

# Trading Strategies in CO<sub>2</sub> Products

On December 5, 2007 Eurex and the European Energy Exchange (EEX) commenced a cooperation that allows Eurex members and their customers to trade EEX emission products via their existing Eurex infrastructure. This alliance combines EEX's energy market membership and connectivity to the European power trading community with Eurex's financial market membership and global distribution network. With a joint member base of about 600 trading participants, the cooperation opens up the most comprehensive and global distribution network for emissions trading, resulting in increased liquidity, improved market quality and transparency.

With the start of the more restrictive Phase II on January 1, 2008, emissions' trading has become even more dynamic. This article provides an introduction to the EU Emission Trading Scheme and background information on the Kyoto Protocol. In addition, it gives a brief introduction to several trading opportunities in the European CO<sub>2</sub> market including CER/EUA swaps and trading the EUA forward curve. Finally, it takes a look at the relationship between the emissions and German power market.

## The EU Emission Trading Scheme (EU ETS)

This section provides a basic overview of the EU ETS. It outlines the basic framework and explains the types of contracts that are available for trading under the scheme as well as the important differences between them.

Under the current framework there are two types of carbon products that are actively traded in the international emissions markets. They are linked to the cap-and-trade schemes of the EU Emissions Trading Scheme (EU ETS) and the Kyoto Protocol Clean Development Mechanism (CDM) respectively:

- **European Union Emission Allowances (EUAs)** are either allocated to installations free of charge or auctioned to the market. An installation must hold and surrender EU Emission Allowances and/or project based carbon credits equal to its monitored carbon dioxide emissions by the annual EU ETS reconciliation date. EU Emission Allowances are also the main unit which is traded in the EU ETS. One EU Emission Allowance = 1 t CO<sub>2</sub>e (CO<sub>2</sub> equivalent).
- **Certified Emission Reductions (CERs)** are generated from emission reduction projects in developing countries and may also be used by participants in the EU ETS for compliance with emissions limits. They may then be sold to hedgers and/or speculators.

The EU sets a cap on the total amount of emissions allowances and then encourages program participants to trade these allowances as a way to help reduce emissions economically. Companies can trade allowances, meaning that companies for whom it is relatively costly to reduce their emissions can effectively pay companies for whom internal abatement is relatively cheaper. This means that, in theory, total emissions can be reduced to the limit of the cap at the lowest possible abatement cost.

The EU ETS is a cap-and-trade scheme that requires companies<sup>1</sup> to submit one EUA, or certified project credit (that is CER or ERU), for every tonne of CO<sub>2</sub> emitted. Companies that do not submit sufficient allowances to comply with their cap need to make up for the shortfall by April 30 the following year or face financial penalties:

- During Phase I, the fine for non-compliance was set at EUR 40 per tonne of CO<sub>2</sub> emitted.
- For the current Phase II, the fine for non-compliance has risen to EUR 100 per tonne of CO<sub>2</sub> emitted.

The EU and its member states fix the total number of EUAs allocated to program participants and also limit on the use of project credits (CERs) in their National Allocation Plans (NAPs). In Phase I, which ran from 2005 to 2007, the number of EUAs allocated was generally thought to have exceeded the number required to compel a reduction in emissions, which contributed to a significant fall in price of traded EUAs.

Phase II, which runs from 2008 to 2012, implements tightened caps which are awaited to result in an expected shortfall in the order of 200 million allowances per year. This anticipated shortfall is expected to have a positive effect on the development of trading volumes in both exchange-listed and OTC CO<sub>2</sub> emission products and is also expected to have a positive influence on price performance. The EEX/Eurex cooperation ensures that its members are well-positioned for new trading opportunities as well as expected volume increases.

The next section explains the overarching international agreement that laid the foundation for the EU ETS. Understanding the agreement and its objectives provides insight into the EU ETS and its specific goals.

## **Background – Flexibility Mechanisms Under the Kyoto Protocol**

The Kyoto Protocol is an international agreement aimed at reducing worldwide greenhouse gas emissions by five percent from 1990 levels during the four-year time period from 2008 to 2012. To help countries comply with their obligations, the protocol allows carbon credits to be used to offset CO<sub>2</sub> emissions.

