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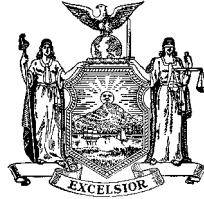
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April 29, 2008

TO: NARUC Climate Change Task Force

FROM: Cheryl Buley, NYS Public Service Commissioner

SUBJECT: Carbon Emissions Pricing Programs

Earlier this year, Mark Reeder, Acting Director of the New York Commission's Office of Regulatory Economics, prepared a draft paper for the Climate Change Task Force on Carbon Emissions Pricing Programs that I circulated for comment. Commissioner Centollela responded. In his comments, Commissioner Centollela amplified several of Mark's observations. However, there were a few instances where he offered a different perspective. Therefore, rather than attempt to incorporate Commissioner Centollela's comments into the Reeder paper, I have chosen to provide both the paper and Commissioner Centollela's comments are footnoted.

Please circulate this to the Climate Change Task Force and Energy Resources and the Environment as soon as possible. Thank you.

Carbon Emissions Pricing Programs

Comparison of Load-based Cap and Trade Program vs. Source-based Program vs. Carbon Tax

NARUC Climate Change Task Force
January 24, 2008
by: Mark Reeder

Summary

Congress is currently considering instituting a nation-wide carbon cap-and-trade program. Historically, the point of regulation for pollution cap-and-trade programs has been at the generator smokestack (e.g., SO₂ and NO_x). The generation owner is the entity that must obtain emissions allowances. These are called “**source-based**” cap-and-trade programs. An alternative approach that has been put forward by some analysts for a carbon cap-and-trade program is to shift the point of regulation from the generators to the Load Serving Entities (LSEs). The LSEs would be the ones to document all of their purchases, calculate the carbon emissions associated with those purchases, and be the entities legally responsible for obtaining emissions allowances. This is called a “**load-based**” program.

A NARUC Task Force is examining carbon cap-and-trade programs. This document represents a “first cut” on comparing the pros and cons of the following three alternatives:

- 1) **Source-based** cap-and-trade program;
- 2) **Load-based** cap-and-trade program;
- 3) Carbon tax.

At the back of this document is a table that compares the three options across a number of dimensions. While it is important to identify areas in which the impacts of the alternatives are different, it is equally important to identify areas in which the impacts

are not different, since some analysts have argued that certain differences exist that drive the choice of one mechanism over another.

The table is not self-explanatory. Therefore, in the section of this document that follows, each of the entries in the comparison table is explained.

Finally, note that the purpose of this document is to give the Task-Force a starting point from which discussions about these issues can take off. It is assumed that any final comparison table will differ from this starting point as a result of those discussions: table entries may change, new dimensions may be added, and the whole table may end up being reorganized. In other words, this is not a finished product, and the reader should not treat it as such.

Explanations of Table Entries

Table Entries 1-2. In an electricity market, all generators receive the market-clearing price based on the bid of the marginal generator, which for purposes of this discussion, is assumed to be a gas-fired generator. Under a **source-based** emission allowance program, the bid of the gas-fired generator will equal the combined fuel and O&M part of its running costs plus the cost of emissions allowances, which is, in essence, an additional component of its running costs. As such, the institution of a **source-based** program will cause market-clearing prices to rise by an amount equal to the cost of allowances for a gas-fired generator. This market-clearing price will be received by all generators, including perfectly clean generators such as nuclear and hydro plants. These clean generators are among the big winners under the program.

While it is not obvious, the same will occur under a **load-based** emissions program. Consider the position of the purchasing load serving entity (LSE): if it buys from a gas plant, the amount it will pay to the gas plant is the gas plant's marginal bid

(which will reflect the combined fuel and O&M costs, but not an emissions allowance cost). In addition, the LSE will have to pay separately for emissions allowances associated with its purchase of the gas-fired generation.¹ So, the total cost to the LSE is, just as in a **source-based** program, the sum of the two components (the combined fuel and O&M, as well as the cost of the emissions allowances). When the LSE looks around at possible purchases from other generators, such as clean nuclear plants, for example, it will be willing to pay a clean generator up to the costs it incurs for the two components of the gas-fired purchase. Looking at it another way, if you were the owner of the nuclear plant, you would approach the LSE and say, “I know that your all-in costs when buying from a gas plant is \$50 for the gas-fired generation plus \$10 for the allowance, which totals \$60. My completely clean plant will supply you power at \$59.90 per megawatt hour, and you should say ‘yes’ since by buying from me, you incur no cost associated with allowances”. Therefore, even in a **load-based** program, the clean generators receive a gain in price (from \$50 to \$60 in the above example) caused by the program. That price gain equals the cost of the emission allowance that would become a required component of any purchases from the marginal gas generator.

