Carbon across Europe

Pan-European emissions trading is a step closer after agreement of an EU directive. *Atle Christiansen* and *Kristian Tangen* of Point Carbon look at the consequences

The European Union Council of Environment Ministers agreed on the proposed directive for greenhouse gas emissions trading on December 9, 2002. It thereby set up a cap-and-trade scheme for large industrial emitters from 2005. The scheme will impose binding targets for CO_2 emissions from large point sources, including electricity and heat generators with rated thermal input exceeding 20 megawatts (MW); production and processing plants for ferrous metals; and pulp and paper production facilities.

The decision means the EU has taken a major step towards establishing the world's biggest market for trading greenhouse gas emission allowances, which will offer unprecedented challenges and opportunities for European industry and business.

However, it may still take some time before the European parliament and member states adopt the directive. Pending the second reading in the parliament and possibly conciliation with the council, the first period of emissions trading is slated to start in 2005, three years before the expected start of international emissions trading under the Kyoto Protocol.

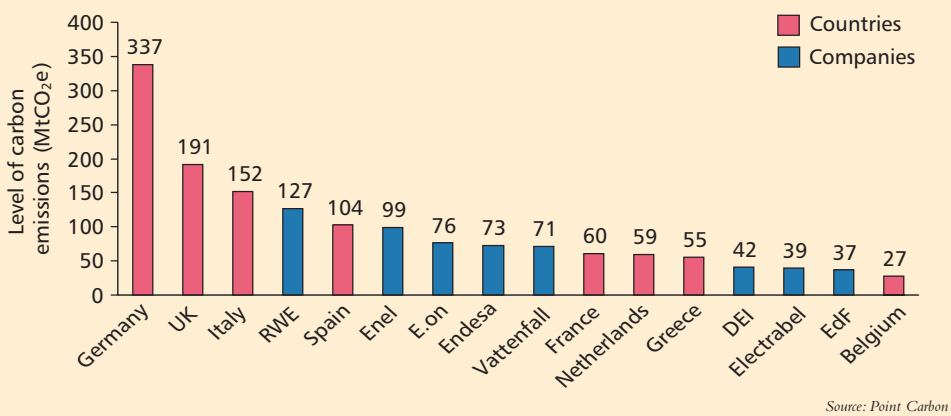
For European business and industry, the envisaged European carbon market represents risks as well as opportunities. Even though risk management is an integrated part of everyday business decision-making, the notion of a carbon-constrained future introduces new and unprecedented challenges.

The main reason is that the carbon market is more politicised than most other international markets. In the case of the EU, this is most notably brought about by the contentious issue of allocation, involving the amount of allowances to be distributed to sectors, companies and installations. Moreover, owing to the so-called 'opt-out' option, political negotiations will determine which sectors, gases and activities will be covered by the directive. These are all features that will have considerable impacts on market structure, trading volumes and carbon prices.

Participants in the emerging carbon market are in many respects squeezed between two highly politicised arenas: EU-level negotiations and domestic policy making.

That said, emissions trading also involves new opportunities. Profits may await market players that can navigate successfully in the carbon market, capitalising on new opportunities for trading in emission allowances and other financial instruments.

Figure 1: **The biggest players – countries versus companies**



Source: Point Carbon

When the EU emissions trading market takes off properly, RWE, Enel, E.on, Endesa and Vattenfall are likely to be among the main players. As the figure above shows, these companies emit more CO_2 than the entire energy industry in individual countries like France, the Netherlands and Greece. Companies such as DEI, Electrabel and Electricité de France are also expected to play an active role in the market.

Forecasting carbon prices

The main challenge when forecasting future carbon prices is that the overall reduction target – or cap – has not yet been set. The caps will, however, be established through the national allocation processes that recently started at member state level.

Model-based studies carried out by Norwegian weather research and consultancy firm Point Carbon in September last year indicated price levels between €1.5 and €20 per tonne of CO2 equivalent emissions (€/tCO2e) under various policy scenarios. After weighting the scenarios according to their probability, we ended up with a 'best estimate' of €5/tCO2e. This corresponds well with the present price level in the so-called pre-compliance market.

The first real EU trade, however, was between Dutch power firm Nuon and oil company Shell, announced on February 27. The companies gave no indication of volume or price, but the deal is believed to be 'in the market'. The Nuon-Shell trade could be considerably larger than what is indicated by current bids, as Shell says it agreed to sell a "significant" volume of its first year's compliance allowances.

Throughout March, brokers cited an indicative €5–7/tCO_2e bid-offer spread. A few firm bids were made at the level of €5.25/tCO_2e, while firm offers were expected to emerge over the next few weeks. It was expected that the next trades will be executed at a level of €5–5.5/tCO_2e. The volumes of the firm bids were typically 10,000–25,000tCO_2e.

Power prices rise

Other model simulations indicate considerably higher price levels. For example, simulations carried out by the European Commission indicate prices of around €20–30/tCO_2e. If prices reach such levels, they are likely to have substantial effects on electricity prices. For example,

US consultancy McKinsey estimates that a carbon price of €25/tCO_2e would lead to a 40% increase in power prices. Simulations carried out by ICF, another US consultancy, indicate a 35% increase in electricity prices in some markets under carbon constraints.

Yet it is uncertain whether carbon constraints of such a size are politically feasible, given the current state of the energy markets and the potentially significant consequences. Nevertheless, carbon costs and liabilities have started to make their mark on company valuations and credit ratings.

