Capping and Trading

GETTING A HANDLE ON CARBON

BY TONY WHITE

EDITOR'S NOTE *The United States is expected to soon enact a cap-and-trade system to limit carbon dioxide emissions.* EnergyBiz *asked Tony White to describe how carbon trading has worked in Europe, and lessons the United States can learn. White has advised the European Union and United Kingdom on carbon trading policies and is considered one of the world's leading authorities on the subject.*

WITH THE THREE REMAINING presidential candidates all agreeing on the need to curb emissions of greenhouse gases, the debate in the United States is now turning to the type of measures that need to be introduced. In recent months, cap-and-trade schemes seem to have gained the ascendancy over a carbon tax as the mechanism best suited to encourage the necessary change in the economy. This may be due to the attraction of linking with schemes that are in operation in Europe and that are being contemplated in other countries. But the argument may not yet be over. In any case, European experience has revealed that not all cap-and-trade schemes are the same. The precise details of each scheme's implementation can have significant influence on the results, in terms of prices that customers have to pay and actual abatement achieved.

Installations operating under cap-and-trade schemes are required to surrender certificates (rights to emit one metric ton of CO_2, or "allowances") equivalent to their emissions over a certain period. With the benefit of hindsight, the price at which these allowances have traded within Europe may be explained in terms of three factors:

FUNDAMENTALS determined by the number of allowances issued for the period, in effect "the cap," and the level of emissions that would have occurred without the scheme (i.e., business as usual [BAU]). This should be linked to the marginal cost of abatement.

THE DESIGN or administrative features of the scheme such as the duration of the abatement period, how the allowances are distributed and whether allowances may be purchased from external markets, such as those generated by the Clean Development Mechanism of the Kyoto Protocol.

THE BEHAVIOR or the actions by various traders cannot always be explained by purely financial considerations. The corporate structure, internal incentive schemes and other factors can influence price.

There are clearly a number of features of these schemes that must be considered when establishing cap-and-trade schemes. It is illuminating to examine the impact of each on the European scheme.

FUNDAMENTALS

The European Union Emissions Trading Scheme (EUETS) started with a trial period, from January 2005 to December 2007. Given the limited duration of this trial and the fact that, in the absence of any track record on prices, it was unlikely that anyone would undertake investments to reduce emissions, the obvious way to reduce emissions was to see if there were changes to operating procedures that could do so. In any event, the easiest way to reduce emissions was for the power-generation sector to reduce the output from the cheaper, but more carbon-intensive, coal-fired stations and to increase production from the cleaner gas-fired stations, whose marginal running costs were higher. By analyzing the operating costs of all the power stations across Europe it was possible to build "abatement curves," showing how the emissions from the power sector would reduce as the allowance price increased. In Figure 1, we show such an abatement curve for the traded sector of the EUETS, identifying the business as usual emissions that were forecast in 2005 for the three-year period from 2005 to 2007.

This type of analysis suggests that the price of an allowance should be capable of being read off the abatement curve, as indicated in Figure 1. If the "cap" were 6,500 million tons of carbon dioxide, the price, according to "mid" forecasts of gas and coal prices, would be around 50 euros per metric ton. The actual price will, of course, depend on coal and gas prices, as shown. The outturn is also affected by outturn demand for power, as affected by economic activity, the weather and the production from nonfossil generating stations, such as nuclear. As a rough approximation, we would expect the price of an allowance to be linked to the price at which the operating cost of a coal plant, including the purchase of allowances, would match that of an average gas plant. Sure enough, for the first 15 months of the EUETS, the actual prices of an allowance correlated closely with this "implied switching price," as shown in Figure 2. The curve shows the price for Phase 1 and for Phase 2, which runs from January 2008 to December 2012.

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Although the actual and implied prices moved in concert, their actual levels were different; the scale for the actual prices is just one-third that of the implied price. So it seemed that the prices were one-third the level that fundamental considerations would suggest.

The curves also show that, in April 2006, the prices for both Phases dropped suddenly, although there was no associated movement in fossil prices. The reasons for the discrepancy may be attributed to a second element of price formation, namely scheme design.