A high-emitting coal-fired generator, under the above scenario, whose allowance costs might equal \$20 per megawatt hour, will be unable to get the same price from the LSE as does a gas-fired generator. If the gas-fired generator costs the LSE \$60, \$50 of which is received by the generator and \$10 of which is the LSE’s payment to buy allowances, then a high-emitting coal-fired generator could get only \$40 from the LSE, since the LSE must pay \$20 for allowances. In this example, one can

¹ In the event that the LSE is allocated emissions allowances for free, the LSE still sees a cost of each allowance that equals the market price of allowances, since the LSE can always sell its unused allowances. This is the “opportunity cost” concept.

see that the effect of the program is to lower the price the high-emitting generator receives from \$50 to \$40.

Table Entries 3-4. Under a **source-based** program, the wholesale market price rises by the cost of the carbon content of the marginal generation. This is the price received by all generation in the market. It is also the price paid by the LSEs.

Under a *load-based* program, no single market price exists, at least as seen by the generators. Marginal gas generators receive a price that exactly equals their running cost. Clean generators receive a price that exceeds the marginal gas unit's running cost. Coal units receive a price that lies below the marginal gas unit's running cost. Accordingly, the price received by each generator varies according to the carbon content of the generation produced by the generator. This pattern is analogous to the current pricing pattern for lower sulphur versus high sulphur oil.

From the perspective of the purchasing LSE under a **load-based** program, the all-in price it pays for wholesale power, i.e., the cost of generation plus the cost of the associated carbon allowances goes up. The size of the price increase equals the cost of the carbon allowances needed by the LSE to accompany the power it purchases from the marginal gas generator. From the perspective of the purchasing LSE, the total cost (including allowance cost) of buying from every generator equilibrates at one market price. In this case, the economic principle of one market price occurs – it just does so as seen by the buying side of the market, not the selling side of the market.²

² **COMMENT:** *Therefore in retail access jurisdictions, the retail price for power should equal the marginal cost of generation, plus the cost of allowances associated with the marginal generator, plus any LSE costs (credit, risk management, etc.). And, if one assumes away impacts on unit commitment, dispatch, and transmission utilization – see comment below, the retail price for power in restructured jurisdictions would be the same for a load side and source based cap.*

From the perspective of the buying LSE, the marginal cost of purchased power rises by the same amount whether a **load-based** or a **source-based** emissions allowance program is instituted. The total cost of purchasing power similarly rises by the same amount for both allowance programs if, in both allowance programs, the allowances are auctioned off by the government (to the generators in a **source-based** program, to the LSEs in a **load-based** program).³ In such a case, the rise in retail electric prices would also be the same for the two kinds of allowance programs.

If the allowances in a **load-based** program were given away for free to the LSEs, and the LSEs flowed this benefit through to electric ratepayers, then the amount of the retail price rise would be lessened.⁴ It would be a lower retail price rise than would occur in a **source-based** program whose allowances were auctioned off to generators and whose auction revenues were not passed through to electric ratepayers. The key point is that the effect on retail consumer prices depends critically on the allocation of the allowances and on the disposition of the auction revenues. It does not appear to depend on the point of regulation: LSEs versus generators.

³ **COMMENT:** *This assumes that including emissions costs in unit commitment and dispatch so that you dispatch on total costs, as would occur in a source based cap or emissions tax, has no impact on costs. This is a highly unlikely assumption. All else being equal, competitive retail prices under a load side cap without the benefit of full cost regional unit commitment and dispatch would likely be higher than under a source cap.*

The primary function of the day-ahead and real time markets is to permit discovery of generating unit marginal costs, so as to facilitate efficient regional dispatch. This has had large benefits. In a load-based cap, the marginal costs associated with marginal unit emission rates would not be transparent and would not necessarily be factored into the development of an economically efficient unit dispatch. Thus, market prices could be higher under a load-based program.

⁴ **COMMENT:** *In retail access jurisdictions, competitive LSEs would not flow the value of free allowances through to ratepayers. Competitive LSEs would build the cost of allowances, either as a cost or an opportunity cost, into the retail price of power. The mechanism and impact should be precisely the same as the impact on wholesale prices of giving free allowances to competitive generators.*

The only way the value of free allowances could be flowed through to ratepayers would be if allowances were provided entities under cost of service regulation, i.e. distribution companies in retail access states (assuming the distribution companies are not subject to long-term price cap or revenue cap regulation).