For instance, when Goldman Sachs valued E.on/RWE in August 2002 before the two German utilities merged, it estimated a potential carbon cost burden of up to 13.1% of RWE's market cap. The following December, Lehman Brothers lowered its rating of Canadian Natural Resources because of potentially high carbon costs. Such costs are hardly surprising, given the level of emissions at some companies (see figure 1).

Developing a sizeable market

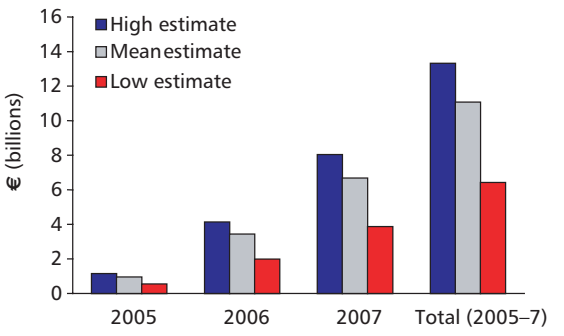
Carbon allowance trading also represents considerable opportunities. Based on experience from other markets, most notably the US SO_2 trading scheme, market liquidity is likely to increase gradually – from around €1 billion in 2005 possibly up to €8 billion in 2007 (see figure 2).

Still, the size of the market will depend on the breadth of participation of new member states and the extent to which countries will decide to use the opt-out provisions in the directive. For instance, it may be that only the new member countries that are best prepared for taking part in emissions trading will be included from the start in 2005.

Moreover, the UK and Germany could choose to opt-out installations or industry sectors that are covered by other policy instruments. Nevertheless, as indicated in figure 2 (low estimate), even with limited participation from accession countries and opt-outs for key industrial sectors, the European carbon market could be worth about €4 billion in 2007.

Depending on the extent to which member states will use the opt-out option, the EU directive will cover an estimated 1,270 million tonnes of CO_2 equivalent emissions (MtCO_2e) from EU power industries. This corresponds to almost 40% of total EU CO_2 emissions. Since CO_2 emissions from the power industry have declined significantly since 1990, and opportunities for further reductions are allegedly restricted and costly, there are concerns that the directive will impose additional burdens that may jeopardise EU power industries' competitiveness.

Figure 2: **The size of the EU carbon market**



Source: Point Carbon

Hence, companies should stay informed about policy developments at EU and member state level, particularly factors such as the choice of base year for national allocation and accommodation for early actions. It will also be important to explore the links between the emissions trading scheme and existing voluntary agreements, which cover about 50% of EU power production.

Value of allowances

In monetary terms, using a carbon price of €5/tCO_2e and allocation based on emissions in 1990, the total value of allowances (assets) to be managed by the EU power industries is around €6.35 billion a year, or €19 billion for 2005–2007.

Consider a coal-fired power plant with installed thermal capacity of 1,200MW (two 600MW steam turbines). Using a capacity factor of 85% and an emissions factor of 1 tonne of CO_2e per megawatt hour, the plant produces about 8.8 terawatt hours (TWh) – and thus 8.8MtCO_2e – annually. At a carbon price of €5/tCO_2e, the total value of allowances to be managed is about €44 million a year, or €132 million for 2005–2007. Assuming a retail power price of €30/MWh, the value of allowances represents almost 17% of annual income, rising to more than 33% if the value of allowances increases to €10/tCO_2e.

Moves towards a carbon market

In brief, the establishment of real, mandatory emission trading schemes means we are steadily moving away from concepts and theories towards markets. That said, uncertainties clearly prevail.

First, the directive has not yet been adopted. Second, the process of hammering out national allocation plans has not begun. Third, little new information has emerged regarding the key factor that will determine prices, namely the overall reduction target for the period 2005–2007. Fourth, it is still unclear to what extent the accession countries will be ready to join the emissions trading scheme from 2005. And fifth, the possibility that countries such as the UK and Germany will opt-out entire sectors could have a significant impact on market prices and liquidity.

Nevertheless, since the EU scheme is likely to start in 2005, companies should increase their efforts in order to prepare for the emerging market. And that means setting up trading units and developing trading strategies. EPRM

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Modelling EU carbon prices

Point Carbon's model for forecasting carbon prices is based on a so-called stock equation. The total stock of allowances that European Union member states might consume in the period 2005–2007 is the sum of the allowances initially distributed through the national allocation plans – denoted EU allowance units (EAUs) – plus credits generated through the clean development mechanism (CDM), so-called certified emission reductions (CERs). Hence, by year-end 2007, the allowance stock situation might be formulated as:

$$EAU + \int_{t=2000}^{t=2007} CERdt = \int_{t=2005}^{t=2007} EMdt - EAU_{Banked} + EAU_{Cheat}$$

EAU means EU allowance units distributed through the national allocation plans. CER refers to credits generated through CDM projects. EM stands for CO_2 emissions from countries included in the scheme. EAUBanked is the amount of allowances and credits banked into the next commitment period, given as a function of estimated carbon prices in the first commitment period under the Kyoto Protocol. EAUCheat refers to CO_2 emissions not offset by allowances. By adjusting this parameter, the model can be used for simulating various scenarios where installations do not meet their emission reduction commitments.

Point Carbon's proprietary simulation tool allows for parametric sensitivity studies and Monte Carlo simulations for a range of policy and economic scenarios.