SYSTEM DESIGN

There are a number of features of the European system that had a direct impact:

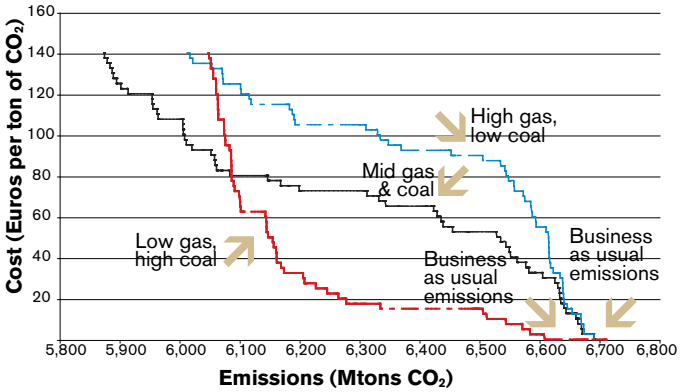
- In the trial Phase 1, the European Commission intended to create sufficient allowances that were about 210 million tons of carbon dioxide below the total BAU emissions of around 6,300 million tons of carbon dioxide. These allowances were distributed free of charge and distributed in equal amounts each year before the date for allowances to be surrendered to cover the previous year's emissions. Therefore, operators had no need to buy allowances, or indeed, to alter behavior to reduce emissions, until the end of 2007, when gas prices, and hence switching costs, were, at the time, expected to be lower.

- The "Linking Directive" was introduced, which allowed the conversion of Certified Emission Reductions (CERs) into European allowances. These verified emissions reductions were achieved by projects approved under the Kyoto Protocol, and could be converted into allowances valid in the EUETS.

- Such discounts were also probably compounded by the uncertainty surrounding actual emissions. Relevant historic emissions data was not available.

- In April 2006, the actual emissions data for 2005 was released and raised the possibility that the overall market was long. As a consequence, the prices of both Phase 1 and Phase 2 allowances collapsed then partially recovered, only for the Phase 1 price to slide gently to zero, which was to be expected for an over-supplied market, since Phase 1 allowances could not be used in Phase 2.

FIGURE 1



The Phase 1 chart shows that under business as usual, with no carbon price, emissions were expected to amount to 6,700 million tons of carbon dioxide, depicted on the right side. As the cost of an emissions credit goes up along the vertical, left scale of the graphic, emissions levels decline. The abatement curve indicates the level of carbon price corresponding to a particular level of emissions abatement within the traded sector. The level of price is very sensitive to the relative price of coal and gas. The higher the price of coal relative to gas, the more the utilities will run their gas stations instead of more carbon intensive coal stations.

The obvious lesson for cap-and-trade system designers is to ensure that accurate emissions data is available before the system is introduced. This was not the case in Europe. Data had been collected but according to different classifications and sized installations, so there was no way that the market could anticipate future emissions. The other remarkable feature was the initial recovery of the prices in May and June 2006. This was partly a consequence of design in that the initial allocations ensured that most of the market was long and that only the power sector was short. This reflected the expectation during the design that the power sector would find it easier to reduce emissions, through fuel switching, than other sectors would. But the designers had not appreciated that the trading behavior of the different sectors would vary.

BEHAVIOR

For many companies covered by the EUETS, the responsibility for emissions trading rested with an environmental officer. Compliance, for them, was key. An environmental officer at one of these companies might be congratulated if he sold some surplus allowances for a profit, but if it was later discovered that

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too many were sold and the company had insufficient allowances to cover its emissions in one year, the management would not take kindly to being fined for noncompliance. The behavior of these companies could be described as compliance driven, rather than profit maximization.

The power sector, on the other hand, was familiar with trading. Trading gas, coal and power was a core function of the business. It was relatively easy to add emissions trading to their responsibilities and the finance functions at these companies ensured that profits were maximized. So the EUETS created a market in which the traders who were "short" were experienced at buying and selling commodities, while those who were "long" were not and so did not sell their surplus allowances until they were absolutely certain that they had sufficient amounts to meet their obligations. For this reason, prices for the Phase 1 allowances took some time to reflect their true economic value, which was, of course, zero.

With the experience gained in Phase 1, the European Commission was able to take a much more robust approach to Phase 2. Figure 3 shows the abatement curve for Phase 2, showing how the European Commission has ensured that a very aggressive cap was introduced. However, in addition to this cap, the Commission, via the Linking Directive, has also allowed a quota of allowances from Kyoto's Flexible Mechanisms to be imported. This could be construed as a type of safety valve, because the import of CERs from the developing world would help contain the cost of reducing emissions.

