The Brattle Group

Waxman-Markey Math: What are the numbers and what might they mean?

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EXECUTIVE SUMMARY

A marked-up version of the American Clean Energy and Security Act of 2009 initially released in April 2009 and revised in mid-May (a/k/a the Waxman-Markey draft bill) passed out of the House Committee on Energy and Commerce on May 21, 2009.

The revised draft bill is 932 pages and covers a broad range of big-picture energy issues, including energy efficiency, renewable energy, and a federal cap-and-trade program to reduce greenhouse gas emissions.

In this short comment, we focus on the cap-and-trade part of the Waxman-Markey bill. In particular, we consider the numbers in the current draft to see what they are, as a starting point for thinking more deeply later about what they might mean for capital, carbon, energy, and related markets.

We consider the minimum carbon prices in the Waxman-Markey bill, and we use them to estimate the minimum value of freely-allocated allowances in the aggregate and to individual industry sectors. We give particular attention to the electric power sector, estimating the minimum value of its free allocations and the minimum cost of purchasing the additional allowances it will need to cover its likely emissions.

The ultimate impacts of a Waxman-Markey style cap-and-trade program depend on many factors beyond the numbers in the draft bill, so we do not project them here. However, the numbers indicate one of the most critical factors will be the collective public and political will for the US to see-through such a program once the costs kick in. Without that will, forecasting carbon impacts based on economic and market fundamentals may generate the wrong projections, and the credibility of the entire program may be at risk.

WAXMAN-MARKEY BY THE NUMBERS

With the ink barely dry on the latest draft of the Waxman-Markey "clean energy" bill (H.R. 2454) and the bill barely out of markup, it seems a bit premature to draw very many hard and fast conclusions about the specifics of the bill and what they mean.

But there is no shortage of detailed commentary on the bill from all sides, if you really must have it. Not surprisingly, conservatives complain the bill is too costly relative to its highly uncertain benefits, while deep greens complain it is too watered-down to avoid the likely impacts of climate change.

We too have pointed out a serious flaw in the bill, and we have argued against freely allocating allowances because it makes emissions reductions more costly.

Meanwhile, academics are still debating the relative merits of cap-and-trade, carbon tax, and direct investment in energy efficiency and renewable energy. (That debate should continue. While cap-and-trade seems to be winning the day, we prefer a cap-and-dividend approach.)

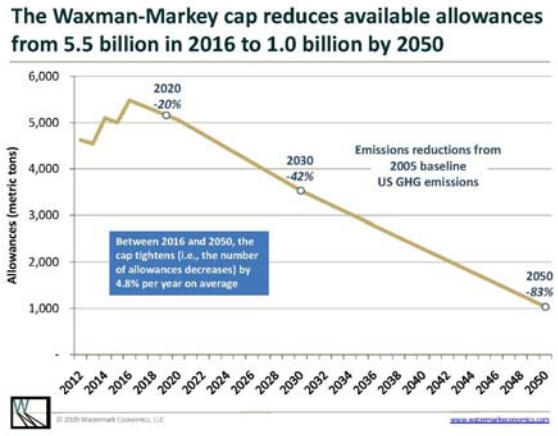
The difficulty in all the debate over cap-and-trade generally, and Waxman-Markey in particular, is that there are some valid points on all sides and the entire debate is forward-looking. The debate is inherently normative. It also may be moot for now, since the prospects of any cap-and-trade bill becoming law this year remain uncertain at best.

So rather than adding another voice to the debate over the *ideas* in the Waxman-Markey bill, we've focused, for now, on some of the simple *numbers* in the bill to see what they are and to start thinking about what they might really mean in practice. Here we focus only on the numbers in Title VII of the bill regarding cap-and-trade.

By focusing on cap-and-trade, we don't intend to discount the relative importance of the clean energy and energy efficiency measures the start of the bill (Titles I and II, respectively), such as a renewable electricity standard, a low carbon fuel standard, and energy efficiency standards for buildings, vehicles, and so on. In concept, those measures are long overdue and ultimately necessary for cap-and-trade to actually work.

EMISSIONS CAP

The number one number in the bill is the emissions cap. As the graph below shows, Section 702 on page 366 of the current draft requires the US to decrease its greenhouse gas emissions from a 2005 baseline by 20% by 2020, 42% by 2030 and 83% by 2050. To make this happen, the number of available allowances decreases from a high of 5.5 billion allowances (i.e., metric tons) in 2016 to 1 billion by 2050.