The types of credits include:

- Certified Emission Reductions (CERs) are carbon credits resulting from projects known as Clean Development Mechanism (CDM) projects. These UN-administered CDM projects are hosted by developing countries that have ratified the Kyoto Protocol but do not have quantitative reduction targets<sup>2</sup>. These project-based credits can be used for compliance by industrialized countries<sup>3</sup>. A number of countries and companies will make use of project based carbon credits from CDM to be in compliance with their Kyoto targets. Reducing emissions outside one's own site or country ("external abatement") can be a cost-effective alternative to internal abatement.
- Emission Reduction Units (ERUs) result from projects known as Joint Implementation (JI) projects, which are undertaken in countries that have quantitative emissions targets under the Kyoto Protocol, that is industrialized Annex 1 countries<sup>4</sup>. These countries can contribute to their greenhouse gas emission reduction targets by investing in emission reduction projects in other industrialized countries and receiving ERU credits. ERUs can equally be used for compliance through external abatement.

<sup>1</sup> Approximately 10,000 energy-intensive companies like steel factories, power plants, oil refineries, paper mills, and glass and cement installations are covered under the EU directive.

<sup>2</sup> Predominantly emerging market countries fall into this category including China and India.

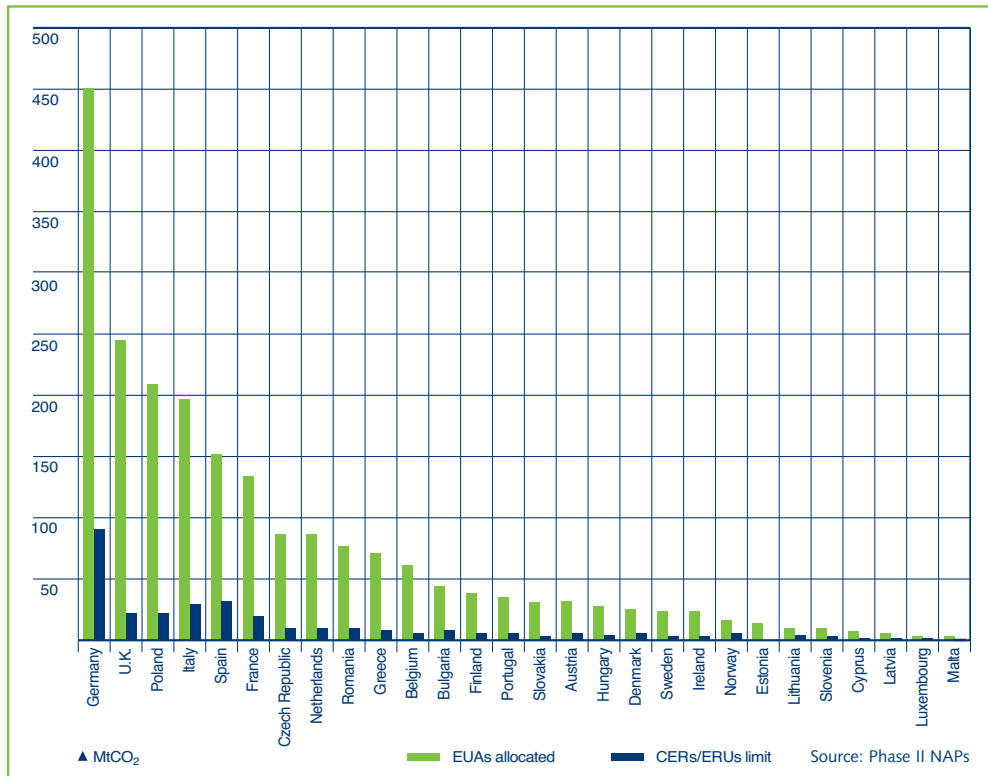
<sup>3</sup> Industrialized countries are included in Annex 1 of the Kyoto Protocol.

<sup>4</sup> Most of these projects are expected to take place in Eastern Europe and former Soviet Union.

To date, only few ERUs were issued from JI projects, accounting for only about five percent of the compliance market, which is dominated by CDM. But issuance of ERUs is expected to form a stream of credits at a later stage of Phase II, which will enable trading of ERUs based contracts.