The European Commission has also made proposals for Phase 3, which runs from 2013 to 2020, and it allows for Phase 2 allowances to be used to meet obligations in Phase 3 (banking). The proposed cap for Phase 3 represents a severe cut in emissions, 21 percent from the 2005 levels, suggesting robust allowance prices. This avoids the possibility of a price collapse in Phase 2, should movements in fossil fuel prices, changes in the weather or in economic activity, cause emissions to tumble and otherwise undermine emissions prices.

LESSONS

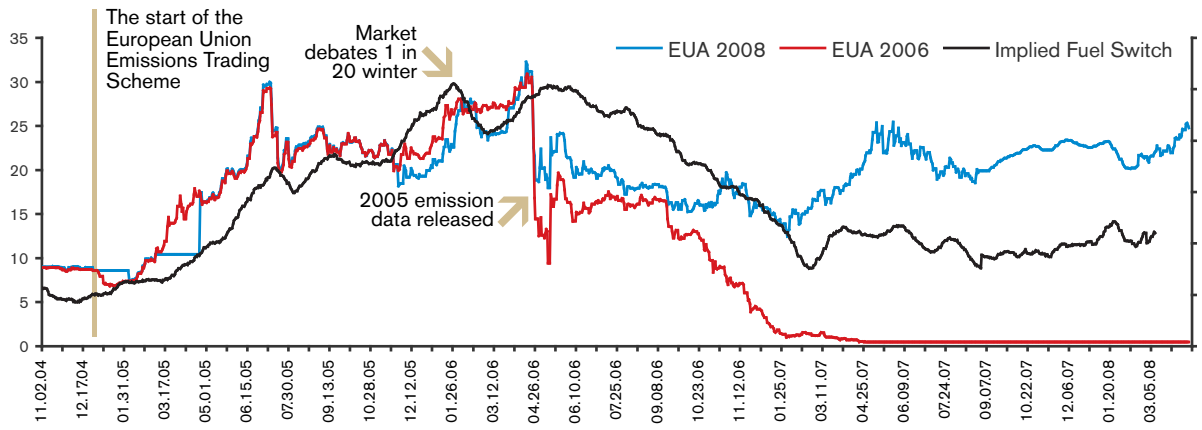
Some critics of the EUETS have suggested that the only outcome, so far, has been:

- No change of operating behavior in Europe, since the price was so low
- No investment in Europe
- Higher power prices in Europe
- Windfall profits for the power sector

At first sight, this is hardly a ringing endorsement. But such a view would be short-sighted for a number of reasons. First, the fact that there has been little change in behavior in Europe is a consequence of the design of the market for Phase 1, especially the over-allocation. That the utilities made windfall profits is proof, if ever it is needed, that economics works! Moreover, Phase 1 was a learning period and Phase 2 and Phase 3 look to be far more robust. Indeed the prices, as shown in Figure 2, are

The European Union emissions allowance (EUA) prices, the vertical, left scale, are shown in red for Phase 1, 2005 to 2007, and blue for Phase II, 2008 to 2012. The black curve shows the EUA price required to make a utility reduce output from an average coal station and increase output from an above average gas station, called fuel switching. The graphic shows that after data on the operations of Phase 1 was released in April 2006, Phase 1 carbon prices crashed as the market realized the phase was over allocated. Phase 2 prices, which were traded alongside Phase 1 prices since late 2004, managed to retain value since the two phases were not linked.

FIGURE 2



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now at or near the switching prices that economics would suggest.