The current Waxman-Markey cap represents a 5% reduction from 1990 US emissions levels by 2020. That seems unimpressive relative to the EU's proposed reductions of '30% over 30 years', and it is reportedly a potential hurdle to negotiating a new global climate treaty by the end of the year in Copenhagen.

Whether the cap is too permissive or too stringent is a matter of debate. But one thing is certain: the numbers reflect a policy preference for delaying the pain.

Section 721 at page 407 of the bill allows for the total number of emissions allowances to *increase* almost 20% until 2016, from 4.6

billion to 5.5 billion. The number of allowances return to the 2012 starting point until 2023. In effect, the bump in the cap helps to create a 10-year transition period (less-formally known as a cushion). That – along with up to 2 billion offset credits per year and approximately 75% of allowances freely allocated rather than auctioned – should help moderate carbon prices.

CARBON PRICES

Despite the initially cushy cap, effectively unlimited offsets (i.e., more offsets allowed than presently exist), and free allowance allocations, carbon prices under the current Waxman-Markey draft may be higher, by design, than some will expect.

Carbon prices are the 64 Thousand Dollar Question (actually, more if you use consultants) to which everyone wants the answer. But forecasting carbon prices very precisely is very difficult to do, and there isn't just one right answer. There are several "right" price paths depending on your view of the "right" values of key price drivers, such as the availability of quality offsets, the future mix of electric power generation, and the viability of carbon capture technology.

But neatly tucked away in Section 791 on page 584 of the current draft is a starkly definitive statement about what carbon prices will be, at the very least, at auction every year from 2012 forward:

> "The minimum reserve auction price shall be $10 for auctions occurring in 2012. The minimum reserve price for auctions occurring in years after 2012 shall be the minimum reserve auction price for the previous year increased by 5 percent plus the rate of inflation (as measured by the Consumer Price Index for all urban consumers)."

That sounds simple enough, but do the prices it will generate make sense? The calculation is simple, so we did the math. The result makes us wonder whether anyone else has bothered to calculate what this bill says will be the *statutory minimum price* of carbon (i.e., the lowest possible carbon price) looking forward in time. The graph below shows the resulting price path in real dollar terms (i.e., assuming no inflation, so the resulting prices are the prices of carbon in future years stated in today's dollars) and with inflation. The path is plain and simple, and it is deterministically upward-sloping at increasing rates into perpetuity thanks to the power of compounding.

Assuming no inflation, the bill sets a *minimum* per-ton (metric) carbon price of $24 by 2030 and $64 by 2050. Presumably demand for the allowances in a given year will exceed supply, so the actual prices will exceed these minimum prices – maybe by a lot. This year, the spot price of carbon in the EU Emissions Trading Scheme has ranged from €8-15, or $10-20.

So a $24+ carbon price by 2030 may or may not seem "too high". $64+ carbon, in today's dollars, is another story. Historically, inflation as measured by the CPI has averaged 3-4% over long periods of time (20 to 40 years). At 3% inflation, the *minimum* carbon prices in the Waxman-Markey draft will be $40 by 2030 and $186 by 2050.

But the prospect of carbon prices increasing automatically by *at least* 5% per year *in real terms* seems to be flying under the radar as everyone focuses on which sectors get more

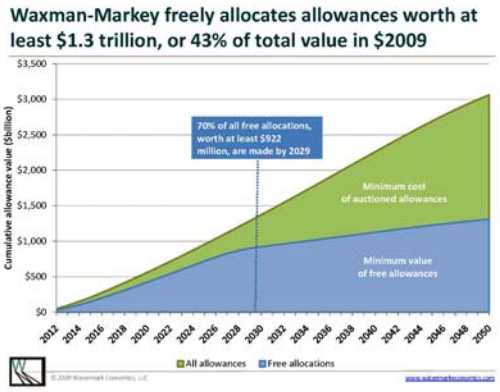
or fewer allowances for free upfront. Over time, this carbon price path will be a far more important consideration, and it should be attracting more attention today. The level of carbon prices mandated in Waxman-Markey have important implications for abatement, investment, and regulatory decisions today. They also have important policy implications.