In Phase II, approximately 2.1 billion EUAs are allocated and 280 million project credits can be created each year. Figure 1 below details the number of EUAs to be allocated and also shows the limits of the use of project credits by country. Logically, industrialized countries like Germany, the U.K., Poland, Italy, Spain and France are allocated the highest number of allowances.

**Figure 1 – Phase II EUAs Allocation and CERs/ERUs Limit per Year by Country**



## Today's Marketplace

After taking a look at the background behind the EU ETS, this section now addresses the current status of the European emissions market.

Currently, spot and futures contracts in EUAs going out to end December 2012 can be traded, as this time frame is aligned with Phase II. Since regulators have not yet finally agreed on a post Phase II strategy, derivatives contracts for beyond 2012 carry too many uncertainties to allow for liquid trading.

However, the market is increasingly sensitive to many factors which impact both spot and derivatives prices, as well as the spreads between the two.

Factors influencing EUA and CER prices are:

- Size of the gap between allowances and business-as-usual emissions
- Level of economic growth and particularly the growth in the demand for electricity
- Relative prices of electricity, coal, gas, and CO<sub>2</sub>
- Level of substitution allowed by EU member states between EUAs and other emissions certificates
- Availability and price of CER and ERU carbon credits
- Expansion in the coverage of the EU ETS, such as aviation and shipping
- Weather related factors, such as level of rainfall on hydro production and fluctuations in temperature throughout the year

As the emissions market grows and matures, these underlying fundamentals become better understood and result in new trading strategies and opportunities.

## Relationship Between EUAs and CERs

The total compliance with EU ETS limits may be comprised of a mixture of the two products currently allowed for trading under the EU ETS, which are EUAs and CERs.

The EU ETS has established that EUAs and some secondary CERs (sCERs)<sup>5</sup> are fungible to a certain extent<sup>6</sup>. According to the EU ETS “Linking Directive”, CERs from CDM projects and ERUs from Joint Implementation projects can up to an average of 13.4 percent be used by companies for compliance with emissions limits. The rest of the compliance is required to be made up of EUAs. Also not all CERs are acceptable for compliance. For example, those resulting from nuclear projects are not accepted for compliance.

Though CERs have been approved and issued, market participants are of diverging opinions as to the risk they carry, which makes for a healthy two-sided market. Having said that, many believe that the price of CERs should converge to that for EUAs. However, the spread has actually diverged.

Possible reasons include:

- Remaining concerns about when the International Transaction Log (ITL)<sup>7</sup> will become fully operational and linked to the European Community Independent Transaction Log (CITL)<sup>8</sup>.
- Not all governments may be eligible to trade CER transactions.
- Limits on the use and banking of CERs may lead to EUAs attracting a premium.

## The CERs/EUAs Swap

The existence of fungible carbon products with different prices has resulted in arbitrage possibilities between these products. EUAs are considered by many market participants to be worth more because they are actual allowances, whereas CERs are credits from projects that are expected to generate credits in the future. As CERs trade at a discount to EUAs, one popular market strategy involves swapping of more expensive EUAs with cheaper secondary CERs in expectation of converging prices. The graph below illustrates that in later vintages, the CERs/EUAs spread widens, making the swap potentially more profitable in the 2012 vintages.

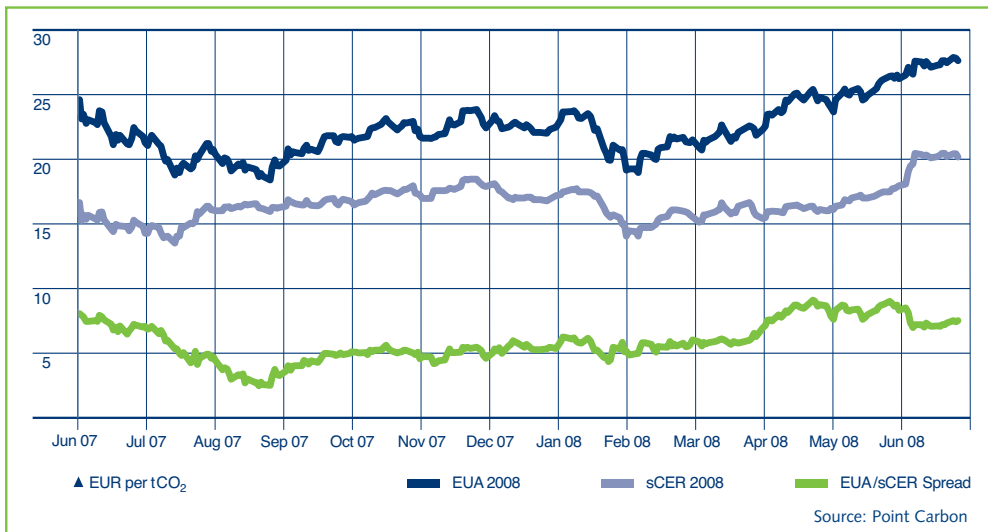
<sup>5</sup> Secondary CERs (sCERs) refer to CERs already issued and listed in the United Nations CDM registry.