Table Entry 6. In discussions of **source-based** programs, it is well understood that high-emitting generators such as existing coal plants will suffer the greatest economic loss unless the program allocates allowances directly to the generators. Such an allocation has been correctly described as a gift of wealth to the generator. (Such a gift can be defended as a way of offsetting, at least partially, the economic burden of the new program borne by such generators.) Under a **load-based** program, because high-emitting generators suffer an economic loss just as great as they do in a **source-based** program, one can expect that the generators will plead their case for moderating measures. Were the high-emitting generators to be allocated allowances in a **load-based** program, the exact same economic moderating effect will occur as in a **source-based** program. Such generators could package their allowances with their power when selling to LSEs.⁵

Table Entry 7. The “yes” in this entry assumes as a base case, that all allowances are auctioned off in the first instance and that the auction revenues flow back to electric consumers. With this as the base case, an alternative case in which generators get some allowances for free reduces the size of the auction receipts, causing a higher retail price than occurs in the base case.

Table Entry 8. Some have assumed that an advantage of a **load-based** program is that it is less likely, from a political perspective, to contain allocations of free allowances to generators.⁶ As item 6 above describes, such an allocation is an effective moderator for high-emitting generators, even under a **load-based** program,

⁵ **COMMENT:** *It is useful to think about free allowances as simply a different denomination of currency, like Euros or Yen, which can be converted into \$ at a floating market price.*

⁶ **COMMENT:** *There is no logical connection between the point of control (source or load based) and the allocation of allowances. Based on my experience in the allowance allocation debates for the 1990 Clean Air Act, I think it is unlikely that selection of the point of control will have a significant impact the allocation of carbon allowances.*

and one can expect generator interests to request it. Whether the framing of the issue differently in a **load-based** program lowers the probability that generators will succeed politically on this point is uncertain.

Table Entry 9. The **load-based** program yields an electricity product that is no longer homogeneous from the buyer's perspective. Low carbon generation will sell at a premium to high-carbon generation, just as is the case with low versus high sulphur oil. This poses a challenge to the hourly markets run by the Independent System Operators (ISOs). A likely outcome is that the clean and low carbon generators will exit the ISO's spot markets so they can obtain their deserved premium price via bilateral contracts with buyers. This could create a large shift in the way electric wholesale markets work, away from ISO hourly, auction-based spot markets, toward bilateral markets. There would be multiple bilateral markets, segmented by carbon content.

Table Entries 10-11. To the extent the shift from ISO hourly spot markets to bilateral markets under a **load-based** program causes the hourly dispatch of the electric system to become less efficient, carbon savings associated with efficient re-dispatch may be lessened, in comparison to a **source-based** program and its benign effect of the efficiency of hourly dispatch operations.⁷

Table Entry 12. All three kinds of carbon programs enhance the profitability of clean generation, and do so for the long-run. So long as the effect they each have on the price/profit of clean generation is the same, the effect on long-run investment is the same.

Table Entries 13-14. If allowances are to be allocated to generators, it is important to recognize the value in having it done in a way that preserves a proper economic

⁷ **COMMENT:** *The question might be asked, if organized markets can no longer play their primary function of efficient regional dispatch, will they remain viable? There is a political risk is that a load side cap could weaken the case for organized markets.*

incentive for generator retirement decisions. The key to presenting the proper retirement incentive is to make the allocation of allowances completely independent of any future action the generator takes. In stark terms, if the generator gets allocated ten years' worth of allowances, and then announces its retirement the very next day, it should be able to keep the allowances it has been allocated, and to keep any money it gets from selling them.

If retention of the allowances is tied to the continued operation of the generators, then the economics of the retirement decision gets distorted in a way that reduces the likelihood of retirement. Since the retirement of the highest-emitting generators earlier rather than later is an important component of carbon reduction, getting the retirement signals right is important. Of course, fairness concerns may win out, leading to a decision to cancel any allocations that a generator is in line for as soon as the generator does retire, even though such a rule distorts the retirement decision. This issue is not different between **source-based** and **load-based** programs unless they differ in terms of their allocation of allowances to generators. To the extent **load-based** programs are less likely to involve allocations of allowances to generators, they may perform better in terms of producing economic retirement incentives for generators.⁸

Table Entry 15. If all of the programs have similar effects on retail prices, then they should have similar effects on the decisions by consumers about energy efficiency.