But when the time comes literally to pay the price for carbon, we wonder seriously whether there will be the political will to commit to even the *minimum* price path established by this bill. We suspect prices significantly above the stated reserve prices will be politically difficult or impossible to impose in practice. That prospect questions the reliability of carbon and related commodities price forecasts based on market fundamentals, and it threatens to undermine the credibility of the entire US cap-and-trade program.

FREE ALLOCATIONS

Section 782 at page 527 of the current Waxman-Markey draft includes a long list of free allowance allocations to specific sectors and initiatives. We are already on record with what we think about that approach in concept. Now, we have some actual numbers to ponder and reserve prices at which to value the distribution of free allocations.

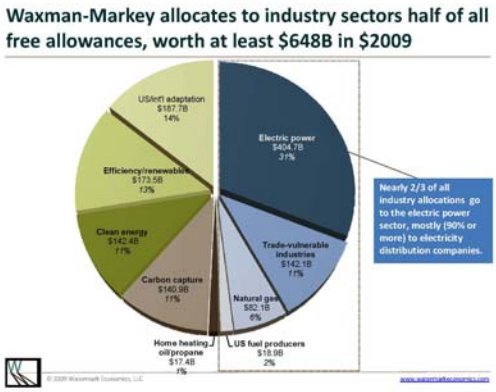
The graph below shows the relative breakdown and minimum values of allocated and auctioned allowances through 2050.



At the start of the program (2012-2025), approximately 75% of all allowances are freely-allocated; 25% are auctioned. In just five years, that proportion exactly flips: by 2030, 76% of allowances are auctioned because many of the free allocations end in 2029. In total, 70% of all free allocations are made by 2029. Beyond 2009, there is an ever-increasing gap between the minimum value of free allocations and the minimum cost of auctioned allowances.

We used the auction reserve prices to determine the minimum value of the allocated allowances. At those prices, the bill initially allocates allowances worth *at least* $30 billion in 2012. That figure grows to $901 billion by 2029, or more than double the $386 billion to be realized in auction revenue at reserve prices up to that point. By 2050, the bill freely allocates 33% of all allowances, worth at least $1.3 trillion, or 43% of the value of all available allowances in real (2009) dollars.

The distribution of the free allocations to different sectors and purposes under the Waxman-Markey bill is interesting, but not so surprising. This graph summarizes the ultimate allocations by sector. The underlying table shows the allocations over time as well.



Valued at auction reserve prices, bill allocates half of all free allowances, worth at least $648 billon ($2009) to four different industry sectors:

Nearly two-thirds of all industry allocations, and 31% of overall allocations, go to the electric power sector. This sector receives $20+ billion in free allocations in 2012, and $405+ billion in allocations through 2029. Most of those allowances (90% or more) go to electricity distribution companies, so the value presumably will be passed-through to ratepayers; the rest (10% or less) go to merchant coal companies to be passed-through to customers or dividended to shareholders.

Most of the other allocations to industry sectors go to either trade-sensitive industries or regulated natural gas local distribution companies. Trade-sensitive industries are allocated 11% of all allowances under the bill, worth at least $142 billion over time. Natural gas LDCs are allocated nearly half that amount: 6% of all allowances, worth $82+ billion in total.

The final sector to receive allowance allocations is US fuel production (e.g., oil refiners). But this sector receives relatively few allocations: less than 2% of the total, worth $19+ billion. As a result, the oil industry calls Waxman-Markey "unacceptable as drafted", advocating for a larger share of allocated allowances since oil refiners account for a third of total emissions and will have to make up the gap by purchasing permits at auction or in the secondary market.

Then again, most of those emissions are not direct, but instead are from uncapped sources downstream, such as people filling-up their cars and heating or cooling their homes. So the oil refiners will just pass-through their carbon cost, creating the very price signal on which rests the effectiveness of the program.

The other half of allowances are allocated mostly to targeted research and development activities, with the exception of 1% allocated "for the benefit of home heating oil and propane consumers". The rest are distributed relatively evenly over four activities:

- 14% of all allocations, worth $188+ billion, for US and international adaptation;
- 13% of all allocations, worth $174+ billion, for energy efficiency and renewable energy sources;
- 11% of all allocations, worth $142+ billion, to develop clean energy sources;
- and 11% of all allocations, worth $141+ billion, to develop carbon capture technologies.