<sup>6</sup> Flexible mechanisms allow Annex 1 countries to comply with greenhouse gas emissions limitations by purchasing emission reductions from CDM projects (CERs). The overall amount of credits that can be purchased for compliance is limited to a maximum of 20 percent.

<sup>7</sup> The International Transaction Log is the registry system that enables the transfer of carbon credits between countries that have ratified the Kyoto Protocol.

<sup>8</sup> The Community Independent Transaction Log monitors and tracks the trade of EU Emission Allowances and is a prerequisite to transfer UN approved offset credits to the EU.

Figure 2 – CERs/EUAs Spread June 2007– June 2008

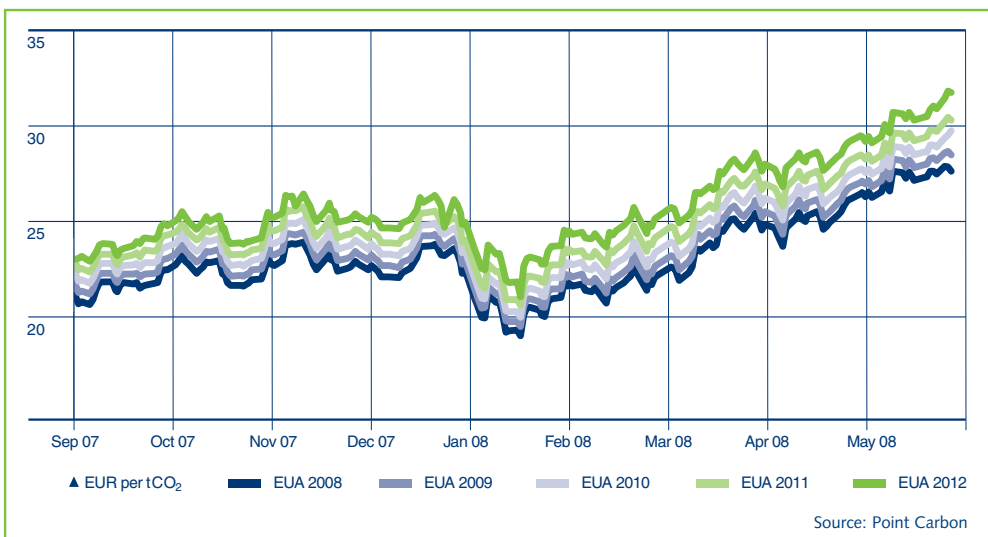


### EUA Forward Curves

Another trading opportunity lies in relationship between the cost of carry and the spread between the various vintages of EUAs. Participants can carry over EUAs for use in subsequent Phase II years and receive new yearly allowances before their compliance for the previous year is measured. Each year, the overlap period runs from February 28 to April 30. During this overlap, participants in the scheme can use the following year's EUAs to comply with the previous year's limits. If the shape of the EURIBOR curve (financing cost) is flatter than the cost of carry, participants can sell nearby EUAs and buy other vintages to gain interest on the sale of the nearby vintages while simultaneously being compliant. The scenarios differ according to the shape of the yield curve. Therefore the scenario respectively arbitrage opportunity is as follows: Less than the cost of carry, purchasing future vintages and selling the current vintage will yield a gain.

Figure 3 shows the prices of the EUA vintages from 2008 until 2012, and shows how the spread has widened and contracted over time.

Figure 3 – Prices for EUA Vintages 2008–2012



Depending upon the narrowness of the spread between the 2008 and 2012 vintages, it may be desirable to buy 2008 vintage allowances and enter a contract to sell 2012 vintage allowances and invest the proceeds of the sale until they are needed for compliance purposes.

