, since they have higher revenues and no compliance costs. Essentially, the effect of the single market clearing price is to magnify the cost of carbon compliance by adding it to all generating resources, whether they emit carbon or not.

Whenever an emitting generator is on the margin in the wholesale market (which is almost all the time in the RGGI region) the clearing price of power will rise. Since all three Northeast markets (PJM, ISO-New England and New York ISO) use a single price auction system, all generators in the region, polluters and non-polluters alike, will see higher revenues for their power output. For generators as a whole, if carbon allowances are awarded for free, the increased market revenue can far exceed the actual costs incurred to comply with the carbon program.

Cap and Trade Programs Which Stimulate Energy Efficiency Will Achieve Carbon Reduction Goals at Least Cost

WE KNOW that the reservoir of unused efficiency opportunities is large. Repeated well-documented studies demonstrate that there is sufficient cost-effective efficiency to meet 50% to 100% or more of all new electricity demand.[6] Not only is efficiency the least cost resource for meeting electrical demand, it is also the least costly means to reduce carbon emissions from the power sector. Cost-effective efficiency provides "avoided tons" of carbon at negative cost — by any measure less expensive than displacing fossil fuels with low-emission generation.

One of the principal aims of all cap and trade programs is to lower the overall societal cost of environmental improvement. It will cost far less to avoid carbon emissions through energy efficiency which lowers demand than through rules that simply rearrange the dispatch of generators delivering power to the grid.

Conclusion

SEVERAL LARGE STATES have taken significant steps to limit carbon emissions in the electric utility sector. As stakeholders have begun to understand the economics of this carbon reduction, it has become apparent that the cap and trade systems developed for other air emissions do not offer the best model for cost effective carbon reduction. Simply stated, a carbon program that directly mobilizes end-use efficiency will cost less and achieve more than one that focuses only on generators. To achieve this mobilization, the carbon cap and trading credits need to be assigned to load (demand side) rather than to generators (supply side).

6 See, e.g., Interlaboratory Working Group, Scenarios of US Carbon Reductions:Potential Impacts of Energy Technologies by 2010 and Beyond (September 1997) at pages 3.11 and 4.9. ("The 5 Labs Study") http://enduse.lbl.gov/Projects/5Lab.html; http://www.swenergy.org/nml/New_Mother_Lode.pdf; http://www.neep.org/files/Updated_Achievable_Potential_2005.pdf

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