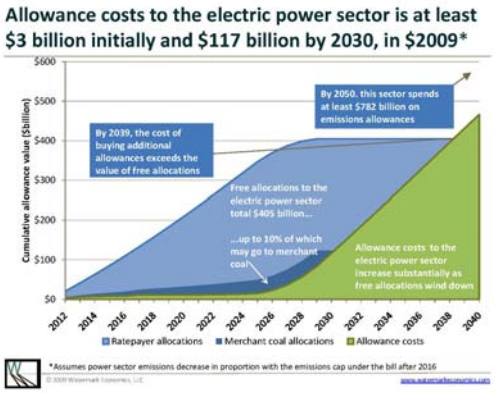
POWER SECTOR COSTS

Right now, carbon is a traded commodity Europe under the EU ETS, in the northeast US under the Regional Greenhouse Gas Initiative, and in the voluntary market for carbon offset credits. If (or more likely *when*) a federal cap-and-trade program caps and monetizes carbon in the US, the price of carbon will have direct and significant effects on the price of other commodities, particularly in the electric power sector which is the largest single source of emissions, accounting for 41 percent of total US emissions according to the latest EIA data.

Putting a price on these emissions will make fossil-fired generation (especially coal) increasingly more expensive relative to less carbon-intensive renewable energy sources. Given the relative importance of the power sector in a cap-and-trade context and to the overall economy, we looked specifically at the free allocations to this sector, and its likely allowance costs, under the Waxman-Markey bill. The graph below summarizes the value of the allowances the electric power sector receives under the bill and its remaining direct allowance costs.

As we noted previously, the electric power sector receives 31% of all freely-allocated allowances in the current draft bill. The graph shows the value of those free allowances in real terms ($2009) increasing each year until 2029 as the number of free allocations decreases and auction reserve

price increases. By 2029, those allocations are worth at least $405 billion.



But that amount is not a windfall to electric power companies. At least 90% of the freely-allocated allowances go to electricity distribution companies, which will pass-through the value to ratepayers. The remaining 10% of free allocations go to merchant coal companies and could be passed-through to customers or to shareholders (or both), depending on the competitiveness of the power market.

Even with free allocations, the electric power sector will have to purchase some allowances every year. How many allowances it will have to buy depends on its future emissions levels. For simplicity, we assume emissions decrease in proportion to the bill's decreasing emissions cap from 2016 onward. As the graph shows, the corresponding allowance cost in real terms starts relatively low but increases sharply as free-allocations to the sector quickly wind-down between 2025 and 2029.

Initially, purchasing enough allowances to supplement its free allocations will cost the electric power sector at least $3 billion. While not a small sum, this cost is just 15% of the value of the sector's free allocations in 2012. The sector will have spent $117 billion to buy allowances by 2030, or nearly a third of the value of its freely-allocated allowances up to that point.

By 2039, the cost of buying additional allowances ($431 billion) will meet and exceed the value of the sector's free allocations ($405 billion).

Thereafter, the sector's allowance cost continues to increase, but at a decreasing rate as its (assumed) emissions reductions in the out-years outpace the 5% annual increase in auction reserve prices.

So even with the lion's share of free allowances, the cost to the electric power sector of purchasing emissions allowances under the Waxman-Markey bill will be substantial. Most of this cost will be passed-through to ratepayers and retail customers, making electric power from high-emitting sources of generation substantially more expensive in the US.

Of course, that's entirely the point. The effectiveness of any cap-and-trade program relies on its ability to help generate efficient price signals to incentivize substitution, innovation, and investment toward energy efficiency, clean energy, and renewable energy sources.

How much more expensive carbon costs will make electric power in the US depends on several factors, most notably whether the government returns the bulk of the revenue from allowance auctions and whether the other parts of a bill like Waxman-Markey really result in significant energy efficiency and renewable energy gains. If so, the EPA says a majority of Americans may realize an overall reduction in their combined energy and tax bills. If not, the increasing cost of carbon and its economic implications may lead to a tough test of the collective public and political will for the US to pay the price of confronting climate change.

That's an answer we can't find in the numbers themselves.

ABOUT *BRATTLE*

The Brattle Group provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governments around the world. We combine in-depth industry experience and rigorous analyses to answer complex economic and financial questions in litigation and regulation, develop strategies for changing markets, and make critical business decisions.

We have offices in Cambridge, Massachusetts; San Francisco, California; and Washington, DC. We also have offices in Brussels, London, and Madrid.

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