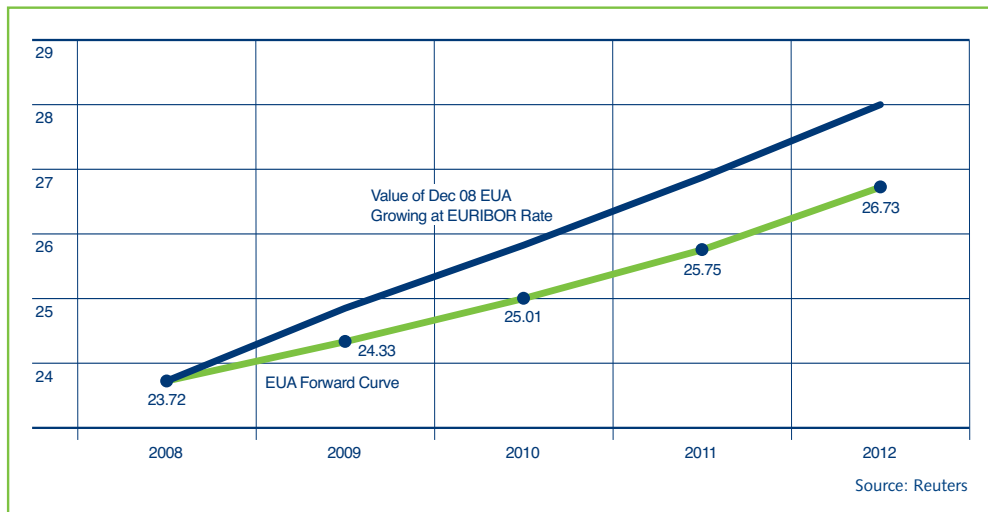
As previously mentioned, allocation of the coming year EUAs occurs before (on February 28, of each year) the previous year's compliance date (on April 30, of each year), which in effect allows borrowing and thus allowing for EUA Futures arbitrage opportunities. For example, assume the following:

1. December 2008 EEX/Eurex EUA Future is EUR 23.72
2. December 2008 to December 2012 risk free rate is 4.4036 percent
3. December 2012 EEX/Eurex EUA Future is EUR 26.73

This gives an implied December 2012 EUA Futures price – based on cost of carry – of EUR 28.18 that is  $EUR\ 23.72 \times (1.044036)^4$ . Assuming a flat yield curve of 4.4036 percent, a forward curve of EUA Futures can be calculated and compared to actual EUA Futures. In such a situation, an institution can sell EUAs for December 2008 delivery, invest the proceeds to buy allowances for future delivery at a price less than the original sale price less the interest earned – selling December 2008 EUAs at EUR 23.72 investing over a four year period at 4.4036 percent and buying December 2012 EUA Futures equates to a profit of EUR 1.45 per EUA.

Figure 4 below compares the EUAs forward curve with the return available through investing the value of the December 2008 EUA at the EURIBOR rate. This does not account for transaction costs, but indicates that arbitrage opportunities potentially exist.

