

## Analyzing the Price of Carbon in 2008-2012

### Its Widespread Impacts

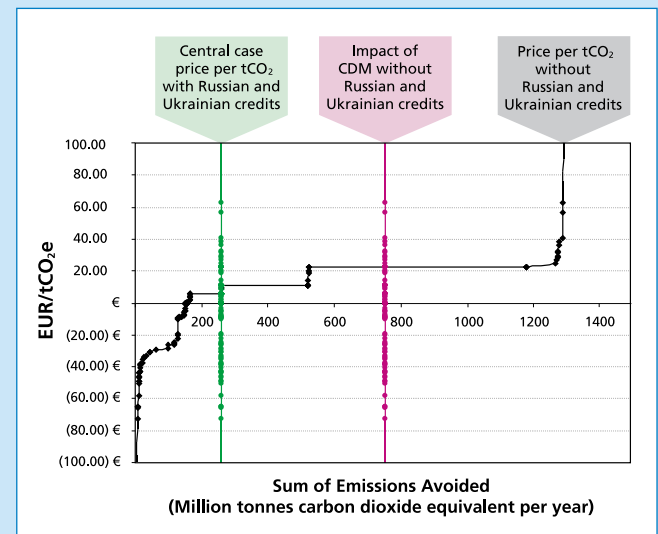
The accepted wisdom in energy markets now is that constraints on greenhouse gas emissions (GHG)—referred to as “carbon constraints”—being imposed on the European power sector will have significant commercial implications for utilities and fuel suppliers alike. With the European Union Emissions Trading Scheme (EU ETS) now moving forward and clearer carbon dioxide (CO<sub>2</sub>) price signals emerging for the period 2005-2007, coupled with the Kyoto Protocol coming into force on February 16, 2005, one of the key risk management challenges utility analysts now face is understanding likely drivers of the price of CO<sub>2</sub> in the first Kyoto budget period of 2008-2012.

The price of CO<sub>2</sub> will drive revenue forecasts in 2008-2012, a period during which expected cash flow will be material to planned, new power plant investment decisions. Some analysts suggest planning for a price of €25/tonne of CO<sub>2</sub>. ICF Consulting’s recent analysis suggests, however, that fundamentals analysis of the market, policy, and technology drivers can help provide significantly more robust estimates for the price of CO<sub>2</sub> and considerably reduce uncertainties. Our perspective is that a price of €25/tonne of CO<sub>2</sub> represents a crisis scenario rather than one grounded in any realistic analysis of the market drivers that will affect price.

Undertaking a fundamentals analysis of the demand and supply for carbon during 2008-2012 is made more difficult by the plethora of variables involved, many of which hinge upon key policy decisions yet to be taken including:

- the tightness of the overall cap for the EU ETS to be set during 2008-2012
- the linkage between the market for EU allowances (the currency of the EU ETS), other domestic trading schemes (e.g., Canada and Japan), and other carbon

### Price of CO<sub>2</sub> in the EU: 2008-2012



commodities created by the Kyoto Protocol’s market mechanisms, such as the Clean Development Mechanism (CDM), which allows companies to obtain carbon credits from undertaking projects that reduce carbon emissions in countries like India, Brazil, and China

- the potential addition of other gases and sectors into the EU ETS

ICF Consulting’s integrated analysis incorporates these uncertainties by using a scenario-based approach and considers the following:

- the quantity of cost-effective abatement options available to participants in the carbon market (represented by detailed bottom-up, sector-specific, marginal abatement cost curves)

- the likely shortfall of emissions within the carbon market(s) due to the tightness of the caps and the availability of credits from the project-based mechanisms of CDM and Joint Implementation (JI)
- the impact of surplus allowances (e.g., hot air), particularly from Russia and Ukraine entering the market
- the range of possible fuel prices given current market trends

Any approach for analyzing the price of carbon during 2008-2012 must consider the dynamic response of the power sector. ICF Consulting has undertaken power market modeling using our proprietary Integrated Planning Model (IPM®), a dynamic, linear programming model that minimizes the cost of meeting future electricity demand while complying with a multitude of constraints. These include cross-border power transmission limits, environmental constraints, reserve margin constraints, and forced investments such as renewables.

ICF Consulting forecasts a total unmet demand in the range of 300-800 million tonnes of CO<sub>2</sub>/year during 2008-2012. The scenarios we have explored for the price of carbon in the EU during 2008-2012 identify a series of key insights. In general, this trading period is characterized by significant growth in the size of the market compared to 2005-2007, with further cuts being made to European trading sectors and additional cuts from other parties as the Kyoto Protocol commences trading. Consequently, the price of carbon dioxide equivalent (CO<sub>2</sub>e) will rise compared to that in 2005-2007.

Our analysis demonstrates that under all likely policy and market scenarios within 2008-2012, two key variables set the price of CO<sub>2</sub>e in this period:

- the introduction into the carbon market of, and the response to, assigned amount units (AAU), or so called “hot air” allowances, from Russia and Ukraine
- the implementation of cost-effective, large-scale power sector abatement options within Europe, as load shifting from coal to gas accelerates and new combined cycle gas turbine (CCGT) power plants come on line in specific markets where high value opportunities emerge

Another key insight from our analysis is that there is adequate availability of large-scale, power sector fuel switching opportunities to reduce emissions. These opportunities dominate the overall marginal abatement cost curve relative to the abatement potential from other sectors included in the scheme. Long-run fuel prices and the spread between coal and gas prices are key factors in determining the level of abatement available in the power sector at specific cost levels.

Generally, however, the available abatement options have the potential to meet all demand requirements when Russia and Ukraine hot air allowances are used in combination. Without the use of hot air allowances, the price of carbon would increase considerably (although still less than the €25/tonne forecast by some commentators). Moreover, it is probable the price will be constrained in such scenarios by the increased use of CDM credits, which put downward pressure on the level of abatement required and ensure a lower price of carbon.

The figure on page 4 (indicative scales for price and level of abatement) highlights the dynamic relationship of these dominant drivers on the price of CO<sub>2</sub>e during 2008-2012. Compared with the 2005-2007 market, in which we expect to see higher price volatility given the pivotal role of weather and fuel prices, we anticipate low upside and downside price volatility during 2008-2012 as a result of the shift in balance between power sector abatement and excess hot air allowances entering the market.

Given the relevance of the price of carbon to power plant valuation, companies that are active in the EU energy sector need to develop explicit estimates for the future price of carbon over the expected life of existing and proposed assets and incorporate them into investment protocols. ICF Consulting coined a term that would now be an appropriate descriptor in the energy risk management lexicon: BAPEC, or Best Available Price Estimate for Carbon.

For more information on ICF Consulting's energy forecasting services, please visit [www.icfconsulting.com/carbon](http://www.icfconsulting.com/carbon).