Table Entry 16. Load Serving Entities' tend to place a very large weight on the result of benefit-cost studies when making decisions about their energy efficiency decisions. Since **load-based** and **source-based** emissions allowance programs yield

⁸ See comment footnote 6 above.

similar increases in marginal power cost to the LSE, the two types of programs should have similar effects on the decisions of LSEs about energy-efficiency initiatives.

Table Entry 17. Data on emissions in a **source-based** allowance program is straight-forward. **Load-based** program data may be less so, since the power purchase portfolios of LSEs can change rapidly. Also, LSEs themselves, in an era of retail choice, can change in a more fluid and harder to track way. These differences are probably not important, and probably won't make the allowance market perform less effectively under a **load-based** program, but they deserve further study.

Table Entry 18. Analysts have expressed a possible concern that a strategy of buying allowances to drive up allowance prices, and therefore electric prices, might prove attractive to large owners of clean generation. The feasibility of such a strategy appears to be the same, at least in terms of logistics, for either **source-based** or **load-based** programs.

Table Entries 19-22. [Task Force to fill in]

Carbon Emissions Pricing Programs

Comparison of Load-based Cap and Trade Program vs. Source-based Program vs. Carbon Tax⁹

	<u>Source Based</u>	<u>Load Based</u>	<u>Carbon Tax</u>
<i>Short-term Effect on Generators, Consumers, and Prices</i>			
1. Existing clean generators realize a substantial gain	Yes	Yes	Yes
2. High-emitting generators suffer a loss (if no allowances are allocated to them for free)	Yes	Yes	Yes
3. Wholesale market price rises, even for high emitting generators	Yes	No	Yes
4. Retail price rises by the cost of the carbon content of the marginal generation	Yes	Yes ¹⁰	Yes
5. Auctioning of allowances or payment of carbon tax produces revenue source for government/consumers	Yes	Yes	Yes

⁹ Note: this chart assumes a market-based wholesale environment. Some entries may not be correct when applied to a fully regulated, vertically integrated electric utility environment. It also assumes, unless explicitly stated otherwise, that all emissions allowances are auctioned off by the government to the generators in the case of a **source-based** program, and to the load serving entities, in the case of a **load-based** program.

¹⁰ COMMENT: *or more*

		<u>Source Based</u>	<u>Load Based</u>	<u>Carbon Tax</u>
6.	Economic loss incurred by high emitting generation can be moderated by allocating them some allowances for free	Yes	Yes	N/A
7.	Allocation of free allowances to some generation <i>or to competitive LSEs in retail access states</i> fails to reduce higher retail prices	Yes	Yes	N/A
8.	Probability that the program will contain some free allocations to generators is high	?	?	N/A

Effect on Short-Term Market Operations

9.	Causes a large shift toward increased use of bilateral contracts	No	Yes	No
10.	Allows ISO spot markets and dispatch operations to continue to operate efficiently	Yes	No?	Yes
11.	Fully yields carbon reductions by altering the dispatch order of the generators	Yes	No?	Yes

Effect on Long-Run Generation Investment and Retirement Decisions

12.	Alters investment decisions for new generation yielding an increase in clean generation	Yes	Yes	Yes
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		<u>Source Based</u>	<u>Load Based</u>	<u>Carbon Tax</u>
13.	Free allocation to generators, if done certain ways, can weaken incentive for high emitting generators to retire	Yes	Yes	N/A
14.	Free allocation, if done in a way that is not tied to future generator operation, can preserve proper incentive for high-emitting generators to retire	Yes	Yes	N/A

Effect on Energy Efficiency

15.	Increased cost of purchased power causes increased retail prices which induces greater demand for energy efficiency by consumers	Yes	Yes	Yes
16.	Increased cost of purchased power induces greater desire for energy efficiency by load-serving entities, if given incentive tied to cost reductions	Yes	Yes	Yes

Effect on Emissions Allowance Market

17.	Market for allowances is efficient (ignoring market power considerations)	Yes	Maybe	N/A
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		<u>Source Based</u>	<u>Load Based</u>	<u>Carbon Tax</u>
18.	Concern exists that clean generation owners could exert market power to drive up allowance prices, which drive up electric prices that clean power providers receive	Yes	Yes	No

Administrative Ease

19.	Ability to track emissions of each relevant entity is relatively easy	Yes	No	Yes
20.	Tracking system already exists	Yes	No	Yes
21.	Can be easily melded with other international carbon markets, carbon emissions, or with carbon markets for other industries (factories, airlines, etc.)	Yes	Yes	Yes

Leakage

22.	Preventing or reducing the harmful effects of leakage beyond the borders of the U.S. is difficult (leakage is “harmful” to the goal of reducing carbon)	Yes?	No?	Yes
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