**Figure 4 – EUAs Forward Curve Versus Value of EUAs Growing at EURIBOR Rate**



## Correlation Between EUAs & Other Energy Products

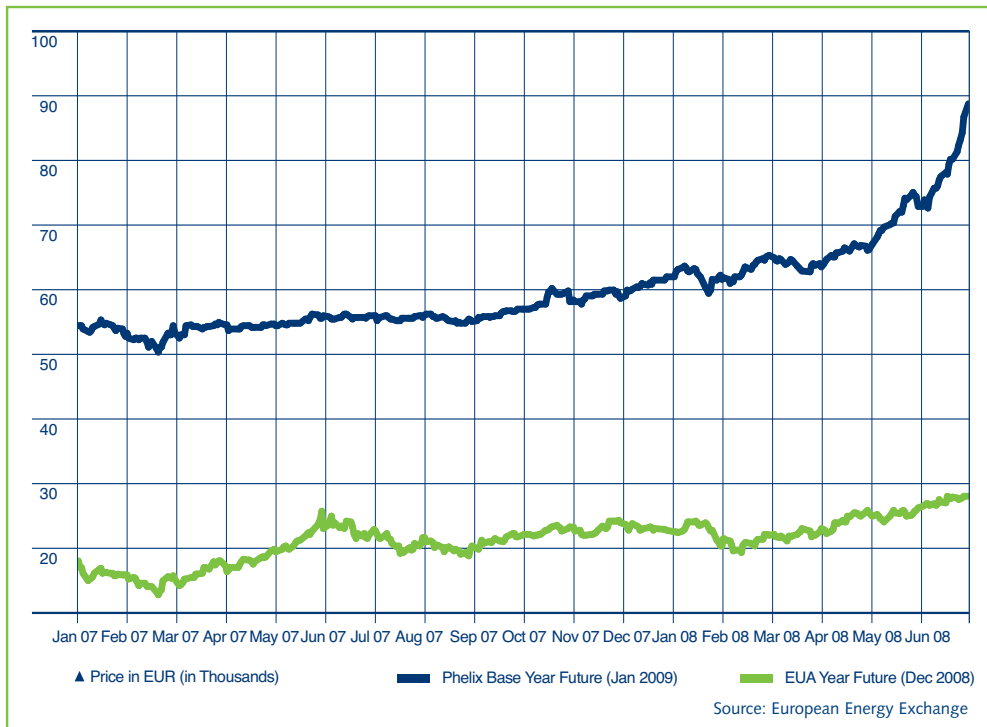
Though a major driver of trading in the emissions markets is the spread between EUAs and CERs, other factors undoubtedly affect price developments in the emissions markets. Besides the CERs/EUAs spread, another major factor is the German power market, and specifically the price of fossil fuels used to generate power.

A correlation between the carbon market and the German power market is often evident, as the increase in the price of electricity encourages operators to increase their output, which requires them to purchase more allowances (or otherwise reduce their emissions). However, this positive relationship does not always apply because power producers can choose to use either gas or coal (or other type of fuel) to produce electricity based on the value of the spark (gas-fired) or dark (coal-fired) spreads. A spark (dark) spread is the spread between what it costs for a gas-fired (coal-fired) power plant to purchase the fuel required to produce a unit of electricity and at what price it can sell that unit of electricity.

The reason for the positive correlation between German power prices and carbon prices is as follows: Germany produces a major part of its electricity using coal. As demand for electricity rises, prices go up. Higher production results in more CO<sub>2</sub> emissions (as coal emits greater volumes of CO<sub>2</sub> than gas) resulting in the need for the utilities to purchase allowances therefore CO<sub>2</sub> prices follow the power prices.

However, if carbon prices rise to where it becomes cheaper to use gas, the demand for allowances may diminish. It is important that market participants bear in mind the relationship between the power market and its inputs (fuel, electricity and carbon prices) in order to better understand the direction the carbon market may be moving in.

Figure 5 – Price Development German Power Prices January 2007– June 2008



Coal produces roughly double the CO<sub>2</sub> compared to gas for the production of a unit of electricity. High oil (and gas) prices cause power generators to switch to coal which in turn drives up CO<sub>2</sub> prices. Therefore CO<sub>2</sub> prices are closely correlated to natural gas (and oil) prices, causing the relative volatility we have seen recently in the markets.

The cost of reducing or "abating" emissions is another factor that affects CO<sub>2</sub> prices. From society's point of view, the optimum condition would be attained when the marginal environmental benefits of reduced warming were equal to the marginal abatement costs. The Marginal Abatement Cost (MAC) curve is upward-sloping indicating the marginal cost of each new method of avoiding CO<sub>2</sub> emissions. Some methods have a negative MAC (that is have direct benefits that outweigh their costs) like for example the introduction of more efficient appliances or vehicles.

## **Conclusion**

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As liquidity is growing and CO<sub>2</sub> products become more widely traded, understanding of underlying drivers is improving. European Union commitments and the ongoing development of a post 2012 international framework for reducing greenhouse gases indicates that carbon trading will continue to play an important role in the reduction of those greenhouse gases. Eurex's and EEX's joint offering of a range of carbon products enables a diverse range of customers, from compliance participants to hedgers and speculators, to efficiently trade carbon products. For detailed information and trade ideas, please visit the Eurex website [www.eurexchange.com](http://www.eurexchange.com) or contact your broker.



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