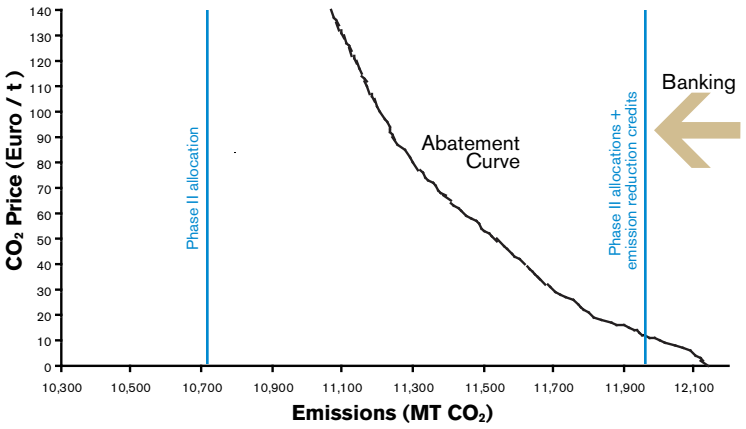
Moreover, the development of the market, with all the associated infrastructure of registries, trading platforms and exchanges, has given governments the confidence to extend the period of Phase 3 to eight years, providing even stronger signals to investors. Also, although there has been limited impact on the European economy, the EUETS has encouraged the development of the Clean Development Mechanism (CDM) market to the benefit of developing countries, as well as the EU itself. Indeed, emissions of 2.7 billion metric tons of CO_2 are expected to be avoided in the developing world, thanks to investments in CDM projects around the world, representing payments of around $4 billion.

In addition, the trial Phase 1 demonstrated the difficulties in distributing allowances free of charge on a fair basis. It is extremely difficult for government to determine future emissions of particular sectors, let alone make fair assumptions on the potential for improved emission performance by different industries. This is why the European Scheme will gradually phase out the distribution of free allowances and move to an auction basis. From 2013, the EU will auction 100 percent of the allowances to the utility sector and gradually introduce auctioning to other sectors, depending on the extent to which their sales compete internationally.

This allocation question has raised heated debates in Europe, but commentators often miss the point that the price of allowances, and what customers finally pay, is determined by just two variables: the number of allowances or the "cap," and the BAU emissions. The method of allocation, on the other hand, determines the distribution of profits between the companies' shareholders and the government. After all, creating the "right to emit" has some value; who enjoys this value is a matter of allocation.

However, this straightforward analysis only holds for competitive markets, where the companies may pass on the cost of emissions to their customers. In regions where the power prices are subject to price control by some government agency, such as a state utilities commission, the regulators could ensure that the benefits of free allocations are passed on to final customers by not allowing prices to rise. This would put some pressure on utilities to reduce their carbon intensity, but the impact on final customers would clearly be muted. The other difficulty is that where there are contiguous regulatory regimes, creating rules that treat the players in different jurisdictions in a fair manner would be complicated. This would be likely to reduce liquidity, which would be to no one's advantage.

FIGURE 3



Absent a carbon price, emissions in the EUETS in Phase 2 are expected to amount to 12.1 billion tons. The level of allocation, the verticle line on the left, for Phase 2 shows that the European Commission set an extremely tight cap, well below the predicted level of emissions. In addition to the cap, the EC allowed regulated installations to obtain emission reduction credits created by Kyoto's flexible mechanisms. In the absence of the ability to import emission reductions in the form of certified emission reduction credits, CERs, from the developing countries, EUA prices would have exceeded €140 or $221.52 per ton. The blue line on the right signifies the Phase 2 allocation plus emission reduction credits. The precise position of this line will depend on the demand for CERs from EUETS installations, national governments and schemes in other jurisdictions. The overall level of credits available in Phase 2 will also depend on "banking" Phase 2 EUAs for use in Phase 3, when prices are expected to be higher. Emissions decline as the price of carbon increases. The price of carbon will be determined by the market – and corresponds to where the blue line on the right crosses the abatement curve.

IS CAP AND TRADE ENOUGH?

A further question raised by the EUETS is whether a cap-and-trade system will be sufficient to bring forward the necessary investment. It should be recognized that immature trading systems are not ideal; financiers will need confidence that, when they invest in equipment specifically designed to reduce emissions, the value of the savings will be able to make an attractive return over a given period. Investors will be reluctant, at first, to make such investments. Another feature of the prices that emerge from cap-and-trade schemes is that they are volatile. We have seen that they will be affected by (volatile) fossil fuel prices; this volatility will be enhanced by the political uncertainty associated with the need for politicians to reset the caps periodically.

Initially, most abatement measures in cap-and-trade schemes will involve changes in operating behavior, such as fuel switching, or measures that provide very fast payback. In order to encourage investments in projects that reduce CO_2 emissions, we will require the market to be confident that there will be suitably high prices for extended periods. This requires institutions that can provide long-term, visible and demanding caps on emissions.

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